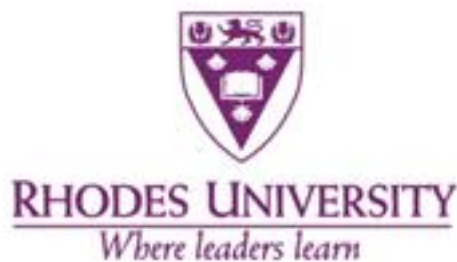


# On Locating the Experiences of Second Year Science Students from Rural Areas in Higher Education in the Field of Science: Teaching Science by Drawing on Students' Lived Rural Experiences

A thesis submitted in fulfilment of the requirements for the degree of  
DOCTOR OF PHILOSOPHY (by full dissertation)

by Nkosinathi Emmanuel Madondo

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## DECLARATION

This study represents original work by the author and has not otherwise been submitted in any form for any Degree or Diploma to any tertiary institution. Where use has been made of the work of others, it is duly acknowledged in the text.

I, Nkosinathi Emmanuel Madondo, declare that:

- i. The research reported in this thesis, except where otherwise indicated, is my original work.
- ii. This thesis has not been published for any degree or examination at any other university.
- iii. This thesis does not contain other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from other persons.
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Signed:



Nkosinathi Emmanuel Madondo, 2020

## ABSTRACT

This study was designed to investigate the experiences of Second Year Science students who come from rural backgrounds within a Higher Education context. The purpose of the study was to understand the enabling and/or constraining factors that influence the teaching and learning of Second Year Science students who come from rural contexts. Given this purpose, the participants that were considered relevant to answer the question: *What are the enabling and constraining factors that influence teaching and learning of second year Science students who come from rural backgrounds at a South African University?* were students from rural areas enrolled in the Faculty of Science at the research site, academic teachers and senior leaders', and roles in providing enabling and/or constraining teaching and learning environment. The phenomenon under investigation was thus, the extent to which the teaching and learning environment, in the field of science, enable or constrain access to the Discourse of science for students who come from rural areas.

To generate data, the study used focus group discussions, Participatory Learning and Action (PLA) tools as part of Participatory Action Research (PAR), digital documentaries, as well as academic teachers' rich descriptions of the rationale for the design and delivery techniques of their modules by means of focus group interviews, as well as curriculum review documents. The purpose of Action Research (AR) in this study was to enable change by way of advancing a self-consciousness, envisaged to yield some action based on the enablements or constraints identified by the participants involved.

Archer's (1995, 1996) analytical dualism was used as the analytical framework to identify the interplay of structural, cultural and agential mechanisms shaping the emergence of, and practices associated with students' experiences of the science curriculum and academic teachers' observations of these experiences. Bernstein's pedagogic device was also used to explain the options that academic teachers have to shape the curriculum, a curriculum that would reflect the experiences of the heterogeneity of the student cohort when designing their course guides, for example. The analysis thus used Archer's (1995, 1996) Morphogenesis/Morphostasis framework through which change or non-change can be observed over time. The work of Bhaskar (1975, 1979) was important in this regard because it allows us to separate what we see, experience and understand (in the transitive world) from what is independent of our thoughts and experiences (the intransitive world) when conducting scientific enquiry, so that we are able to deduce the 'real' factors that enable and constrain the events and

experiences being studied. Since there are multiple mechanisms operative that can act to include or exclude students in Science classrooms, particularly those who come from lower class, including those who come from rural areas, this study focuses on curriculum as one mechanism that can be at play in the problem of exclusion. In this study, I argue, the University and its structures like curriculum are not neutral but are historical, cultural, political and social, which is why persistent apartheid legacy and coloniality were seen as playing a role in how the curriculum is designed and thus enacted. This is the reason, a decolonial gaze was adopted in order to engage with social justice issues and in the process tease out the social relations of knowledge practices. A decolonial gaze provided a way to re-describe the structuring of the curriculum and the contradictions it sets up for black students, particularly those who come from lower class backgrounds, including those from rural areas.

Findings reveal that the way in which the science curriculum (and/or teaching and learning) is structured, and thus enacted, tends to favour certain worldviews to the exclusion of others. Also, findings show that when students are presented with knowledge that seems completely separate from them, their identities, their heritage, their backgrounds and value systems, accessing that knowledge can seem inordinately difficult. Consequently, students from rural contexts are often alienated, because the “world” they bring and know is often not considered part of the starting point, neither is it seen as relevant when teaching the science curriculum. There is therefore a clear need to bring something ‘from home’ into our teaching as a means of reassuring students that all is not foreign and that what they already know is valuable.

**Key Words:** second year science students, Participatory Action Research, Critical Realism, Social Realism, Discourses, curriculum, rural areas, Bernstein.

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## ETHICAL CLEARANCE

The work described in this thesis was carried out in the Centre for Higher Education Research, Teaching and Learning at Rhodes University during 2016-2019 under the supervision of Professor Emmanuel Mfanafuthi Mgwashu. Ethical clearance was obtained for this study.



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30 November 2016

To Whom It May Concern

**Re: Proposal and Ethics Approval for Nkosinathi Emmanuel Madondo (G16m8984)**

The minutes of the EHDC meeting of 24 November 2016 reflect the following:

**2016.11.1 CLASS A RESTRICTED MATTERS**

**DOCTOR OF PHILOSOPHY RESEARCH PROPOSALS**

*Nkosinathi Emmanuel Madondo (G16M8984 Topic: On understanding the influence of rurality in second year science students' transition from secondary to university education Supervisor: Prof Emmanuel Mgwashu Decision: Approved*

This letter confirms the approval of the above proposal at a meeting of the Faculty of Education Higher Degrees' Committee on 24 November 2016.

In the event that the proposal demonstrates an awareness of ethical responsibilities and a commitment to ethical research processes, the approval of the proposal by the committee constitutes ethical clearance. This was the case with this proposal and the committee thus approved ethical clearance.

Yours truly,

Prof. Mellony Graven, Chair of the EHDC, Rhodes University

From: noreply@ru.ac.za

Subject: Mr Nkosinathi Madondo: Ethics Recertification- PG Report Approved. Ethics Recertification Approved

Date: 27 January 2019 at 15:01:59 SAST

To: g16M8984@campus.ru.ac.za

Cc: E.Mgqwashu@ru.ac.za

Cc: ethics-committee@ru.ac.za

Dear Mr Nkosinathi Madondo

RUESC Chair hereby grants extension to Mr Nkosinathi Madondo (16M8984) under the supervision of Prof Emmanuel Mgqwashu to continue the research project titled **On locating the experiences of students from rural areas in higher education in the field of science** which has been granted ethical clearance approval under the tracking number 2016.11.1, for 1 Jan 2020 - 31 December 2020. This extension implies that there have been no significant changes to the conditions/term of the original application.

Kind regards

Chair: RUESC

### **Note on stylistic conventions:**

Steps were taken to protect the anonymity of those involved in this study. Specific names of participants were not used in this study to protect their privacy. Citation: the data source is given, enclosed in brackets, indicating the source and type of extract, Acronym of the name of the research site (pseudonym), and date, for example, (Discussion group/Focus group interview, NX., 26 October 2017). Unless otherwise indicated, all quotes and transcripts are speakers' exact words.

## DEDICATION

I dedicate this thesis to the students who participated so willingly in the Southern African Ruralness in Higher Education (SARiHE) project, the academic teachers and senior leaders, for the advancement and quality of teaching and learning that recognises the experiences of all students in higher education. It is further dedicated to my late parents, Nombuso (MaMthembu: iskhukukazi esifukamela izinsizi zakweminye imizi) Madondo and Chistopher Boy Madondo. I know you are happy when you look at my achievements.

I further dedicate this dissertation to the late Professor Brenda Leibowitz, for encouraging me to be part of the SARiHE project team. Her scholarly rigor will forever live in my memory. May her soul rest in peace. You will forever be in our memories.

Thank you, Mighty God, for the benevolent opportunities I have been bestowed with in life.

## ACKNOWLEDGEMENTS

I acknowledge the love, support and encouragement from my wife and life partner, Busisiwe (Mamnganga) Madondo. Hers was an incalculable encouragement in this long and lonely journey. Thank you love. I promise to have more time for us two, now that this journey has been completed.

Thank you, my children, for always encouraging me in my times of doubt. Thank you Siyabulela, Fanelesibonge, Unathi. Okuhle my boy, just know that I love you very much. I promise to have more time for all of you now that I have completed this journey.

Thank you, my supervisor, Professor Emmanuel Mgwashu, for introducing me to the SARiHE project. I have found a home in the project and was able to do what I am so passionate about: fight against injustice. Thank you for your insights and guidance. Sometimes I would complain and say you are not giving me the attention I think I deserve; you would say it was because you knew I could do what you asked of me. “I am your guide, not your supervisor”, you would say. Now I understand what you meant.

I would also like to express my sincerest gratitude to the SARiHE team for the love, support and encouragement. I have found a home with you.

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Professor Sioux McKenna, you have been so instrumental in giving the time to read my work and giving frank comments wherever I got it wrong. For that, I will forever be grateful to you.

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Doctor Karen Ellery, you might not be aware that the little talks we used to have in the corridors or our offices had a significant impact on how I understood the research process and the rigor that was required. Thank you.

Lastly, I would like to acknowledge the Newton Fund, the Economic and Social Research Council (UK) and the National Research Foundation (South Africa) [ES/P002072/1]. Without this funding, it would not have been possible to conduct a study of this magnitude.

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## LIST OF ABBREVIATIONS

AD	Academic Development
ANC	African National Congress
CEP	Cultural Emergent Properties
CHE	Council for Higher Education
CR	Critical Realism
DET	Department of Education and Training
DVC	Deputy Vice Chancellor
EHDC	Education Higher Degrees Committee
HE	Higher Education
HEIs	Higher Education Institutions
HWU	Historically White University
HWUs	Historically White Universities
HSRC	Human Science Research Council
ISCM	Introduction to Science Concepts and Methods
LCT	Legitimation Code Theory
LoLT	Language of Learning and Teaching
MM	Morphogenesis/Morphostasis
n.d.	No Date
PAL	Participatory Learning and Action
PAR	Participatory Action Research
PEP	Personal Emergent Powers/Properties
PGDipHE	Post Graduate Diploma in Higher Education
RUESC	Rhodes University Ethical Standards Committee
RU	Rhodes University
SA	South Africa
SR	Social Realism
SAHE	South African Higher Education
SARiHE	Southern African Rurality in Higher Education
SAWUs	South African Historically White Universities
SESP	Structural Emergent Properties
SESP	Science Studies Extended Programme
STEM	Science, Technology, Engineering and Mathematics
UK	United Kingdom
UKZN	University of Kwa-Zulu Natal
USA	United States of America

# CHAPTER 1: INTRODUCTION

## 1.1 Introduction

Students from working class backgrounds, including those from rural areas, are often associated with the notion of gaps in generic skills that students bring with them in Higher Education (HE) (Department of Higher Education, 2017). However, recent research challenges this “deficit” model in that it has little effect on student access, fails to provide genuine access to the practices of the field, and leaves the university and its structures outside of any critique (Boughy & Mckenna, 2016; Fataar & Filies, 2016). This critique is seen as pertinent given that universities, internationally, are no longer dealing with socio-culturally homogenous cohorts (Wilmort & Mckenna, 2018). The associated massification of HE internationally, including social inclusion, widening access and lifelong learning, has meant that universities need to accommodate and adapt to a widening and diversifying student body. Research shows that the heterogeneity of the student cohort, in terms of social and educational backgrounds, could potentially mean that the accepted norms and standards in HE are taken for granted by insiders or traditional students, but are incomprehensible to non-traditional students (Ellery, 2016; Reay, Crozier & Clayton, 2010). Historically under-represented or non-traditional students often belong to minority groups (those of a lower socio-economic status, ethnic minority, first-in-family or studying part-time, for example), and rural students are occasionally considered as part of this category.

In this study, I investigate how students from rural areas experience the transition into science studies at higher education level. By experience I mean the navigation that students go through as they negotiate studying in higher education (HE) and the challenges they face in the process. I interrogate the ways in which university spaces (physical, ideological, intellectual) welcome or alienate students from rural areas. Furthermore, the challenge this study poses is to the university itself, when it questions the ways in which we might be enabling or constraining genuine access to science Discourse as per the focus of the study. The concept of Discourse with a capital letter “D” is important in this study and is discussed further in Chapter 2 of this dissertation.

We are at a significant point in the higher education sector when there is a loud call for better understanding of the processes of epistemological access and the problem of the absence of certain knowledge, experiences and identities from our universities. Studies such as this that place issues of context and the purpose of higher education at the forefront of considerations of student success are crucial. How students from rural areas experience higher education in the

field of science and how the Science Faculty has positioned itself in widening participation of all students, including those from rural areas, is of particular importance in this study.

Chapter 1 thus discusses the context of rurality and argues that this is a complex concept to define, but a necessary one to engage with in order to understand how it could act as a hindrance or enablement for students' access and success in the field of science. The chapter then moves to learning and teaching in rural communities. This section posits that rural students are the most marginalised in literature on widening participation in HE, but the fact that these students come from marginalised or "deficit" backgrounds does not mean that as people they are also "deficit", but rather that they possess literacies (Boughey, 2018; Street, 1984) acquired in rural home contexts. The third section deliberates on teaching and learning of science. This section highlights issues of formal ways of knowing in science and informal ways from rural homes. This section argues that, while there are tensions between these ways, there are also interactions. The problem statement is then discussed with reference to students' performance in the field of science at the research site, leading to the rationale for the study. The research questions which the study is investigating are then provided in terms of factors that could constrain or enable students from rural areas in the field of science. Lastly, the layout of the dissertation is provided.

## **1.2 Context: Rurality**

The concept of rurality is at once demographic, geographic and cultural (Roberts & Green, 2013). It is defined "empirically" as having sparsely populated areas and ontologically as "a category and a set of experiences" (Moreland, Chamberlain & Artaraz, 2003, p. 56). It is spatial, geographical and contextual (Green & Reid, 2014). Rurality is a difficult concept to define; for example, distinguishing between rural and remote rural (Randall, Clewes & Furlong (2015). Essentialising rurality would thus be problematic (Roberts & Green, 2013) as not all rural contexts are the same. There exists a continuum of contexts of sparse population, small towns and large towns, and contexts of privilege and lack of access to resources, which may even exist side by side (Moreland, Chamberlain & Artaraz, 2003).

Rurality has also been associated with discourses of traditionalism, disadvantage and even backwardness (Robert & Green, 2013). "Spatial blindness" is a large source of concern as it assumes that students from metropolitan and rural areas have the same needs. A further serious concern, according to Roberts and Green (2013) is that educationists assume that rural students need to become less rural, or "other" than what they are. This is revealed in studies on rurality, where issues of lack of equality of opportunities in contexts as diverse as South Africa

(Denhere, 2013; Nkomo & Sehoole, 2007), India (Trilochan & Iaisan, 2010) or even China (Wang, 2013) are dominant. It is in this respect that this study is important: first, it provides a direct focus on issues of rurality in relation to academic success in higher education; second, it is based on a non-deficit approach; third, it considers the implications and possibilities for teaching and learning in higher education; fourth, it combines perspectives at the macro and micro levels; and finally, it investigates this phenomenon in the context of resource constraints in rural South Africa.

Within the South African context, rurality is both all-enveloping and permeable, and intersects with other aspects of human existence that occur in urban locations too. This is well illustrated in the moving memoir of Polela (2011) who documents growing up in two deep rural locations in South Africa; the account is premised on a deep betrayal by his father, which occurred in an urban area during his childhood. Many children in South Africa move between urban and rural areas several times during their childhoods and, in the context of this study, similar incidents of movement between locations and intersecting spatial experiences and practices (if they emerged) would have been taken into consideration.

Writing about rural existence, Leibowitz (2001) notes how students from the Eastern Cape Province in South Africa describe their growing up in a mix of urban and rural conditions, and how they acquired academic literacy in these contexts. Furthermore, the incidence of rural versus urban populations shifts over time, with a trend towards urbanisation. An example is Botswana, where the rural population has decreased from 58.1% in 1990 to 42.8% in 2014 (tradingeconomics.com, p. 1). Rates of urbanisation also vary from country to country. In comparison to Botswana, in the same period the rural population in Malawi decreased from 88.4% in 1990 to 83.9% in 2014 (tradingeconomics.com, p. 1). During this period, the rural population of Swaziland reversed the trend towards urbanization slightly, increasing its rural population from 77.1% in 1990, to 78.1% in 2014. All of these instances of variation point to the need for a contextualised and nuanced study on rurality. Hence the focus of this study on how rurality can be said to shape students' learning, particularly in the field of science, in one of South Africa's universities. Although they might have some connection with city life as it has been described above, their education was received within rural contexts.

There is a body of literature, significant but not vast, on rural education in Australia, Canada and less so in the United Kingdom (Roberts & Green, 2013; Steffes, 2008; Roberts, 2014). Some of the conditions described in this literature are similar to those described for rural South

Africa. For example, Roberts (2014) refers to vast distances needed to walk to school, and a lack of resources such as electricity, not unlike conditions described by students in Leibowitz (2001) or Polela's writings. The Rural Education Access Programme (REAP) (2008) report emphasizes lack of funding, inadequate prior education and alienation amongst rural students attending South African universities.

In debates and studies on widening participation, much attention is paid to the importance of participation of individuals from the working class and underrepresented ethnic groups, and to the need to further this participation once they have achieved formal access to higher education (Burke, 2012; Fraser, 2000, 2003, 2008; Morrow, 2009; Shay, 2016). However, research has shown that formal access to higher education, given the demographics of students, should also be associated with revisiting institutional structures like curriculum and cultures embodied in teaching and learning approaches, assessment strategies, Language of Learning and Teaching (LoLT) and so on (Boughey & McKenna, 2016, 2015; Leibowitz, 2017a). The idea of revisiting institutional cultures is linked to a realization that South African higher education remains a colonial project, where the content is essentially derivative of the metropole (Badat, 2009). The curriculum is seen to be "obsolete" (Mbembe, 2015) or irrelevant to the identity positions of students, as the #RhodesMustFall student protests, which began in March 2015, testify. There is a great need to understand the nature of the formal and hidden curriculum, and how it is received by all students, but more importantly, by students from non-traditional university backgrounds. Such an understanding requires scholarly, theorised and empirical investigations into conditions at universities and how these are experienced and managed by students, especially those from non-traditional backgrounds.

The discourse on non-traditional students is couched in the language of "disadvantage". The literature on disadvantage in higher education in South Africa makes frequent reference to race and to class, and occasionally to gender, but rarely to conditions of rurality. However, one of the social categories which is most marginalised and affected by socio-economic conditions and historical legacies of dispossession is that of rurality, especially as it interrelates with race.

If it is the case that rurality is associated with academic disadvantage, then it would be fair to argue that in the interests of social justice and social inclusion, attention should be paid to the experience and conditions of rural students in higher education. The social justice considerations affecting rurality are, appropriately, those outlined by Fraser (2000, 2003, 2008, 2009) as *mis-recognition-recognition*, *misdistribution-distribution*, and *voice, representation*

and *framing*. It is important to consider these dimensions as they intersect, especially to consider the relationship of identity and culture and the material in learning. A concerted strategy to encourage *parity of participation* (Fraser, 2008, 2009) of students from rural areas in higher education would need to take into account a wide range of issues, including residence conditions, fees, as well as students' experience of the formal and informal curriculum. However, to be able to focus sufficiently in order to contribute to the international and regional scholarly literature on social justice in higher education, the study focuses most directly on students' experience of knowledge, the curriculum and their learning, and the manner in which this interrelates most directly with the material, including artefacts such as textbooks, notes or computers.

### **1.3 Learning and teaching in a rural context**

Rural students are one of the most marginalised groups that have attracted little attention in widening participation research to date (Mgqwashu, 2016), particularly in SA. It is possible to see this given the multiplicity of factors that affect transitions from rural areas to HE, which include geography, financial resources, schooling, language and “other socio-cultural factors” (Jones, Coetzee, Bailey & Wickham, 2008). In addition to the factors mentioned above, there is also a disadvantage in terms of material conditions such as lack of electricity, television or books, as well as a discursive disadvantage, such as access to the dominant language, English (Leibowitz, 2001).

Reporting on Information and Technology (IT) conditions from the two schools in the North-West province of South Africa, Mentz *et al.* (2012) have observed constraining conditions which include impediments with regard to internet access, lack of technical support and learners not having computers at home. In some cases, there are also challenges with regard to electricity supply, shortage of textbooks and insufficient software. While the conditions enabling or constraining access to IT may not be similar in rural schools, Mentz *et al.* (2012) concluded that rural schools do have generic conditions, but that these conditions vary significantly from school to school.

Even though there are disadvantages associated with rural areas in terms of teaching and learning in those contexts, conceptions of lack of necessary cultural capital for educational success by rural working-class students in SA are challenged (Fataar & Filies, 2016). These authors use theories of cultural capital by Bourdieu to demonstrate how the learners maximise their family and community resources in their quest for educational success. Furthermore,

Jones, Coetzee, Bailey and Wickham (2008) suggest that it is not only the students who are disadvantaged, but the institutions that are not prepared to support their needs. This point is also made by Mahlomaholo (2012), who writes that rural students feature more prominently in statistics provided for early school leavers. He attributes this to the lack of adaptation by the system to the needs and strengths of students from rural areas. In relation to this point, Yosso (2005) posits that the students possess “community cultural wealth”, which the schools *misrecognize* and fail to build upon.

The ‘community cultural wealth’ is known in literature as “funds of knowledge” (Zipin & Fataar, 2015), in this study funds of knowledge are referred to as knowledge resources. These authors argue that the knowledge resources that students bring with them to the academy could not just be simplified as trivial. But these could be understood as “historically accumulated and culturally developed bodies of knowledge and skills” (Moll, Ananti, Neffe & Gonzalez, 1992, p. 133) which are meaningfully put to use as “household and other community resources” (*ibid*, p.132). According to Esteban-Guitart and Moll (2014) these knowledge resources are profoundly significant to the practices and identities of given social-cultural groups represented in classrooms. Nonetheless, cautions Zipin and Fataar (2018), this cultural wealth could not just be unsystematically assumed to constitute assets (‘funds’) for formal academic learning. Zipin and Fataar (2018) postulate that what could happen would be a selection of these assets through research in students’ home and community locales, followed by study groups in which academic - and teacher-researchers discuss “theory, data collection, and findings” (Moll, 2014, p.122) to distinguish relevant assets appropriate for curriculum events. Drawing on the knowledge resources that students bring with them has a potential to positively affect students’ agency development in academic interactions (Fataar, 2018).

Reporting on a study about rural youth in Lesotho, Morojele and Muthukrishna (2012) demonstrate how the youth navigate journeys to school and how they utilise agency to interpret activities such as the long walk to do so. There is also variation in their experience due to differences in family dynamics (for example, being orphaned and living on one’s own due to HIV/AIDS, versus living with family members). This variability in outcome or effect of a particular phenomenon is further illustrated in the Human Sciences Research Council (HSRC) (2005) study in a discussion on household tasks and labour, resulting in tension between parents and schools in some instances. This is because the tasks that rural youth are expected to do at home may cause children to be late for school, to be punished, or to avoid going to school on that particular day to avoid being punished. However, the expectation that children carry out

household chores is embedded within a larger system of values, which could in fact be an important source of strength and agency for children in their later lives.

Not only do parents need their children's labour, they also believe that the household chores are part of learning about and preparing for life, complementing formal education. This is not a simple question of cost alone, it is embedded in social mores and values. (HSRC, 2005, p. 46).

From the above discussion, an observation could be made that rurality does constitute a form of disadvantage, and an advantage to rural life in some cases (Stokes, Stafford & Holdsworth, n.d.). One advantage could be that people living in rural areas are resilient and determined, despite the constraints, to pursue a "better life" (Randall, Clewes & Furlong, 2015), including educational qualifications. In the context of HE, it is important for the study to investigate the extent to which students' existing knowledge and cultural resources are used to scaffold their acquisition of dominant forms of academic capital, or whether they are excluded (Leibowitz, 2017b), particularly in the field of science. Access to the dominant forms of cultural capital in the field of science involves, but is not limited to, access to disciplinary knowledge, learning and teaching methods, methods of assessment, use of technologies, studying methods, ways of acting, being and thinking. For that investigation and understanding, the context of teaching and learning in the field of science in general, and in HE in particular, as well as at the research site, is of paramount importance.

#### **1.4 Teaching and learning of science**

There is a general agreement among scholars that "Scientific knowledge is tentative (subject to change), empirical (based on and/or derived from observations of the actual world), subjective (theory laden), that it necessarily involves human inference, imagination, and creativity (including the invention of explanations), and is socially and culturally embedded" (Lederman, Lederman & Altink, 2013, p. 140). These qualities underpin formal science as a way of knowing. In the rural areas, practices such as observation of the natural world stemming from curiosity also lead to the use of inferences to draw conclusions (Zinyeka, 2013). In some areas, for example, cow dung is used as a fertilizer. The development of this practice resulted from observing the impact of the dung on the growth of grass and other plants (Zinyeka, 2013). According to McDonald (2013) the process of knowledge production involved in this practice resembles scientific procedures, as it draws on the skill of observation to observe the environment and the making of inferences, including inferences about what causes the grass around the cattle kraals to grow healthily (Zinyeka, 2013). When it comes to formal disciplinary

science, students could engage in experiments to investigate the substances that the cow dung possesses to enable grass to grow healthily around cattle kraals.

The practices found in rural areas such as those mentioned above are not the same as science knowledge (this aspect is discussed at length in Chapter 4) but may have scientific underpinnings. It is for this reason that the concept of practice (and practices) is considered in this study, as it is underpinned by the dialectic relations between structure and human agency (Schatzki, 2005). Practices are “embodied, materially mediated arrays of human activity centrally organised around shared practical understanding” (Schatzki, 2005, p. 11). The emphasis on embodiment and material mediation are important in highlighting that practices are not just actions, but are culturally mediated in different material and bodily ways. From a situated learning perspective, Lave and Wenger (2005), for example, argue that a theory of social practice “emphasizes the relational interdependency of agent and world, activity, meaning, cognition, learning and knowing” (Lave & Wenger, 2005, p. 151). Their attention is on participation and for them, the concepts of practice and practices show how meaning is produced and understood within a community, including through the “shared repertoire” of community members which forms part of the practice of that community, including the artefacts, discourses, routines and actions that people share (Wenger, 1998). Lave and Wenger (2005) link practice more specifically to learning as the historical production, transformation and change in persons, where understanding and experience are in constant interaction (Boughey, 2017). Holland and Lave (2009) go further in proposing that “social practice theory emphasizes the historical production of persons in practice, and pays particular attention to differences among participants, and to the ongoing struggles that develop across activities around those differences” (p. 5). The importance of seeing practice in relation to history produced in persons is, I argue, particularly important in a study of rurality set principally in South Africa, where as highlighted above, the continuing legacy of apartheid is particularly felt in rural communities.

In order to account for differences in knowledge and ways of being and knowing in formal science and local knowledge, it is pertinent to consider the extent to which the distinctive features underpinning scientific ways of thinking and thus knowing manifest themselves in students’ prior knowledge, experiences and/or practices. Clearly, differences in the epistemologies and ontologies of scientific and local knowledge present major challenges for attempts to integrate the two in formal science teaching. For example, one difference is that formal science is concerned only with phenomena that are testable empirically through careful

observations and measurements or through experimentation, “where conditions are controlled to verify a predicted outcome based on theories and/or hypotheses” (Ellery, 2016, p. 39). On the basis of this testing, theory and principles are logically deduced.

Local knowledge, on the other hand, embraces both testable and non-testable metaphysical phenomena (Zinyeka, 2013). This means that mainstream science validates only that which can be observed empirically, whereas in local ways of knowing, even that which cannot be empirically observed, including superstitions, is validated. The fact that phenomena such as superstitions are not empirically observable does not mean that they are irrelevant. However, in order to overcome this challenge, it is necessary to have a clear understanding of the characteristic features underpinning scientific ways of thinking and knowing. It is then necessary to understand features of other world views in order to see how these might be linked for ease of access to formal science.

Based on an understanding of the epistemology of science “as a way of knowing, or values and beliefs inherent to the development of scientific knowledge”, (Lederman *et al.*, 2013, p. 140) argue that philosophers of science, historians of science, scientists, and science educators do not generally define the nature of science (that is, its ontology) or the epistemology of science in similar terms (Lederman *et al.*, 2013). Such dissonances should not be viewed as irrelevant, as Lederman *et al.* (2013) maintain. Rather such dissonances could be resolved by accepting that scientific knowledge is never absolute. The implication for the above discussion is the effect of our interpretation of science and ways of knowing in science on course structure, curriculum, pedagogy and student learning.

## **1.5 Problem identification**

Black students, especially those from marginalised backgrounds and previously disadvantaged schools, quintile 1-4<sup>1</sup>, perform worse than their white counterparts in the field of science (Science Faculty Curriculum Review Progress report April, 2018), and students from rural areas fall into this category. The statistics (Table 1), show students’ performance by race in the Faculty of Science at the research site. The table, however, is not specifically about students

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<sup>1</sup> The quintile system was introduced by the National Norms and Standards for School Funding to address equity in South African Schools. Schools are assigned to quintiles based on their resources and the affluence of feeder areas: Quintile 1 contains the poorest schools, while quintile 5 includes the better-off schools. In South Africa, quintile 1, 2 and 3 schools have been designated no-fee schools and receive larger subsidies (Mestry & Ndhlovu, 2014).

from rural areas, though it does shed some light on the performance of black<sup>2</sup> students in the field of science, and students from rural areas are part of this cohort. In this study, the table is used to identify performance statistics per department and course. At the time of the review, however, some statistics were not available, but those which were available showed the performance by race.

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<sup>2</sup> The South African society is still defined in terms of the social construct of race. In this study, the categorisation that is adopted is congruent with that of the Council on Higher Education (2013), where African refers to (black), Indian, coloured (mixed descent) and white. In this study, however, the focus is on black African students.

**Table 1:** Science Faculty Curriculum Review progress report, April 2018: Summary of Science Faculty statistics: Student profile 2012-2016: all Science Faculty students over these five years.

Department	Course	Statistics
Botany	All courses	Pass rates for BOT 102 lower than CEL 101 and ZOO 101. Black students do significantly worse.
Chemistry	CHE 202	For all Chemistry students, performance by race is not statistically significant, but when controlling for language, being African is statistically significant, but language is not. SA students perform worse than international students; no significant correlation between MAT 1 marks and CHE 2 or 3 marks; looked at which subjects are taken after CHE 1 and CHE 2.
Computer Science	CSC 101	Under way; first years with less than 60% do not pass third year; second year is a barrier; lecture attendance correlated with success.
Environmental Science	ENV 201	From 2007-2017: increasing proportion of black students; differences in performance among racial groups; females do better than males; 80% of students are South African, but international students do better; no significant difference between English first language speakers and others.
Human Kinetics and Ergonomics	All courses	Of the science students, 62% female, 65.5% white, and 25.1% African; white students perform better. Students with English as home language and those who are from Q5 schools perform better.
Mathematics	MAT 1C	Correlation between success at MAT 1C and 2 <sup>nd</sup> and 3 <sup>rd</sup> year; NSC Maths vs MAT 1C results need to be done; white students do better than black students.
Science Extended Studies Programme		No significant difference in results among groups in BSCF; BSCF students perform worse in first year courses than others; BSCF 1 students do worse but BSCF2 students do better than other students in terms of graduation rates.
Zoology and Entomology	ZOO 101	Females do better than males; home language, school quintile, and race have significant effects on student marks.

The statistics above show that there is a problem as far as the performance of black students in the field of science, and that this is an ongoing problem. While it is black students who do not perform better as the above statistics show, this study is interested in black students from rural areas. Given these statistics, it could be argued that the status quo is maintained where black students bear the brunt of poor performance as opposed to their white counterparts (Science Faculty Curriculum Review Progress report, 2018). There seems to be a knowledge problem in that we do not know enough about black students from the working class, including those from rural areas in higher education and in the field of science. In the previous sections I have alluded to the fact that students from rural areas bring knowledge resources into university. Chapter 6 and 7, for example, provides data from that explicitly show that academic teachers do not know much about students from rural areas. If this is the case, I argue, we need to have an adequate explanatory framework pertaining to issues of rurality, theory on learning, or to the interaction of local knowledge and institutionally powerful knowledge, in order to devise an adequate

response to issues of rurality in higher education and students' educational outcomes, especially black students from the working class, including those from rural areas.

## **1.6 Rationale**

The study was motivated by social justice issues in the field of science in HE, particularly for students who come from rural backgrounds. This was seen as important, especially to contribute to the literature on widening participation. This literature is focused primarily on issues of race and class in South Africa (Leibowitz & Bozalek, 2014). A focus on rurality would enhance an understanding of how higher education operates to maintain the status quo, and some of the measures that could be devised to reverse this. This study was thus further motivated by shedding light on the variations and dimensions of rurality, complexities and contradictions, and conditions that the study's participants might have experienced in the field of science in HE. It was then important for the study to draw on students' prior learning experiences, and how these may influence students' academic practices at university.

## **1.7 Research question(s)**

Having engaged with the background and rationale for the study, outlined above, my study sought to investigate the ways in which students from rural areas experience higher education in the field of science and whether ways of teaching, assessment, curriculum design and enactment are reflective of all the experiences of students within the academy, including addressing challenges that non-traditional university students face, as well as building on the strengths they already have. The study thus sought to answer these question(s).

Research question:

*What are the enabling and constraining factors that influence teaching and learning of second year science students who come from rural backgrounds at a South African University?*

Research sub-questions:

1. What practices shape the learning habits of second year science students from rural backgrounds at a South African University?
2. What knowledge, cultural and technological resources do second year science students from rural backgrounds bring to negotiate epistemological access in the sciences?
3. How do academics who teach second year science students understand the knowledge resources that students from rural areas bring to their classrooms?

## 1.8 The layout of the study

This dissertation is categorized into eight Chapters. The first chapter has outlined the context of the study, the problem statement, and the motivation driving this study, and in the process provided the research questions. Chapter 2 presents the philosophical foundation of this study that is informed by Critical Realism (CR). Philosophically, CR is based on the idea that, what we observe, feel, and experience as humans in the open world is generated by the mechanisms beyond our experiences and observations of these experiences. As such, a researcher situated in CR should attempt to excavate the mechanisms that lead to experiences and observations in his/her quest for truth (Bhaskar, 1978, 1979).

It is through this excavation that CR offers an appropriate ontological framework for this depth interrogation and an understanding of mechanisms shaping the students' experience of the curriculum in the field of science in HE and potential clashes or interactions between home-taught ways and academic ways. This investigation required an explanatory theory which could account for why things are what they are, not the other way around, in terms of students' experience of a curriculum which results in skewed educational outcomes on the basis of race (Boughey, 2018; Boughey & McKenna, 2016; Shay, 2016), where white students from middle-class, educated backgrounds usually experience higher pass rates than their black counterparts from lower-class, "uneducated" backgrounds. For this excavation, I drew on the tools provided by Archer's Social Realism (SR) (1995, 1996). Archer's explanatory theory enabled an in-depth explanation of some of the identified home practices, as well as institutional practices, and their reproduction and elaboration. The justification for adopting Bhaskar's (1978, 1979) CR depth ontology and combining it with Archer's (1995, 1996) SR analytical tools is engaged with in this chapter. Crucially, Chapter 2 sketches the morphogenesis framework which accounts for change or non-change in the social world over a period of time. Also, an argument is presented for the use of analytical dualism. For this, Archer (*ibid.*) insists that the "domains" of structure, culture and agency should be analysed separately by arguing against what she terms the "fallacy of conflation" (Archer, 1996. p. xv).

Participatory Action Research (PAR) as well as Participatory Learning and Action (PLA) tools as part of PAR and decolonising methodology (Bozalek, 2011; Leibowitz, *et al.*, 2019) are presented in Chapter 3, as forming a methodological framework of this study. Chapter 3 is thus designed to present a demonstration of how I worked with data to explain how home environments and the HE environment in the field of science lead to the emergence of students' experiences and teachers' observations of these experiences, as well as the impact of these

events on educational outcomes. These data are experienced directly through senses, and so to move from the immediate experiences of participants to access the unobservable mechanisms leading to what the participants experience or observe, I had to subject data to the tools of SR. Limitations of the adopted framework are also engaged with. In addition, ethical considerations are similarly addressed in this chapter to examine potential biases that could compromise the trustworthiness of the study and how these were addressed.

Chapter 4 discusses the structural and cultural contextual factors that shaped the students' home experiences both before joining the university and when they had joined, and how these played out in the HE environment when students were faced with the education that was required of them. The home conditions of students before they joined the university are discussed in this chapter as pre-existing conditions which either served to constrain or enable the ways in which they accessed the disciplinary knowledge of science and the ways of acting, being and knowing therein. Institutional cultures embodied in the language and technologies of the academy are also addressed in this chapter, as are how these condition the agency of students in relation to the agency of their teachers. A decolonial gaze is adopted to further explore the structural and cultural conditions of the postcolonial university (Luckett, 2016), and the decolonization of university structures such as curriculum (Odeyemi, 2018). In relation to this point, Archer (1995, 1996) argues for the relevance of identifying these conditioning factors, as it allows the researcher to distinguish the mechanisms that are responsible for the origin, persistence and elimination of the identified phenomenon (Moyo, 2018).

Chapter 5 deliberates on theorizing an enabling science curriculum structure. The discussion presented in this chapter deals with issues of epistemic access where curriculum, pedagogy and assessment practices are debated. The chapter presents an argument for the recognition of pre-theoretical knowledge, that is, the knowledge drawn from rural homes, in order to theorise an enabling science curriculum structure and thus, enactment. As academics located in our disciplines, we are likely to make assumptions about the nature of our disciplines in terms of how they legitimize themselves, which is of course not "neutral" (Ellery, 2017; Hlatshwayo, 2018; Mkhize, 2015). As insiders in our disciplines, there are aspects of teaching and learning that we present to students in tacit ways, which makes it difficult for students who come from backgrounds which are "other", i.e. outside of mainstream ways; therefore, we might alienate some students. This argument is presented in this chapter. Bernstein's (2000) pedagogic device is recommended to explain how the field could be made welcoming for all students. The impact of historical inequalities on epistemic access is presented from an academic development (AD)

perspective, and in the process an argument is presented, that as much as these initiatives are commendable, they did not engage with how black students in Historically White Universities (HWUs) experience the education that is required of them (Hlatshwayo & Fomunyam, 2019).

Chapter 6 presents the first part of findings, as such, locates the events that may have led to clashes or interactions between the participants' home-taught ways or primary Discourse and secondary academic Discourses, and how these might have played out in the teaching and learning environment. This chapter engages with factors influencing learning practices from home, and how these either aided in accessing knowledge, or hindered it. The change in student demographics necessitated that this study draw on events that might have led to change or non-change in the teaching and learning environment, as individual agents or groups of agents interacted with structures and cultures. How individuals or groups of agents interact emerges from these structures and cultures in a given environment (Archer, 1995, 1996); as such, Archer's morphogenesis framework provides explanations for both observed and experienced phenomena. These structures and cultures are discussed in Chapter 4, and they condition the manner in which agents exercise their emergent powers to negotiate their interests, projects to achieve their goals, and in the case under study, their qualifications. Consequently, to pursue their goals, agents are confronted with either constrained or enabling environments emerging from the exerted conditions. Chapter 6 thus engages with conditions shaping students' learning practices both before and after joining the university, and how these play out in the teaching and learning environment in the field of science.

Chapter 7 presents the second part of findings, as such, this chapter discusses how the institutional cultures and structures acted as mechanisms that shaped interactions in the teaching and learning environment in the field of science, with regard to the support of students from rural areas, access to science Discourse and the role of senior leaders in that respect. Chapters 6 and 7 present analysis and deliberate on how data was subjected to Archer's framework, since it provided tools to unearth the interaction of specific factors that may have enabled or constrained access to disciplinary knowledge and ways of being and knowing in the sciences. Archer's framework was used in conjunction with Bhaskar's depth ontology.

Although reflections were provided throughout this study, a close focus reflecting on this study and thus providing concluding remarks is presented in Chapter 8. This chapter thus critically reflects on the findings that have emerged from this study. These findings delineate the factors that have been identified in the study to have enabled or constrained access to secondary

academic Discourse of science for students who come from marginalised rural areas of South Africa, as well as the implications for the study.

## CHAPTER 2: SCIENCE STUDENTS' TRANSITION FROM RURAL CONTEXTS INTO HIGHER EDUCATION: A SOCIAL REALIST PERSPECTIVE

### 2.1 Introduction

“Research is about constructing new knowledge. In so doing, we are making claims to the ‘truth’ based on our understanding of reality (ontology), as well as of how we gain knowledge of what exists (epistemology). Our ontological and epistemological assumptions will have a direct effect on how research is conducted and the claims we can make as a result.” (Ellery, 2016, pp. 41-42).

The purpose of Chapter 1 was to contextualise the study. It was clear in this chapter that learning and structures associated with it, like curriculum, are never “neutral” but are value-laden. It stems from this understanding that one’s home background could either ease access to powerful knowledge of the academy or hinder it. This is because the ways of learning at home in some families or communities, especially middle-class educated contexts, are similar to the ways of learning in formal institutions like universities. And so, for students coming from these families or communities, learning at university is more like a continuation of literacies already learned at home, which facilitates access to the norms and ways of learning in the academy. Chapter 1 also showed that higher education institutions know little, if anything, about students from rural areas in terms of how their home backgrounds and the experiences gained therefrom could in fact enable (or constrain) access to the norms and values of the university itself, and the discipline of science in particular.

In this chapter, the focus is on how social realism could allow an exploration of these students’ home experiences in the construction of knowledge in science, since it allows for a social aspect of learning, which is not normally the case in science. This is because researchers have to make philosophical underpinnings of their research explicit as part of intellectual justification for research findings (Quinn, 2007). This is the reason why research should be done within particular paradigms underpinned by philosophical assumptions. An adopted paradigm directs the kinds of considerations and arguments employed in the scientific enquiry. Since research is about the construction of new knowledge and making claims about how one explains reality (ontology) and how knowledge emerges, particularly through the relationship between the knower and the known (epistemology) (Amin, 2008), “how do we conceive of reality itself... is of central importance to what it is to “know” the social world” (May, 1998, p. 160). Thus, unless research findings are situated in a theoretical framework (which must be explicit),

knowledge generation is compromised. It is the philosophical assumptions of the researcher that will enable powerful knowledge generation about the phenomenon under study.

It is in the context of these considerations that this chapter is designed to present an argument for the need to use students' prior learning in our universities, particularly in science. It argues for the use of a specific theoretical framework combining Bhaskar's (*ibid.*) critical realism (CR) and Archer's (*ibid.*) social realism (SR). It begins by presenting the broader focus of this study. It then moves to providing the philosophical foundations of CR. The third section presents a layered, depth ontology of CR to engage with students' experiences and academic teachers' observations at different ontological depths. The fourth section presents the power of d/Discourse<sup>3</sup> to enable or constrain roles and positions that people occupy in society. Abduction and retroduction are presented as concepts that allow an abstraction of data. The last section on CR presents the limitations thereof. Then SR is presented, where the strata of the social world is presented as consisting of structure, culture and agency, and the relevance of analytical dualism as an important concept to engage with data in this study is discussed. The chapter then presents Archer's Morphogenetic cycle to engage with the concepts of elaboration (change) and reproduction (non-change) in the world that was explored. The last section of this chapter presents situational logics in terms of understanding why some students find university education more like a continuation of home literacies, while others find it alienating.

## **2.2 The focus of study**

The broader focus of this study has to do with how students from rural areas have learnt in the home and community, and how this subsequently influences their learning of science at university. Furthermore, this focus has to do with how academic teachers can assist students to access scientific knowledge and ways of knowing by drawing on their home-based practices with scientific underpinnings. In other words, to investigate the extent to which students' primary Discourse could act as a pathway to access the secondary academic Discourse in the field of science.

In Chapter 1, it was mentioned that this study is motivated by concerns about persistent social injustices, such as generally poor and racially skewed educational outcomes in the South African Higher Education (HE) system (Mgqwashu, 2016, 2012; Shay, 2016; Shay, *et al.*,

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<sup>3</sup> Gee (2008) differentiates between the construct of discourse with a small d, which relates mainly to language use, as opposed to his use of the term Discourse, that is, interconnection between the ways of thinking, feeling, believing, valuing and acting.

2016). I engage with the social justice issues in chapter 4 of this dissertation. I thus aimed to investigate the conditions and mechanisms that contribute to the persistent injustices, by looking at students' experiences of curriculum in the field of science, how these students have been conditioned at home before joining the university, as well as the teachers' perspectives on students' experiences. In attempting to get a socio-historical perspective on possible reasons for such skewed educational outcomes, a central question was necessary: "What must the world be like for black students who come from rural areas at a post-colonial university?" The issues of previous conditioning of students and the context of a post-colonial university are addressed in Chapter 4 of this dissertation. A decolonial gaze is adopted for this, as it allowed me to deliberate on the social relations of knowledge practices (Luckett, 2016). It therefore provided a way to re-describe the structuring of the curriculum in a post-colonial context and the contradictions that this set up for black students and those who come from lower class-backgrounds, including those from rural areas (Luckett, 2016; Mgqwashu, 2016). I used Archer's (1995, 1996, 2000) theory of social change for the analysis of a range of social and political issues excavated from data. For this chapter, CR and SR provided tools to answer the research questions of this study, already presented in chapter 1.

This chapter thus aims to introduce some of the tools which are informed by CR philosophical underpinnings. In the following chapters, I use these tools in order to arrive at the answers to my research questions. I thus discuss, in this chapter, how I was able to explore the workings of the layers of reality over time, in terms of the experiences of students in the field of science at the research site by drawing on Archer's SR. This was done by drawing on Archer's (1995, 1996, 1998, 2000) Morphogenetic/Morphostasis analytical framework (MM Framework) and analytical dualism. The application of these concepts in this study is discussed in section 2.9 below.

### **2.3 Philosophical foundations of Critical Realism**

The foundational basis of CR is that most practices of social research are informed by knowledge that is concept-dependent, and that the reality of this knowledge has been acquired through perception, thought and language. The language and concepts through which our knowledge of reality has been acquired are not fixed, but change over time and space. Through this acquisition of knowledge, the reality of such knowledge has the potential to be conflated with reality itself. It is therefore necessary, when conducting research, to explore the unobserved workings of reality which generate what we observe or experience, or even feel (Bhaskar 1998). Bhaskar (1998) distinguishes between our knowledge of transitive reality

readily accessible through the senses, and the difficulty of accessing intransitive realities of independently existing objects. These objects of reality exist and have effects independent of our knowledge of them. The contribution of CR theory to social research is that it clearly distinguishes between an external reality that exists independently of our conceptions (ontological claim) and our conceptions of this reality (epistemological claims). This distinction has made epistemology secondary to ontology, because the existence of the natural and the social world is understood to be a precondition for our knowledge of them, while our knowledge of the world is not identical to the world itself. In this way, the focus of research should be on causal mechanisms, not just events (Danermark *et al.*, 2002). This means that the purpose of research should be to come as close as possible to this independent reality, that is, what produces events, not just events themselves.

#### **2.4 Layered reality: the Transitive and Intransitive World**

In differentiating between ontology and epistemology, Bhaskar (1975, 1979) introduces us to an idea of a transitive world and an intransitive world: both reality and our conceptions of it are layered and differentiated. The critical realists accept the existence of an external world, or reality independent of our knowledge of it, enactment or discourse (Bhaskar, 1975, 1989, 1998; Boughey, 2012; Case, 213; Quinn, 2007). This world consists of generative structures or mechanisms, hence the transcendental reasoning of CR. According to Bhaskar (1975), the existence of social reality, which is independent of human thought and action (agency), is referred to as the intransitive dimension of social reality involving social objects and relations, and is relatively enduring. In other words, the intransitive world of human experience is the world that exists, whether we know about it or not, and the transitive world is the world that we have access to, can observe and/or manipulate, and is temporal, open to change. Therefore, the independent reality of being suggests that the existence of the natural and social worlds is a precondition for knowledge of these worlds.

According to Bhaskar (1975, 1979), it is important to separate what we see, experience and understand (in the transitive world) from what is independent of our thoughts and experiences (the intransitive world) when conducting scientific enquiry. This is so because it allows us to deduce the “real” factors that enable and constrain the events and experiences being studied. In the context of this study, it is the extent to which the home practices with scientific underpinnings of students from rural areas are acknowledged in science classrooms at the research site, and how this acts to enable or constrain access to the powerful knowledge (I engage with the construct of powerful knowledge in Chapter 4) of the science discipline. Since

there are multiple mechanisms that can act to include or exclude students in science classrooms, particularly those who come from the lower class, including those who come from rural areas, this study focuses on curriculum as one mechanism that can be at play in the problematic exclusion. Curriculum is understood as an event involving interactions between agents (students, co-researchers and academic teachers or lecturers).

In order for a scientific enquiry to be able to identify causal intransitive mechanisms that lead to the inclusion or exclusion mentioned above, it is important not just to be concerned with what these students experience in science classrooms or the lecturers' observations of these experiences. The most important thing to be concerned with is the workings of the mechanisms in the intransitive that would have led to the manifestations of these observations and experiences. It has been mentioned earlier that the CR philosophical foundation is based on the switch from epistemology to ontology, where ontology becomes the point of departure in scientific research. In this way, it is possible to see that what we experience and observe (transitive) is a product of the unobservable and difficult to access mechanisms independent of human knowledge and discourse (intransitive). Therefore, in my pursuit of answering my research questions, I should avoid just using what the students experience in science classrooms as is reflected in data and the lecturers' observations of these experiences as if these were the full reality of the social world of students and/or lecturers. Rather, I should be careful in using the transitive data of events and experiences as mentioned above to explain the intransitive, or treating the transitive as the ultimate truth. Guided by Bhaskar (1998), my task is to determine the conditions in the intransitive science curriculum that have led to the inclusion or exclusion of the experiences or knowledge resources that students from rural areas bring with them.

The above-mentioned view is different from the view which is held by empiricists and relativists. For empiricists, for example, reality is reduced to what can be observed (the transitive world is the whole world, that is the only thing that you can touch, see, observe, that is the truth) while for relativists, there are multiple truths in the sense that all knowledge is relative. In contrast, Bhaskar's critical realism allows us to see beyond the limitations of both empiricism, which is realistic in the sense that it acknowledges a reality independent of human activity, and relativism with its acknowledgement of multiple realities. In the context of this study, this does not suggest that by using CR I will arrive at a complete explanation of causal mechanisms.

Since as a researcher I have access to the transitive world of experiences and events captured in data and only limited access to the world of mechanisms, CR accepts the effects of epistemological relativity (Archer, Bhaskar, Collier, Lawson & Alan, 1998; Danermark *et al.*, 2002). In this, CR acknowledges that mechanisms are ontologically realist, but our research of them is constrained by relativism of epistemology (Archer *et al.*, 1998; Danermark *et al.*, 2002). Acknowledging that our knowledge of the world is relative but the nature of the world itself is real, CR suggests that as researchers, we need to be able to weigh various accounts of the mechanisms from which events and experiences emerge. This means that judgements must be made by researchers which provides the most likely explanations of the workings of mechanisms, given our current knowledge of the world. Judgmental rationality is therefore one of the important concepts of CR, implying the “possibility of arriving at non-arbitrary views of the world” (Hedlund-de Witt, 2012, p. 8). In my research, the CR approach thus enabled me to identify the likely relations (mechanisms) between different social events to reach probable conclusions on what has emerged in the given period in the ever-changing world.

Carspecken (in Boughey, 2009, p. 5) maintains that a “critical” orientation to knowing is not linked with any one research methodology, but rather involves a concern for social justice and power”. Boughey (2009, p. 5) taking from Carspecken points out that “critical research can therefore take a wide variety of forms because it is the orientation which is critical and not the research methodology itself”. It is possible then that a methodology that one uses in scientific enquiry can be aligned to critical realism in that it could lead to an understanding of how the reality that exists independently of our preconceptions can be analysed, and how this reality affects events and experiences in the social world we are trying to explore. In this study, the methodology chosen treated student participants as co-researchers, because their voices were important in accounting for their experiences of learning science, both in science classrooms and out in the field. The implication for this is that the information that co-researchers and academics teaching these students provided, which is the data for this study, is not sufficient to arrive at conclusions about what exclusion and inclusion really are in terms of accessing science disciplinary knowledge. Thus, the methodology used in this study was aligned with critical realism in order to allow me to look beyond what has been presented in focus group interviews, for example. In this way, it would be possible to identify mechanisms from which participants’ interpretations of their experiences emerged.

Critical realism allowed me to interrogate the workings that led to the experiences and events mentioned above. My research goal was not to determine the interpretations of these events and

experiences, but to identify the mechanisms and workings that have led to these interpretations and their implications for genuine epistemological access in the construction of science knowledge or ways of being. The aim of CR is therefore not to determine direct cause and effect relationships, but to determine an understanding of the underlying properties and mechanisms that are capable of generating events in the object being studied (McKenna & Boughey, 2004). Earlier in this chapter I have mentioned that there are numerous mechanisms from which a social phenomenon or events emerge. For this reason, it would be difficult to establish direct causal relationships. What is a concern for CR is to identify as many of the mechanisms as is practically possible, and establish their tendency to enable or constrain particular events and experiences. CR therefore provided me with the framing perspective, which is a good fit for me to identify the underlying mechanisms accounting for the manner in which the curriculum is playing out in the science department.

CR posits a “layered” or “stratified” reality between easily accessible transitive domains and less accessible intransitive domains. In providing for the explanations about things in the social (and natural) world, that is, conceptualizing the links between the intransitive world and the transitive world, CR recommends the idea of a stratified ontology which consists of distinct layers as I have deliberated above. More details are presented in Chapters 4, 6 and 7, for example, the role of a persistent apartheid legacy in conditioning access to material resources, which has a tendency to lead to ease of access, or difficulty in accessing mainstream discourses valued in the academy. This requires the establishment of the relationship between observable parts (both the objective world of events, termed the “Actual” and the subjective perceptions of individuals, termed the “Empirical”, and that which cannot be observed but includes mechanisms that give rise or lead to what we observe, termed the “Real” (Bhaskar, 1975; Fletcher, 2016; Luckett, 2016). This is what is termed a differentiated reality or depth ontology, and is represented through the iceberg metaphor (Figure 1).

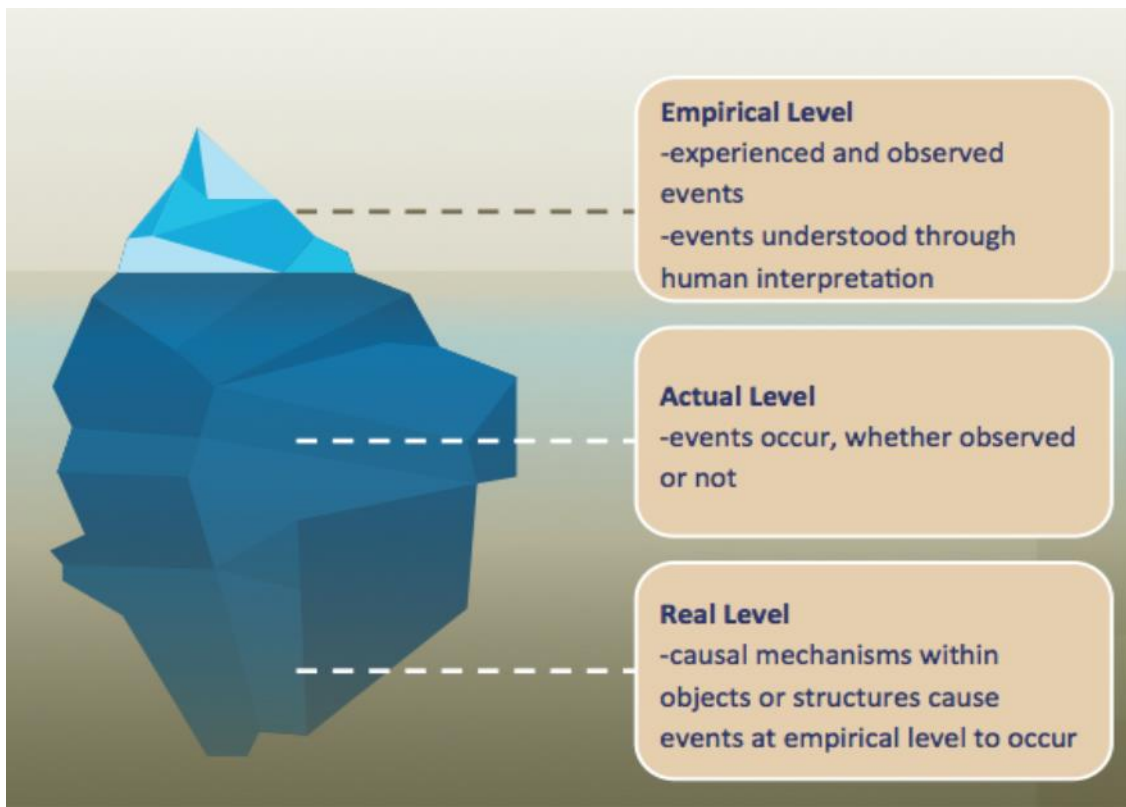


Figure 1: An iceberg metaphor for CR ontology and epistemology, from Fletcher (2016).

The “Empirical” layer is the first layer of reality and consists of experiences and observations made through the senses. This layer in Bhaskar’s (1978, 1979, 2008) critical realist ontology is said to be relative, constructed, ever-changing and transitive. This is because this layer is informed by human experience, observation and experimentation, and human beings experience the world differently, hence different colours. It is for this reason that human experiences and observations are acknowledged to be multiple and made on the basis of our past histories and, therefore, to be relative. Since this layer represents human experiences and observations, it represents what we can see, feel or even touch. These are represented on top of the iceberg. The second layer of stratified ontology in Bhaskar’s critical realism is the “Actual”, which is the layer of events. These events may be experienced directly or indirectly by agents in the social world in several ways, which is why this layer is just below the iceberg, closer to what is readily seen and observable. It is out of this layer that the experiences and observations emerge. Case (2013) succinctly captures the domain of the “Empirical” and the domain of “Events” when she writes that “...the world can be seen to comprise the observable parts (both the objective world of events... and the subjective perception of individuals (p. 38)”. Thus, the “Empirical” domain and the “Actual” domain consist of the world that we know, that we experience on a daily basis, such as curriculum events and experiences of these events.

The recognition of the presence of the layers of the “Empirical” and the “Actual” accordingly authorizes Bhaskar to provide an explanation for the multiplicity of human experience and a “world” of knowing that is relative. The “Actual” and “Empirical” domains are thus located in the transitive domain, where all data pertaining to a study can be observed, whether through observations, interviews, documents etc. According to this critical realist example, everything we experience and observe, in this case all that can be observed in terms of how students from rural areas experience the science curriculum or teachers’ observations of these experiences, is in the “Actual” and transitive realms, which emerge from the workings in the most intransitive “Real” domain, located at the deeper end of the iceberg metaphor. Accessing information and understanding from the “Empirical” and “Actual” domains is limited in explaining and bringing an understanding of the make-up of the studied reality, hence a recommendation is made for the focus in the domain of the “Real” (Bhaskar, 1975). This will enable a condition of coming as close as possible to understanding the reality of a given phenomenon. It is therefore important to note that the transitive is not discarded in CR methodology, but is used in the process of uncovering the effects of mechanisms at the level of the “Real”, while guarding against conflating ontology with epistemology. Through the above explication, it is possible to see that reality is structured.

So far, I have indicated the idea of emergence, which is emphasized by critical realist philosophy in the sense that “Events” at the level of the “Actual” emerge from structures and mechanisms at the level of the “Real”. Experiences and observations at the level of the “Empirical” emerge from the “Actual”, which have, in turn, emerged from structures and mechanisms at the level of the “Real”. In other words, emergence occurs when something new comes into being because of the interaction of two or more things. When people interact, for example, within a particular social structure such as an educational institution, with its institutional culture or curriculum, a new *sui generis* social practice may emerge that is not reducible to the sum of its parts and instead has its own properties and powers (Archer, 1995, Sayer, 2000). For example, within the same science lecture hall, after a lecture in Physics, one student might say, “I love reading Physics textbooks” and another might say “I hate reading Physics text books”. This is what these two students experience from the presentation of the lecturer, and so one student might end up actually doing the reading while the other does not. As a result, the educational outcomes of these two students would be affected. In a situation like this, a critical realist would be interested in digging deeper to find out why these students

experience what they experience and do what they do when it comes to reading or not reading a Physics textbook.

Although it is possible to draw diagrams (e.g. Figure 1), it is simplistic to conceive of the layers as strictly separated and sequential. In practice, the strata co-exist and work together simultaneously. As I have mentioned above, also central to Bhaskar's thinking is that, although structures and mechanisms have causal powers, they are not strictly causal. The fact that a person comes from a family background or social class where reading is appreciated does not mean that experiences toward the love of reading will emerge for this person. The emergence or non-emergence of experiences is based on the interplay and interaction of mechanisms and structures operative at the time. In critical realist research, we are therefore looking at the tendency of a structure or mechanism to make something emerge.

Since my aim was to try and move beyond just describing the empirical relativism/world or participants' experiences (domain of "Empirical" in the figure above), I had to be careful to not conflate what is with what could be known, that is, epistemology with ontology (Danermark *et al.*, 2002). This implies that as a researcher, I should not be guilty of "epistemic fallacy" (Bhaskar, 1978, p. 16). Epistemic fallacy is a belief that the world is that which we know in the empirical domain. However, the world does not only include that which we know, it also includes that which we do not know, the intransitive world in the domain of the "Real". According to Bhaskar (1978), this is the conflation of what is with what can be known, that is our knowledge of reality and the reality itself. I have made mention earlier that the structures in critical realist ontology, and in the context of this study, refer to social structures like the educational system and/or curriculum. These social structures regulate access to material resources.

Curriculum, for example regulates access to knowing and knowledge. According to Boughey (2012), for example, black students have long been disadvantaged in gaining access to higher education because of historical inequalities and therefore bear the brunt of poor completion and graduation rates. In this way, the likelihood is that curriculum does not treat all those who are involved equally or fairly (Boughey in press). In terms of students' biographical data, it is black students who come from rural areas who are participants in this study. While gaining access to higher education for these students is commendable, gaining genuine access to the science discipline or Discourse needs to take into consideration knowledge outside of the academy, which is part of students' home practices that are underpinned by scientific elements. This could

be used as leverage to account for an “ontological gap” that students who come from rural areas in the field of science experience, or which could act as a pathway to access science’s powerful knowledge (as Chapters 6 and 7 will demonstrate).

Although I am conscious that there is no direct connection between science and reality, in the context of a critical realist ontology, the theoretical claims that we make about the world in the field of science in our lecture halls could be improved on if students’ lived experiences were taken into consideration. We could begin to explain whether or not students from rural areas see higher education as a continuation of the stories they already have, and the effect that this has on genuinely accessing scientific knowledge (Khene, 2017). In relation to genuinely accessing science’s academic Discourse, a number of scholars (Heleta, 2016; Le Granje, 2016; Subreenduth, 2016; Worger, 2014) point out that while South Africa underwent a political transformation following the end of apartheid rule in 1994, knowledge systems at South African universities have not enjoyed a similar transformation. Heleta (2016) for example, argues that:

“Epistemic violence persists in post-apartheid South Africa, where the higher education system, rooted in colonial and apartheid exploitation and racism, has obliterated nearly all linkages that black students may have with the prescribed texts, propagated narratives, debates and learning on the one side and their history, lived experiences and dreams on the other side” (p. 4).

Hence ontological gap and a need for ontological turn (De Sousa Santos, 2007).

In relation to the ontological gap highlighted above, Leibowitz (2017a) points out that there has really been no substantial change in higher education content, rather there have been adaptations to the curriculum so that students from “disadvantaged” backgrounds, including those from rural areas, can be successful within the current system. Success in the context of the current system is a challenge for these students because, as Otuluga and Ogunniyi (2017) argue, the way Western Science Knowledge (WSK) is taught in science classrooms often presents a worldview that counters Indigenous Knowledge Systems (IKS) and could be challenging to deal with for both teachers and students of African origin. In order for the curriculum to become more genuinely inclusive in HE to enable success for all, the curriculum adaptations mentioned above are understood as instances of cognitive injustice (Leibowitz, 2017b; Maldonado-Torres, 2016) and therefore can act to favour certain worldviews or specific ways of coming to know, at the exclusion of other ways of knowing.

## **2.5 Claims to knowledge: a Socio-Cultural Critical Realist epistemology**

In order to account for how knowledge emerges or how we come to know both the natural and social world, critical realists underscore the fallibility and open-ended nature of knowledge. Earlier in this chapter, I mentioned that as researchers we should be aware of epistemic fallacy and that any researcher is potentially fallible and open to challenge. This is because our knowledge of the world is concept-dependent, such that we can only know and explain the world in terms of the concepts that are available to us (Sayer, 1992). The identification of the three separate layers of reality mentioned in the preceding section allows me as a researcher, using Bhaskar's stratified ontology, to be aware of the dangers of conflating what is with what could be known through the senses, or simply put, to never claim to know the world fully. This is the reason why critical realists "dig deeper" in order to uncover more fundamental causal mechanisms than are known at any particular time.

Our experiences and observations, that is, our knowledge of the natural and social world, is acknowledged to be diverse and made on the basis of our past histories, and therefore multiple. As academic teachers in the field of science, we can observe students' lack of success in their marks and we can also observe the things that they do as inappropriate to be a successful and participating student. As academic teachers in HE, and particularly at the research site, we do not know much about students who come from rural areas. These issues are discussed in depth in Chapters 6 and 7.

The aim of critical realist research, for example, in the above-mentioned situation(s) is to explain why things are the way they are through an explanation of the generative causal mechanisms of events in the world. For example, the event of reading or not reading, or completing an assigned task as expected by an academic teacher, as emerging from discourses constructing reading a book as something appropriate or enjoyable for some students and not for others. This is because knowledge is socio-culturally constructed, and social realism is consistent with this position. The process of knowing is crucial for critical realists, since "individuals cannot develop knowledge independently of a society in which they can learn to think and act" (Sayer, 1992, p. 14). Social interaction is necessary for systems of meaning. This is because systems of meaning are negotiated during social interaction. These systems therefore become "conventions according to which actions of individuals can be related" (Sayer, 199, p. 21). These relations exist, for example, because of the relations between teachers and students. In the context of this study, these relations involved a better understanding of events and experiences related to the inclusion or exclusion of the experiences and home practices of

students from rural areas in HE at the research site. This is an example of social interaction between academic teachers and students in science classrooms/lectures or put differently, the contradictions that the curriculum sets for these students.

## **2.6 D/discourses constraining the way we think and therefore act**

Earlier in this chapter I have mentioned that discourses are understood to be mechanisms at the level of the “Real”, constraining what is possible or not possible to do or say. For example, the event of reading or not reading emerges from discourses constructing reading as appropriate/enjoyable and so on and their interplay with factors like poverty (can people buy books), geography (are they near library), race, social class, gender and so on. An understanding of the interplay between structures and mechanisms like discourses which are operative in order for an emergence of an event at the level of the “Actual” and experiences and observations at the level of the “Real” is vital for this study. By engaging with a mechanism in the way discussed above, we can also talk about the social aspect of learning and teaching.

In order to write about the relevance of the social aspect of learning, I draw on Gee’s (2008, 2012) construct of “Discourse” with a capital letter, where Discourses are understood to be:

... composed of distinctive ways of speaking/listening and often, too, writing/ reading with distinctive ways of acting, interacting, valuing, feeling, dressing, thinking, believing, with other people and with various objects, tools and technologies, so as to enact specific socially recognizable identities engaged in specific socially recognized activities (p. 154).

Intrinsically, Discourses involve distinct “roles” played by individuals in different social situations and contexts. Gee (2008) maintains that all individuals acquire a primary Discourse which is developed by virtue of the social contexts into which they are born. Any number of additional secondary Discourses can be acquired depending on the contexts to which individuals gain access, for example, science academic Discourse. The move from home to university involves the acquisition of one or more academic Discourses (Boughey, 2000, 2013), a process which may be eased by the proximity of the primary to secondary Discourses (Boughey, 2018).

Based on the above-mentioned movement, students may move between very different environments. An individual could, for example, spend time in a historically white university (HWU) but return to an impoverished home in a rural area or township during vacations (Boughey, 2018). Boughey (2018, p. 34) further notes that “Home”, moreover, even while at university may never be far away as family and other loved ones call on the student to provide

financial assistance or to participate in cultural and religious ceremonies which hold special significance in the primary Discourse”. The beliefs and world views characterizing the primary Discourse may be at odds with the secondary Discourses which students have partially mastered, and this may result in conflict at an individual level, argues Boughey (2018).

It is then possible to see how the construct of Discourse with a capital letter D can help us explore the potential clashes between the home and the “academic” and we can ask questions about interactions between the home and academic environments and their impact on students’ “sense of being”, as well as their values and attitudes towards knowledge and knowing. More specifically, data for this study allow an exploration of the impact of home on the “ways of being and knowing”, which are legitimated in academic environments and which may act as gatekeepers or enablers to success (Boughey, 2018).

## **2.7 Abduction and retroduction**

The interplay of structures and mechanisms at the level of the “Real” generally cannot be accessed directly using the senses. This is important in critical realist research. A researcher can only work with empirical data that can be accessed via senses at the level of the “Empirical” and the “Actual”. In the context of this study, this data was accessed through Participatory Action Research (PAR) and Participatory Learning Action (PLA) tools like drawing the river of life, where students described their experiences of learning in the home, community and school and through focus group interviews and discussions. In order to study and understand participants’ interpretations of their experiences and begin to explore the level of the “Real”, I had to use tools of abduction and retroduction. Abduction, or abductive reasoning, involves using theory to see empirical data in a different way. This reasoning is explained by Danermark *et al.* (2002) as involving:

“...a move from a conception of something to a different, possibly more developed or deeper conception of it. This happens through our placing and interpreting the original ideas about the phenomenon in the frame of new set of ideas.” (p. 91)

The use of abductive reasoning requires us to draw on substantive or explanatory theory. In relation to the sample above, I drew on learning theories, for example, Boughey and McKenna’s (2016) work on the “model of the student as a social being” and the “model of the student as a decontextualized learner”, along with the work of theorists such as Street (1984) and Gee (2012, 2008), which acknowledges learning and the practices associated with it as profoundly social. These models were used in conjunction with Archer’s (1995, 1996) theory of SR.

A move from empirical data, from for example, a description of experiences provided by a student or the lecturer, to positing the conditions which could lead to the emergence of them is retroduction. A researcher thus asks questions such as “What could have caused students’ lack of success in chemistry, in the context of the understanding that a deeper level of reality, the “Real”, exists and that this layer involves a constant interplay of structures and mechanisms?” These tools are used extensively in data analysis when subjecting data to the philosophical orientation of a layered or multiple reality. While the potential strengths of CR have been deliberated on in the above discussions, critical realists are aware that CR does not hold the key to the “ultimate truth”.

## **2.8 Limitations of Critical Realism**

The limitations of CR are such that the source of truth is intransitive and the conclusions one draws are based on human interpretation and thus subject to fallibility. Since researchers do not have direct access to the truth, this poses a weakness for CR. One of the strengths of CR is its ability to enable researchers to move beyond transitive empirical data. However, accessing the intransitive “Real” is never straightforward. As a consequence, the philosophical premise of CR is also its limitation (Cruikshank, 2003; Archer, 1998). Critical realist research does not necessarily acknowledge generalisations, but the conclusions that are drawn in a given study relate to the identification of mechanisms, or processes, that the researcher does not have direct access to. Detractors of critical realism argue that this trait of CR is problematic, in that CR has a tendency to suggest unequivocally rejecting (or acknowledging) particular mechanisms, in conditions when such mechanisms may be unobservable or in some cases, their powers unactualised (Mingers, 2006). Also, the nature of the accepted truth in CR is likely to be subjected to fallibility (Mingers, 2006). In this study, for example, there may be other mechanisms responsible for inclusion or exclusion, in the science disciplinary knowledge and ways of being, of students from rural areas, which this study might not have been able to identify.

As I conducted this enquiry, I was cognisant of these internal conflicts and I reflect on them in chapters 6, 7 and 8 of this dissertation. Despite CR’s limitations, an argument has been presented regarding the choice of CR in this dissertation, in that a critical realist framework allows us to adopt a position on reality, what we believe it is and how it can be known. Nonetheless, we need another theory to work with this overall position. The theoretical framework consistent with critical realism to explicate processes of social change or reproduction is that of Archer’s Social Realism (SR), to which I turn in the next section.

## 2.9 Social Realism: analytical framework

Archer's SR (1995, 1996, 1998, 2000) draws on Bhaskar's CR in order to allow us to explore the workings of the layered/stratified reality discussed in the preceding sections. In this way, Bhaskar's CR acts as an "underlabourer" in guiding the empirical research by providing some ontological foundations deliberated on above. Drawing on Bhaskar's work, Archer's theory provides a framework which enables a researcher to give an account for how and why things have either changed (elaborated) or stayed the same (reproduced) in a given societal setting, or how different phenomena emerge therein. Bhaskar's philosophical underpinnings are in principle compatible with a variety of social sciences (Archer, 1998; Danermark *et al.*, 2002).

When it comes to teaching and learning in HE, and given the aforementioned discussion on using CR, such an environment can be understood as stratified and differentiated. My responsibility as a researcher is to excavate the intransitive "Real" domain so as to come close to forming explanations for how co-researchers' experiences of the science curriculum and academic teachers' observations thereof have emerged in the "Actual" and "Empirical" domains, and why these have emerged in the way that they have. It is for this reason that CR/SR theory is used as a guiding framework in my study, regulating how data will be viewed, organized and interpreted, and how the extracted data is explored within the framework.

The word "social" in Archer (1995, 1996, 2000) signifies the social aspect of her theory as opposed to the physical world. Archer accepts Bhaskar's (1975, 1978) CR assumptions of reality; that various mechanisms are at play in the generative "Real" domain. She insists that the social world is made up of three intersecting aspects, namely structure, culture and agency, which are at work across the three levels of reality. These three aspects have emergent, independent properties and powers which are said to be enduring. When these emergent powers are activated, they intersect to be variously responsible for different events that may emerge in the given social setting. These powers are operative at the level of the "Real". Drawing on a concept she terms "analytical dualism", Archer (*ibid.*) insists that the "domains" of structure, culture and agency should be analysed separately, by arguing against what she terms the "fallacy of conflation" (Archer 1996, p. xv).

Archer (1996) identifies three types of conflation: upwards, downwards and central conflation. Downwards conflation, or what Archer terms "Society's Being", involves the belief that everything is socially constructed and that human beings have no choice or free will. Upwards conflation, or "Modernity's Man" privileges human agency and sees society as created by

human action. The final view, central conflation, draws on Giddens's (1984) "structuration theory" and is critiqued by Archer because agency and structure are "clamped together in a conceptual vice" (Archer, 2004, p. 4).

It is for this reason that the independent, emergent properties that these entities (structure, culture, agency) have are irreducible to each other. Emergent powers or properties are the causal abilities that the entities possess and which they translate into an ability to enable or constrain change within themselves, and to exert some force on their surroundings that may contribute to change or the lack thereof (Archer, 1995, 2000). The implication for a researcher in identifying these entities is to individually examine each in order to construe how its emergent powers contribute to what has emerged in the "Actual" and "Empirical" domains. This analysis of the roles that the three entities play is achievable through Archer's "morphogenetic cycle", which in this study is referred to as the Morphogenesis/Morphostasis (MM) model.

Since Bhaskar's theory is adopted as a philosophical foundation in this study, Archer's socialist realist MM model is used as my analytical framework in order to tease out how the workings of the "Real" domain have led to the emergence of science curriculum events in the "Actual" domain, and how student co-researchers experience these events in the "Empirical" domain. Given that the student cohort has changed in the research site, Archer's framework allows me as a researcher to determine how elaboration (Morphogenesis) or reproduction (Morphostasis) in the structure and thus enactment of science curriculum for epistemic access to enable success has occurred and also how such enactment has emerged. The emergence of elaboration and/or reproduction in curriculum structure and enactment is likely to be conditioned by the nature of the discipline. I deliberate more on this issue in Chapter 5. This analysis is important in this study, considering the historical background of the research site as a Historically White University (HWU) which has now opened its doors for students from various racial, cultural and socio-economic backgrounds. The elaboration and/or reproduction of the design and enactment of science curriculum for epistemic access (I elaborate more on the construct of epistemic access in chapter 5 of this dissertation) emerges from particular chains of socio-cultural interactions, as conditioned by *a priori* social contexts. Archer accepts that social structures exist, that they are relatively enduring, and that these structures are ontologically prior to and independent from the people operating within them (Archer 1995, p. 96). Structures are irreducible to the people who brought them about, or the people who operate within them (*ibid.*, p. 15). Thus, Archer contends that people are born into or enter into a pre-structured context.

Crucial to Archer (1995, 1996, 2000) is to arrive at an explanation of how the identified entities are causally intertwined through socio-cultural interactions. In other words, it is my task as a researcher to first identify the conditioning mechanisms of the context into which the socio-cultural interactions related to the science curriculum at the research site emerged.

Data regarding the experiences of students, and academic teachers' observations of these experiences as they are shaped by enacted curriculum, are in the form of focus group interviews (academic teachers) and discussions (co-researchers) and Participatory Learning and Action (PLA) techniques in the form of drawings by co-researchers in the "Empirical" and "Actual" domains. When academic teachers teach in the science lecture halls, they most likely draw from structures like their social class, geographical location, science literacies. As such, co-researchers, when they engage with teaching and learning of science, they most likely draw from their social class, geographical location and home rural literacies or Discourses. The interplay between these structures and cultures and how they lead to the emergence of experiences and events was crucial in this study in order to highlight the chains of socio-cultural interactions as per Archer's social methodology. Her framework provides the techniques through which the "Real" domain can be explored for the researcher to explain what has been manifested in the "Actual" and "Empirical" domains.

## **2.10 The strata of the social world in Archer's Social Realism**

Archer (1995) maintains that the point of departure in the analysis of the "morphogenetic cycle" is exploring the social, cultural and agential conditioning in place at a fixed point in time. As far as this research is concerned, this entailed exploring conditioning in place before students started learning at university level in the field of science, and how the teachers' role was conditioned in equipping the students with Discourse from the science curriculum for epistemic success. This conditioning included the effects of the students' home rural learning experiences, or primary Discourse, and the impact this had on their learning at university (experiences which in part had been shaped by the effects of colonialism are discussed in detail in Chapter 4), as well as the extent to which teachers understood these home practices and the effect they could have on students' epistemic access and success. This meant that the analysis of data in this research involved exploring the interaction between what Archer (1996, p. xiv) terms "the parts" (that is, structure and culture) and "the people" (that is, agency over a given period). The parts are assumed to be relatively enduring, because people who join a given institution are confronted by parts which were constituted by previous occupants in that environment. For example, students who enrol in a particular institution and teachers taking up lecturing jobs do

so within a university environment that preceded them. While they may bring certain expectations, ideas and wishes with them (for example, students drawing on literacy practices or primary Discourses that are different from those which lecturers draw on or expect students to draw from) they will be enabled or constrained in achieving them by the institution's norms, values and processes.

Archer talks about social structures being the product of the “doings” or activities of the “long dead” (Archer 1995, p. 1996). In relation to the above, she argues that current actors are not responsible for the way the social context is at the present time (Archer 1995, p. 152). Contrary to Archer's argument above, Sibeon (2004) maintains that current actors who have been in a particular context for some time may be complicit in the way a particular structure is at a particular time. In the case of science curriculum design and thus enactment at the research site as reported on in this dissertation, the socio-cultural contradictions that the curriculum sets up between students' home literacy practices and academic Discourse might have been inherited by the lecturers who were appointed before a significant number of black students, especially those who come from rural areas, were enrolled in the university. What would be interesting to see in this situation, would be the contribution that these lecturers make in developing a new social context for agents to operate in, with new social structures and new ideas to consider. For example, in curriculum review processes, whether such processes demonstrate acknowledgement of the diverse student body, and how this translates to genuine curriculum inclusivity.

In the context of this study, let us assume that a lecturer teaching students from working-class rural backgrounds might observe that the students do not obtain the desired marks to pass a test in, for example, physics or chemistry. The lecturer, as a result of his/her social and cultural conditioning (involving structures such as social class, language, curriculum as well as the impact of dominant discourses which construct failure as a result of a lack of inherent ability in students) (Boughey & McKenna, 2015) might fail to understand why students do what they do in order to study and complete assignments, and therefore attribute failure to a lack of ability or motivation. Students, on the other hand, might understand their failure very differently. They know they have worked hard and therefore see the results of the assessment as unfair. In the context of higher education, parts and agency would thus allow us to understand how working-class students from rural areas interact with the learning required of them given their previous conditioning, as well as how efforts to enhance teaching and learning (such as drawing on

students' home-based knowledge practices) can result in change or stasis in accessing powerful knowledge.

The theoretical lenses of critical realism and social realism thus have the potential to allow for more sophisticated understandings of the need for prior experience to be welcomed in the university classroom. The academic teachers are thus confronted with both pre-existing structures (dominant discourses, social class, language of the academy) and pre-existing cultures (institutional norms, values and processes) which pervaded the institution before they took up their posts in the faculty of science. Students on the other hand, are also faced with pre-existing structures (their social class, which might not be in line with that of their academic teachers) and pre-existing cultures (valuing and attempting to draw on their home practices, which might not be valued in the academy). As the students' demographics have changed over time and the cultures remain unchanged, the parts would have endured in their original form and will then condition the environment that academic teachers and students will be faced with. It is important to engage with these constructs separately to avoid "fallacy of conflation" or clamping these constructs together in a "conceptual vice".

### **2.10.1 Structure**

Mechanisms in the domain of structure would include social structures, the finance system, the education system, social class and so on. The education system or specifically, curriculum distributes access to material goods (Boughey & McKenna, in press). Social structures not only distribute access to material goods but they also organize relationships in any society. Critically, mechanisms are dormant until agents exercise their own powers to draw on them in order to pursue a project which will allow for the attainment of goals. Structures possess causal properties called structural emergent properties (SESPs), so when they interact with the emergent properties of culture and agency, they contribute to what emerges in the "Actual" and "Empirical" domains.

In the example of students and academic teachers demonstrated earlier, they would draw on Discourses about what constitutes knowledge and appropriate ways of learning, as well as structures such as the location of their home and the social class of their family, in order to generate events that would lead to the attainment of their goal, a qualification. Students from working-class rural backgrounds could thus be expected to draw on very different mechanisms to those from middle-class, educated, urban homes. The experiences by students of not understanding their failure of an assignment or test, and the academic teachers' observations of

these experiences are what is manifested in the “Empirical” domain. Accordingly, structures have emergent powers to constrain and enable particular events and experiences in the environment that the students and academic teachers find themselves in.

### **2.10.2 Culture**

For Archer, based on the MM model, culture is understood to be discursively constituted as the accepted and adopted ways of doing things, grounded on beliefs, ideas, discourses (or sets of ideas in language and other sign systems), ideologies, schools of thought or theories, resulting in action. Just like structure, culture constrains and enables the emergence of events at the level of the “Actual” and experiences and observations of these events at the level of the “Empirical”. Culture is also relatively enduring and possesses causal properties known as cultural emergent powers (CEPs) (Archer, 1995, 1996, 2000). While ideas in language are always held by people, it is necessary to consider their role outside of the individuals who hold them. It is through Discourses that ideas and beliefs could be identified, and Discourses have an effect on how the world is viewed and interacted by others, because they determine what can be done and said.

Also, culture is able to influence the contexts in which agents operate and accordingly, it has an impact on whether pursued goals will easily be achieved by people or not. In the example of students and lecturers enrolling and getting employed, they would be entering an environment which is historical, social, cultural and political; as such, these factors would shape what is accepted in terms of beliefs and norms of behaviour. Views about what constitutes legitimate knowledge in the field of science and who can claim to produce and/or have legitimate knowledge (Bernstein, 2000; Leibowitz, 2017b) are relevant for this study, given that certain ways of reading the world are hegemonic, as they are assumed to be universal (Gramsci, 1971). The hegemony of certain kinds of knowledge leads to a situation where other knowledge systems and values are ignored, unrewarded and suppressed as scientific knowledge is generated (Leibowitz, 2017b; Santos, 2014).

The above-mentioned situation could have implications for teaching and learning in the field of Science and could thus have an impact on academic achievement, as there could be clashes between broader institutional contexts and/or departmental contexts and those of the families and communities in which students were raised. In this way, culture would have acted as a mechanism, possibly constraining academic success, given that immersion in the academic context of a university can undermine a student’s way of being and of understanding the world in profound ways, a process that then impacts both psychologically and emotionally on the

learner and thus, on learning itself. When students are presented with knowledge that seems completely separate from them, their identities, their heritage, their backgrounds and value systems, accessing that knowledge can seem inordinately difficult. To possibly enable genuine access to science, there is therefore a clear need to bring something “from home” into our teaching as a means of reassuring students that all is not foreign and that what they already know is valuable.

It is thus the “social” aspect of teaching and learning that this study argues could play a significant role in positively affecting the academic achievement of students, most especially those who come from disadvantaged backgrounds including rural areas, particularly in the field of science. The argument is therefore that the informal acquisition of scientific practices in home contexts has the potential to be harnessed to facilitate access to formal, disciplinary science knowledge and ways of knowing. The argument noted above could have implications for the curriculum more broadly, and not simply in the selection of knowledge. As a result, students’ local ways of being and knowing are crucial in the development of scientific knowledge, something which is not usually the case in these disciplines, which normally focus on the knowledge that is to be transmitted, as opposed to students themselves as knowers (Ellery, 2016; Maton, 2014). It is for the social aspect of teaching and learning that the “parts” are assumed to have the ability to shape the contexts through activation of their emergent powers, which in turn will be enabled or constrained by the actions of agents. The institutional or departmental culture will have an impact on whether students will achieve their goals or not, that is attainment of their degrees as scientists, and/or whether lecturers tap into the social aspect of teaching and learning. It is possible to see that “the parts” of structure and culture present enablers and constraints for “the people” as they enact their agency to pursue their goals.

### **2.10.3 Agency**

The question of how people interact with structures and cultures within given social settings leading to the emergence of events and experiences in the “Actual” and “Empirical” domains is at the crux of Archer’s social theory, explicated in the MM model. In this model, persons are assumed to belong to a collective group termed “agents” (Archer, 1995, 2000). Agency thus refers to human thought and action constituting agential emergent properties (PEPs), which come about as people interact in different contexts that require them to exercise different sets of powers as part of new groups, or where individuals’ interactions are challenged within the natural, particular or social realms of reality (Archer, 1995, p. 184). In this way, agents exercise their agency (powers to achieve their goals).

It is of paramount importance to differentiate between people, actors and agents. Agents or persons have emergent properties, and these may differ in different social settings. In relation to this point, emergent powers or powers of influence differ in the strength of their contributing to what emerges. For example, as students and lecturers enter a new institution, what they do and how they do it will be influenced by the relative emergent powers of three entities in a new environment. It is for this reason that a stratified distinction should be made between humans as individuals, as people with roles and positions, and as groups and collectives who may be more or less influential in decision making (Archer, 1995, 2000; Horrocks, 2009). It is through this distinction that agents are further distinguished into primary and corporate agents in order to highlight that emergent powers which agents possess vary according to social positioning. In this way we can see why and how some agents may be more influential in society given the positions they occupy or resources they have at their disposal.

Little positional authority, for example, is held by “primary agents” (Archer, 1995, 2000). In the example of a student and a lecturer entering a new space in the Faculty of Science at the research site, they both could be viewed as primary agents, as they are unlikely to direct and/or influence how the curriculum is designed or enacted for epistemic access. Put differently, they might have little or no say when it comes to matters of curriculum review to cater for all students, including those who come from rural areas.

From a social realist perspective, corporate agents are understood to have significant powers, than primary agents, to shape and drive curriculum review processes in terms of structural and cultural modelling that could be seen to be more inclusive of the experiences of students from different backgrounds, for example. Corporate agents are likely to involve senior leaders like the Deputy Vice-Chancellor (DVC), academics, Dean of the Faculty and senior academic staff, provided they play a role in influencing curriculum review processes, for example.

While corporate agents might be said to possess influencing powers, these would however hinge on primary agents’ interaction. For example, the act by students from universities across South Africa to express concerns that curricula are not connected to their lived experiences and ways of being of their home communities (Mbembe 2016, 2015; Ndlovu-Gatsheni 2013) could be seen as an attempt to influence the powers that corporate agents possess, such as the advancement of curriculum review processes. In this way, students would have organised themselves in a manner that could enable achievement of their goals, pursued and driven by corporate agents, that is, an inclusive and living science curriculum that will be reflective of the

experiences of all students to enable success for all. Such concerns were particularly apparent in the #FeesMustFall protests of 2015 and 2016, events which saw students citing their marginalization and their perceptions of the continuing elitist and exclusive nature of the institutions in which they were enrolled. While primary agents influence the environment in which corporate agents advance their goals, and corporate agents shape the contexts that primary agents operate in (Archer, 1995), it is worth noting that existing cultures and structures in a given setting also provide conditions in which agents may flourish or be restricted. These issues are discussed in Chapters 6 and 7.

## **2.11 Archer's Morphogenetic Cycle: the MM framework**

The power of Archer's morphogenetic framework is its ability to analyse the interplay of structure, culture and agency over time (Horrocks, 2009; Isike, 2018). Furthermore, it allows me as a researcher to account for why change, termed by Archer, "morphogenesis", happens or does not happen, a state called "Morphostasis", that is, a state of no change. It is through this framework that I was able to interrogate the relevant emergent powers drawn from the interplay of the three entities (structure/culture/agency) (Jessop, 2005).

### **2.11.1 The three-part cycle conditioning**

In order to account for analytical dualism, where the three entities are temporarily separated for the analysis of which entity resulted in the emergence of which event, Archer states that we need to look at *a priori* social context, which was created by previous agents in that society in any cycle termed  $T_1$ . In the endless three-part cycle,  $T_1$  presents the antecedent circumstances, either structural or cultural or both, that provide the conditioning mechanisms for current agents (Archer *et al.*, 1998; Porpora, 2013). These conditioning mechanisms are presented in Chapter 4 and are analysed in Chapters 6 and 7. The conditioning or shaping which is in place at the beginning of the cycle is as a result of two sources of conditioning (Porpora, 2013), that is, both structural and cultural, at  $T_1$ . The structural and cultural conditions may enable or constrain the way individuals act. Agency is conditioned in the first part of the cycle, termed  $T_1$ . It is then possible to look at the way students and/or academic teachers use their agency, either individually or as groups, over a specific time period termed  $T_2$  to  $T_3$ . It is then likely to explore whether change or non-change has occurred in the final part of the cycle,  $T_4$ . According to Archer, this framework allows us to arrive at an "explanation of how... the properties and powers of the 'people' causally intertwine with those of the 'parts'" (Archer 1995, p. 15). In this cycle, emergent powers of structure, culture and agency can be analysed separately. This separate analysis of the emergent properties of structure, culture and agency, which are at play

in the “Real” domain and whose interactions are responsible for what emerges in the “Actual” and “Empirical” domains, is important for this study.

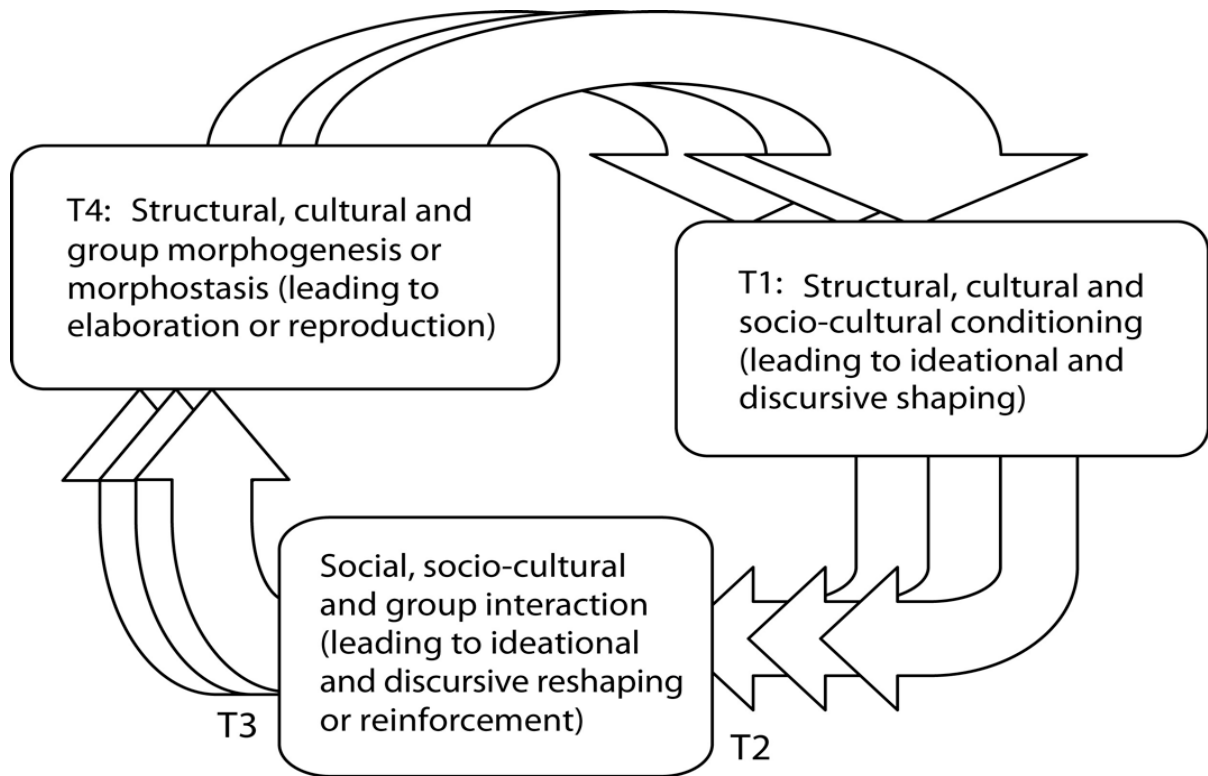
Based on the brief discussion on structural and cultural conditioning above, Porpora (2013) argues that “Structural motivations derive from the interests built into social positions, and cultural motivations derive from people’s value commitments and ultimate concerns” (p. 28). In relation to Porpora’s argument, Archer (1995, 1996) notes that through these motivations people are “involuntarily” but non-deterministically conditioned at T<sub>1</sub>. In other words, we are born in families or environments which are not of our making (Archer, *et al.*, 1998; Horrocks, 2009). Chapters 6 and 7 then cover discussions on how these identified mechanisms enabled or constrained students’ epistemic access to Discourse as they enrolled in the field of science. If an individual, for example, comes from a family where parents had been educated via the university, they may well be conditioned to pursue careers in HE, not only because of ideas and beliefs they have been exposed to, but because they may have been introduced to the way university education is itself structured (Boughey & McKenna, *in press*). By contrast, students who were raised by “uneducated parents” might be expected to draw on Discourses different to those from middle-class educated families.

It is possible to see that when people act, they do so within the constraints of social structures and cultural circumstances which they are presented with and, given their abilities, they are able to either maintain (sustain) or modify their circumstances or environment (Porpora, 2013; Vorster, 2010). There are a number of factors at play that affect how agents react to the structured and shaped situations that they face (Horrocks, 2009), based on their allowable abilities. In the example above, this might include the circumstances of their birth, educational competencies, and powers entrusted in them because of their titles in society, and so on. Agents have reflexive powers or “internal conversations” in dealing with how they negotiate their way through enablements and constraints presented by structural and cultural conditioning. Through their actions, agents may then alter, reshape or sustain structures or culture, and these may happen simultaneously. The nature of the interaction between agents could thus be said to maintain or alter some structures and some aspects of culture. In other words, the nature of interaction could either lead to elaboration of structures and/or reproduction of cultures or both structures and cultures could either be elaborated or reproduced.

In the example of a new student and the academic teacher in an institution that preceded them, they enter a culture and structures that have remained largely unchanged, as a historically white

institution designed to serve mainly students from middle-class urban educated homes. This point is echoed by Boughey (2018) when she notes that Nxakanxaka University (Pseudonym of the research site) “has also been challenged by calls to “decolonise” which have included demands that it should change its name. Many of these challenges have cited the academic spaces of the university as “white” and “alien” to the students who now study here” (p. 34). As they enter the pre-existing social setting, known as  $T_1$ , the new student may find that the beliefs and world views characterizing their primary Discourse may be at odds with the secondary academic or science Discourse, resulting in conflict at the individual level (Boughey, 2018) and challenges against epistemic access. Academic teachers may find that they are unable to align their theoretical persuasions and pedagogical inclinations to students’ primary Discourses, particularly those who come from working class, rural backgrounds. As a result, they may be frustrated with the lack of structural and cultural support for developing teaching and learning environments that could also enable the epistemic success of students from working class, rural backgrounds. Or the support academic teachers get might not address the challenges that black students face in HWUs.

Archer (1995, 1996, 2007) mentions that the institutional conditions that the students and academic teachers are confronted with at  $T_1$  may condition how they interact with a given context in the environment at a given point in time. As primary agents, the likelihood is that they may have little influence on the institutional culture. So they may, as a result, be constrained to challenge the alien space or whiteness of the university and thus accept the status quo. Or they may find some means to more gradually affect the structures and cultures in ways that might lead to better educational outcomes for students who come from rural “uneducated” homes, as the #FeesMustFall protests of 2015 and 2016 attested. In relation to the above discussion, Figure 2 below serves as a demonstration of a several-measurement cycle of change/reproduction for structure, culture and agency.



**Figure 2:** A multi-dimensional cycle of change/non-change of structure, culture and agency, adapted from Horrocks (2009).

### 2.11.2 Social, Socio-cultural and group interaction

Suppose that the student and the academic teacher in our example above realize that the institutional culture is still “white”, designed to serve middle-class urban students. Because of that, they realize the challenges that black students from lower-class rural backgrounds face in terms of better educational outcomes. What they can do under these circumstances, as primary agents and persuaded by conditions that enable decisions and actions, would be to exercise their emergent powers and identify with a group of other students and/or academic teachers embracing related observations. This kind of interaction between students and or/ academic teachers with other agents takes place at T<sub>2</sub>-T<sub>3</sub> in Figure 2 above (also see Boughey & McKenna, in press). When agents interact with the parts, they exercise their emergent powers in order to mediate their interests, projects and goals within the conditions presented by the existing structures and cultures (Archer, 2007). As mentioned earlier in this chapter, Archer (2007) also notes that these emergent powers of the parts are inactive and are triggered by agential interaction; the CEPs and SEPs when actuated, as a result, pose conditions that may hinder or promote desired goals by agents. In order to analyse the emergent powers of each entity, the use of analytical dualism is necessary, a point I made earlier in this chapter. In other words, the interactions of agents with other agents, with culture and with structure, should be

analysed separately even though in reality the working of these entities is simultaneous. Analytical dualism allows researchers situated in SR and CR to come up with explanations of how the emergent powers are exercised, which is what is manifested in the “Actual” and “Empirical” realms.

Under the conditions mentioned above, which include primary agents deciding to interact with the parts and with other agents in the university setting, they may organise themselves in ways that constrain or enable the attainment of goals advocated by corporate agents. This will depend on what corporate agents are persuaded to achieve. Through organising themselves, primary agents can play a role in ensuring that the interests of corporate agents are achieved or compromised by aggregately reconstituting the environment (Horrocks, 2009). According to Archer (1995, 1996) the reconstitution of the environment by primary agents may not be harmonised, nevertheless, its aggregate outcome may pose constraints and enablements for corporate agency. Crucially, Horrocks (2009) maintains, while corporate agents may have influential powers, exercising these will more than likely be dependent on the manner in which primary agents interact or react to the contexts that corporate agents have created for them.

The possible result under the above-mentioned circumstances would be that the aggregate outcome of the actions of either primary or corporate agents may not be what each had aimed for. Primary agents might, for example, realise that the institutional culture embodied in curriculum and the Language of Learning and Teaching (LoLT), university space: ideologically and intellectually, is biased towards certain cultures, identities and languages. They might then aim to challenge these practices of the university for support of inclusive institutional culture that draws on the experiences and the world views of all students in knowledge construction. However, corporate agents, whose goal maybe to maintain the status quo as they see nothing wrong with the institutional culture, might constrain the environment within which primary agents pursue their goals of transforming the biased institutional culture. Given these opposing or different views on institutional culture, the outcome of period  $T_2$ - $T_3$  interactions may result in reproduction of inherited curriculum as primary agents might receive little or no support from corporate agents.

Another example might be when the new academic teacher (primary agent) may be invited to participate in the review process of the curriculum in the Faculty of Science, only to find that after the curriculum has been reviewed, it does not really engage with the notion of how students from marginalised backgrounds (including rural areas) experience it. Therefore, the lack of

structural and cultural support on the part of the new academic teacher would make it next to impossible for her or him to draw on students' prior rural learning in order to use such an understanding as leverage to enable students' access to the powerful knowledge of science. For corporate agents whose goal may have been to review the curriculum because of the pressures from the #FeesMustFall protests, for example, the outcome of period T<sub>2</sub>-T<sub>3</sub> interactions may result in the reinforcement of the status quo, resulting in students from marginalized groups feeling ignored by the curriculum and the teaching and learning processes that it encompasses (Ellery, 2016).

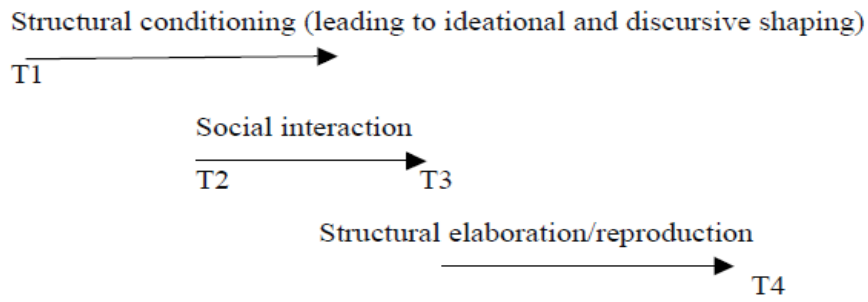
### **2.11.3 Morphogenesis and Morphostasis**

The examples in the preceding section regarding the interactions of the “agents” and the “parts” suggest that there could be either elaboration or reproduction when it comes to enacted science curriculum for epistemic access. The change or non-change will be contingent on the relative powers of the entities in the situation. Figure 2 above represents the outcome of the interactions at T<sub>4</sub>. Crucially, this outcome is contingent on the relative emergent powers of the agents and parts, suggesting that the outcomes may represent more than just individual goals but also transformation of primary agents to corporate agents as they empower themselves as a collective. When students organised themselves during the #FeesMustFall protests of 2015/2016 and/or when they chose to become part of this project, they may have been empowered and thus organised themselves into a powerful group of influence. This situation could see students being transformed into corporate agents. Academic teachers on the other hand, may also have contributed to the debates about decolonizing the science curriculum, conversations which took place at the research site during the period of 2016 and 2017. In this way, they may also have organised themselves into powerful groups which could be seen as transformed into corporate agents leading to elaboration in T<sub>4</sub>.

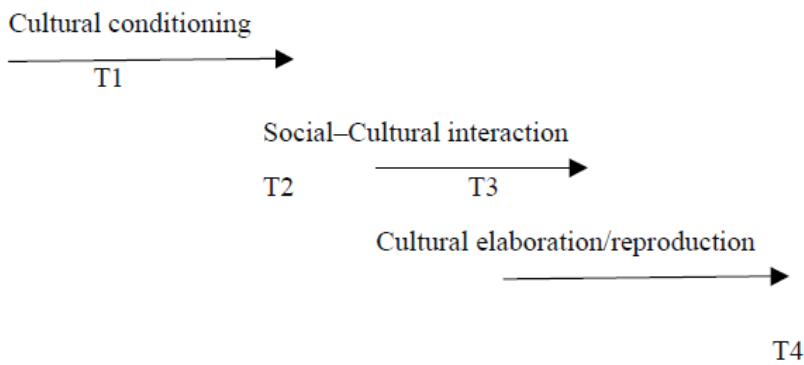
The establishment of whether elaboration or reproduction of the parts and agency has taken place required a separate analysis of the three interrelated stages, that is, conditions/emergence-interplay/outcome. This separate analysis is presented in Figure 3 below. To establish whether elaboration – that is, acknowledging students' prior home practices with scientific underpinnings when the science curriculum is designed and thus enacted – has taken place or whether reproduction – that is, whether the science curriculum is still imbued with the notions of covertly favouring the world views of students from middle-class educated home backgrounds – has taken place at T<sub>4</sub>, culture, structure and agency have to be separately analysed. Analytical dualism would thus enable me as a researcher to establish if there have

been any changes or no-change in the structure (curriculum); culture (beliefs about teaching and learning in the field of science at the research site; and agency (interactions between primary agents and corporate agents). The change or non-change would then impact on what emerges in the ‘Actual’ and “Empirical” domains.

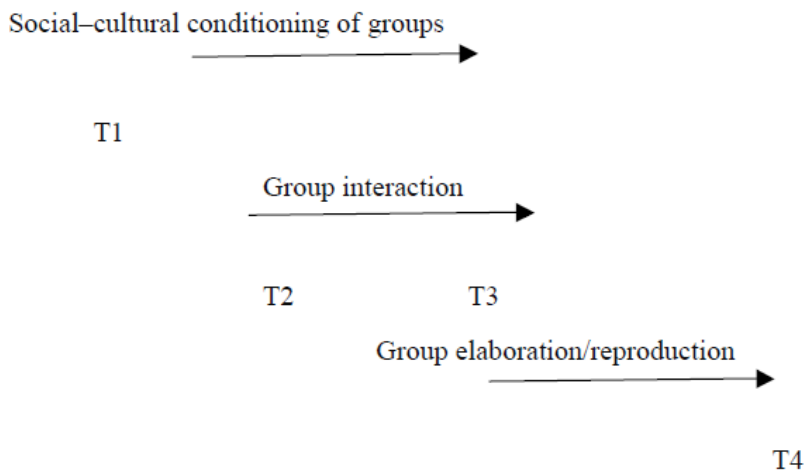
### The Morphogenesis/stasis of Structure



### The Morphogenesis/stasis of Culture



### The Morphogenesis/stasis of Agency



**Figure 3:** The Morphogenesis/stasis of structure, culture and agency, adapted from Archer (1995, 1996).

Based on the aforementioned deliberations, it is possible to see how useful Archer's (1995, 1996) framework is in helping researchers arrange unearthed data and explain how historical conditioning, change (elaborations) or non-change (reproduction) ensue. According to Archer (2007), the likely occurrence of elaboration could be when conditions in a given social setting present the rostrum for agents to pursue their goals. This is possible when conditions allow primary agents to collectively organize to enable their voice to be loud enough to be successful, and if structures like decision-making hierarchies allow them to voice their opinions about how university space (physical, ideological and intellectual) could constrain access to powerful knowledge. In this way, primary agents could make a case toward recognition and reward for forms of rural-originated knowledge and practices currently ignored in HE.

Primary agents could thus be empowered to transform into corporate agents, which may in turn influence or become powerful groups in shaping the science curriculum to be more inclusive of the experiences and world views of all students, particularly those who come from marginalized backgrounds, including rural areas. Consequently, in exercising their emergent powers, agents could benefit from structural and cultural enabling conditions in pursuing their goals. In that way, elaboration could take place at  $T_4$ , whereby we would observe an inclusive curriculum for epistemic access, so that all students could see that learning of science is not divorced from their home lived experiences or world views, an event which this dissertation is hoping to contribute towards. It should, however, be noted that the argument made in this study is not to suggest that students' home lived experiences or world views formed in rural contexts are fixed, and thus need to be left intact. Rather than viewing what students bring with them in essentialist terms, I argue that the rural community from which the student co-researchers come, as the findings show in Chapter 6, is as much a learning environment as the university. As such, both can be appreciated in the process of knowledge construction, even in the field of science. It would therefore be possible for the structural and cultural conditions in the institution to be such that they enabled primary agents to thrive and pursue their desired goals. However, the opposite would be true if the university still sees itself as an HWU without acknowledging that demographics of students and staff members have changed over the years, hence the reproduction of an environment that is not conducive for genuine epistemic access because of structural, cultural and agential emergent powers that constrain the abilities of primary agents in pursuing their goals.

$T_2$ - $T_3$  forms the interaction of agents leading to what emerges at  $T_4$  as a result of the emergent properties that the three entities possess. Significantly, the properties form constraints and

enablements for other elements as Jessop (2005) maintains. Consequently, it is possible to see that  $T_4$  represents morphostasis or morphogenesis, which are relevant to the conditioning factors at  $T_1$  in the next MM framework process that agents will be faced with.  $T_4$  could be said to give rise to structural and cultural traits which will be responsible for conditioning “new” agents or agents re-entering the given environment. It is important to note that the preconditioning or “pre-structuring of actor’s backgrounds (situations) and concerns is responsible for shaping the pressures for transformation by some and for stable reproduction by others in the present (or given point in time)” (Archer, 1995, p. 152). So, the three cycles of the MM process are continuous and the researcher is thus sanctioned to “set out the conditions under which change or reproduction is likely to occur in social/structural/cultural contexts and produce an analytical history of this without having to resort to a deterministic approach” (Horrocks, 2009, p. 40).

## **2.12 Situational logics involving complementarities and contradictions**

At this point, I draw on the work of Archer’s MM framework to account for how the university structuring of curriculum could potentially set contradictions for black students, especially those who come from lower-class backgrounds, including those from rural areas. The literature from African writers, for example, Garuba, 2012; Heleta, 2016; Leibowitz, 2017a, 2017b; Leibowitz & Mqgqwashu, 2019; Mqgqwashu, 2019; Nyamjoh, 2012, 2016; Ndlovu-Gatsheni, 2013; Oyedemi, 2018, and international writers like Grosfuguel, 2013; Maldonado-Torres, 2016, 2011; De Sousa Santos, 2007; Yosso, 2005; Wynter, 1995, 2003., among others, is relevant in this study for its critique of the persistent “coloniality” of African universities and the global South. I engage with this literature in Chapter 4. Nevertheless, Archer’s (1995, 1996, 2000) theory of change or non-change is crucially important in this study because it offers a framework for my analysis. Through her theory, it is possible to draw on her conceptual framework to solidify an array of social and political analyses of the post/colonial condition, which have been revised by scholars such as Alexander (2002, 2013) and Mamdani (1996, 2018). Again, I deliberate on this literature in Chapter 4. In the preceding sections of this chapter, I made mention of the curriculum as an event, at the level of the “Actual” that is affected by social interactions and causal mechanisms; the “Empirical” which comprises experiences of students and academic teachers’ observations thereof; and the “Real” which is relatively enduring with anterior structures, for example, class, curriculum, race and so on.

At the level of the “Real”, there are structural systems comprising institutions and roles that are mediated by access to material resources, and there are cultural systems which include, but are

not limited to, ideas, beliefs and ideologies found in instances of language and discourse mediated by access to cultural resources (Archer, 2007; Lockett, 2016). The interplay between structures and cultures conditions the environment that human agents will enter, or within which they are required to act (Case, 2013; Vorster 2010). This interplay can be explained by the concept of “situational logics”, which provides explanations for how change or non-change may take place as a result of certain institutions and roles shaped by power relations and access to material and cultural resources. Access to these systems then conditions the daily events and experiences that individuals are faced with, thus necessitating certain actions that enable or constrain the emergence of human agency. Tables 1 and 2 below, attuned from Case (2013), present various roles that predispose agents to act in particular ways given the structural systems and cultural systems in a given context. This tool provided by Archer (1995, 1996) is also used in my study as an explanatory tool to analyse students’ experiences of curriculum in the field of science and academic teachers’ observations thereof.

**Table 2:** Situational logics in the domain of structure, adapted from Case (2013).

Configurations of structural interests	Situational logic
Necessary complimentaries	Protection: mutually reinforcing ideas (Compatibilities)
Necessary incompatibilities	Compromise: everyone makes some gains and losses
Contingent incompatibilities	Elimination: there is a loser
Contingent compatibilities	Opportunism: new opportunities for advancement

**Table 3:** Analogous situational logics in the domain of culture, adapted from Case (2013).

Configuration of cultural interests	Situational logic
Concomitant (necessary) complementarities	Protection: mutually reinforcing ideas
Constraining (necessary) contradictions	Correction: modification of ideas
Competitive (contingent) contradictions	Elimination: one set of ideas is eliminated
Contingent complementarities	Opportunity: new opportunities for “cultural free play”

A key distinction between these logics is that some are necessary or complementary as shown in Table 1 and Table 2 above, and others are contradictory or clash. Crucially, the same institution can simultaneously set up different situational logics for different groups of people, hence the complex nature of the “logics” (Lockett, 2016; Moyo, 2018). In necessary or integrated situational logics, groups have mutually reinforcing vested (material) interests where there is potential for social reproduction of the status quo and/or assimilation for those who fall

outside the systems (Morphogenesis) (Case, 2013; Lockett, 2016). In other situational logics, there are instances of incompatible and contradictory systems that result in tensions or correction, and potential for systemic transformation (morphogenesis) (Lockett, 2016). For this study, it is important to find out how these situational logics played out in the extracted data.

Necessary contradictions are likely to lead to correction, that is, something will have to change to address the situation. When contradiction is contingent, the likely result is elimination, where some aspects will be brought to an end. Necessary complementarity between mechanisms is likely to lead to protection, with an attempt to sustain the status quo. Contingent complementarity is likely to lead to a situational logic of opportunism for agents in order to achieve their projects through various means, as depicted in Tables 2 and 3 above. Importantly, these logics are shaped by numerous mechanisms at play, so are not given truths.

The concepts discussed above are important in Archer's (1995) three-part cycle conditioning model. In the first instance, the structural/cultural conditioning, for example, takes place when their emergent powers and properties *a priori* and objectively shape or condition the environment that agents confront involuntarily, predisposing them (non-deterministically) to act in certain ways (Lockett, 2016). Based on this understanding, Archer (1995), Lockett (2016) and Vorster (2010) maintain that curriculum could be described as having "culturally emergent properties" independent from the people operating within them. In other words, the structural and cultural conditioning has already been set up before social actors with particular vested interests located in particular roles in institutions begin integrating with each other (Lockett, 2016). In the example of a new student enrolling at university, they are faced with a contradiction between primary Discourse and secondary academic Discourse set up by curriculum. There is also a lack of structural and cultural support for the academic teacher, with which they might enable a student to draw on home practices with scientific underpinnings in the construction of knowledge in science classrooms. Secondly, social and socio-cultural interactions arise when people individually and collectively interact to achieve their subjectively defined concerns and projects (Lockett, 2016). According to Lockett (2016, p. 418) "what emerges from a particular period of interaction, for example, teaching and learning is contingent on the situation and cannot be determined or predicted". Lockett (2016) further notes that agents (lecturers and students) determine subjectively through reflexive deliberation how to act in relation to the constraints objectively defined by the situation, for example, curriculum, in which they find themselves. Thirdly, Lockett (2016) posits that the outcomes of social

interactions may involve structural and/or cultural change or reproduction (morphostasis/morphogenesis).

### **2.13 Conclusion**

In this chapter, I discussed phases of Archer's social realist approach in the analysis of social change. The theory enables an analysis of the interplay between structure, culture and agency in the process of social change or non-change. Furthermore, I have stated some examples of how the theory may be applied to the enquiry reported on in this dissertation. Archer's theory is, of course, much more complex than this limited elucidation; however, I have only selected those aspects of the framework that I consider applicable to this enquiry. In the enquiry of curriculum design and enactment for epistemic access in the faculty of science at the research site, I use Archer's social realist methodology in conjunction with Bhaskar's critical realist ontology, Street's Literacies Theory, Gee's Theory on Discourses, and Ndlovu-Gatsheni's decoloniality theory. In the next chapter, I account for how Participatory Action Research was used as a methodology to tease out transitive data in order to excavate the intransitive data.

## CHAPTER 3: A LAYERED METHODOLOGY FOR CURRICULUM INCLUSIVITY

### 3.1 Introduction

Transformation of HE has meant that things are changed to remain the same (Mgqwashu, 2016). It is only the form (physical access to HE) that has changed by allowing different demographic groups to access HE (Luckett, 2017, 2019). But curriculum, which is understood as a structure that regulates access to knowing and knowledge, tends to favour certain world views and ways of being, and as result, does not treat all fairly (Boughey & McKenna, in press).

The purpose of Chapter 2 was to argue for a theory that enables an analysis of the interplay between the “parts” (structure and culture) and the “people” (agency). It was clear in this chapter that critical realism and social realism allow an explanation of how the “parts” and the “people” impact on each other for the emergence of events in the domain of the “Actual” and experiences in the domain of the “Empirical” in order to account for change or non-change in the world we want to explore. What seems to be emerging is the need to avoid “fallacy of conflation” when conducting research, by avoiding mingling the roles of the “people” and the “parts” in explaining the emergence of events and experiences. Not separating these entities in the analysis would bring narrow explanations, as more power is accorded to one domain. This situation is likely to lead to a blind spot as to the causal tendencies of another domain (Archer, 1995). The focus of research should be on the analysis of how the properties and powers of the “people” intertwine with those of the “parts”, so that as researchers we can come as close as possible to an explanation of why things are like this, not otherwise.

The purpose of this chapter is to describe and explain the methodological choices made as part of investigating the experiences of students who have lived and learnt in rural areas, and how they make their way to university life, particularly in the field of science. The extent to which academic teachers who teach these students appreciate the knowledge resources that these students bring into their classrooms is also part of this investigation. In engaging with the purpose mentioned above, I also try to think about the question(s) this study is attempting to answer, by simultaneously considering how my methodological choices relate to the philosophical underpinnings. Developing from Bhaskar’s (1978, 1979) and Archer’s (1995, 1996, 2000) theories, presented in Chapter 2, this chapter demonstrates how these theories have framed the study’s approach to addressing the research questions. According to Boughey (2018), theories allow researchers to explain what they see and how it is seen based on data, or explain the world differently.

This chapter is designed to present a demonstration of the steps in how I worked with data to explain how both home environments and the Higher Education (HE) environment in the field of science led to the emergence of students' experiences, as well as teachers' observations thereof, and the impact of these events on educational outcomes. In accessing data in the transitive world, the first section of this chapter thus describes the kind of data the study sought to gather. Qualitative data was generated for this study. This type of data assists a researcher to describe and interpret experience (Gillis & Jackson, 2002; Leininger, 1985; Lincoln, 1992; Mason, 2006; Oishi, 2003). The relevance of this type of data is the heavy reliance of this study on participants' rich descriptions of the rationale for the design and delivery techniques of their modules as teachers (captured in focus group interviews) and a need for comparing such descriptions with documents, such as curriculum reviews.

Through focus group interviews, data that were generated drew on the experiences of involvement with the design and/or delivery of modules meant to develop scientific concepts and thought processes at tertiary level. Critical engagement with these interviews enabled me as a researcher to gain access to participants' experiential understandings, with the intention of opening possibilities for informed and deliberate introspection on the part of university science practitioners. Such introspection is crucial when one considers the fact that in most tertiary education institutions, there is hegemony of knowledge, which tends to obliterate local knowledge and legitimize formal or school knowledge forms (Leibowitz, 2017b). This point refers to existing knowledge that has been generated through research, and it is relevant to the point I am making. What should be taken into consideration here is not only what is taught in terms of scientific concepts, for example, but also how it is taught, and how the way it is taught takes into consideration home literacies or primary Discourses. Proximity between primary Discourses and secondary Discourses is likely to act as a hindrance or leverage for epistemic access and thus success (Boughey, 2018).

The study also relies heavily on students' experiences of living and learning in rural areas, as well as learning at a university. This data is captured through Participatory Action Research design (PAR) and Participatory Learning and Action (PLA) techniques, as part of PAR, like drawings, digital documentaries as well as focus group discussions in order to understand the phenomenon under study and its context. The data focuses on the social interactions of agents with structures and cultures in accordance with enacted science curriculum.

The second section presents the project informing this study. It points out that this study is part of a bigger project involving five universities. How participants were selected for this study is then accounted for. Since this a qualitative study, the relevance of this methodology and research design are then discussed. In this section, a rationale for the choice of the research instruments is provided, where PAR design is presented and argued for. Data that was obtained through PAR is transitive and relative. This transitive data was subjected to SR in order to excavate mechanisms that led to the emergence of what is experienced and observed in the “Empirical” and “Actual” domains. PLA research techniques as part of the more general PAR approach are also argued for. Through this methodology it was possible to critique and observe the taken-for-granted assumptions or common-sense discourses about teaching and learning in HE. This criticality was arrived at by moving from the transitive realm of experience and observation which were generated through PAR and PAL techniques, to the intransitive realm of structures and mechanisms which might have led to such experiences and observations (Boughey & McKenna, in press; Bozalek, 2013). The choice of PAR as a design for this study has two strengths: first, it proposes a collaborative approach between the researcher and the study participants. The second strength of the study is its intention to train students as “co-researchers”, thus facilitating their views and insights to emerge. This is in line with a call for research related to cognitive justice (Leibowitz, 2017b).

Some scholars on cognitive justice have argued that in the process of knowledge construction in HE, other knowledge systems and values are ignored and suppressed as scientific knowledge is generated (De Sousa Santos, 2014; Leibowitz, 2017b; Mbembe, 2016; Visvanathan, 2007). This situation results in mono-cultural way of knowing which is likely to constrain participation in knowledge construction. Thus, in accordance with the above-mentioned strengths, this study hopes to provide space for both the sharing of experiences and expertise, as well as a fuller and less hierarchical relationship than is normally the case in education research study. A study on collaboration suggests that collaborative research can support learning and participation between the researcher and study participants if the interpersonal relations and issues of power and identity receive concerted attention (Leibowitz, Ndebele & Winberg, 2014; Leibowitz *et al.*, 2012). Data gathering techniques utilised in this study have been explored in previous studies. Leibowitz *et al.* (2012) and Timmis and Williams (2013), for example, involved students as co-researchers and used digital technologies. In a study conducted by Bozalek (2011), PLA techniques were used where students from different racial, cultural and linguistic backgrounds mapped their river of life. A similar study which involved students from rural

Southern Africa was conducted by Leibowitz, *et al.* (2019). For local contexts, the techniques used in such studies were adapted. These are discussed in section 3.10 below.

Chapter 2 pointed out that critical realism conceptualises reality as stratified. Based on this understanding, the deepest and most abstract domain comprises mechanisms responsible for the emergence of our experiences and observations of events in the “Actual” and “Empirical” domains. It is for this reason that the section on data analysis (section 3.11) provides an explanation on how I attempted to move from students’ interpretation of their experiences of the science enacted curriculum and academic teachers’ observations of those experiences as set of events to identify the responsible causal powers from the “Real” domain. Ethical considerations are then presented, leading to the last section which is based on the limitations of this study.

### **3.2 Accessing data relevant to this study**

Before identifying responsible causal mechanisms in the intransitive domain, I first needed to access data in the transitive world of what we readily see and know. To do this, data in this study was generated through PAR and PLA tools as part of PAR. PAR is, however, adopted as a lower level methodological framework, while Archer’s MM framework is the bigger one, since it is through the MM framework that the intransitive realm can be identified. While ontologically PAR is often located in a relativist position (students’ experiences, lecturers’ observations), I have used CR and SR to access structures and mechanisms that led to the emergence of what co-researchers and teachers say, which enable or constrain the teaching and learning of science. For this reason, data in this study was further organised into broad aims. These broad aims served to provide the context of this dissertation, as well as the identification of the generative mechanisms that were key to addressing the research questions:

1. To contribute to a nuanced and context-sensitive, theoretically and empirically informed perspective for the need to use students’ prior learning in our universities, and particularly in science;
2. To argue for the use of a specific theoretical framework combining Bhaskar’s (*ibid.*) critical realism and Archer’s (*ibid.*) social realism to explore this and,
3. To suggest ways in which higher education can be more responsive to the needs and strengths of students from different backgrounds, including and importantly those from rural areas, including by highlighting examples of good practice.

Within the context of these categories, specific methodological choices are described in this chapter in order to engage with the context of students who come from rural areas, both before going to university and when they are enrolled. In addition, the circumstances which facilitate the theoretical inclinations and pedagogical choices that lecturers have made and/or are making are described and engaged with. The broader focus of my PhD study had to do with how students from rural areas learnt in the home and community, and how this subsequently influenced their learning at university, either as a strength or a hindrance.

### **3.3 Southern African rurality in higher education (SARiHE)**

This PhD is part of a bigger project that considers how the condition of rurality impacts on the transition of students from rural areas, communities and schools to university, and how this affects their trajectories. The project is called Southern African Rurality in Higher Education (SARiHE). The project brings together 5 universities, that is, University of Johannesburg, Fort-Hare University and Rhodes University, all in South Africa, as well as Bristol University and Brighton University, both in the United Kingdom. This work was supported by the Newton Fund, Economic and Social Research Council, UK [grant number ES/P002072/1] and the National Research Foundation, South Africa. It is envisaged that the study will contribute to an understanding of the condition of rurality and how it impacts either positively or negatively on students' success at university, thus work toward genuine curriculum inclusivity. In all 5 universities, the project investigates students' experiences and transitions from rural areas to university education in both Humanities and Science, Technology, Engineering and Mathematics (STEM subjects). My PhD contributes to the broader project aims of developing a nuanced and context-sensitive, theoretically and empirically informed perspective for the need to use students' prior learning in our universities, and particularly in science. Hence this study is trying to find answers to the research questions presented in Chapter 1 of this dissertation.

### **3.4 Research questions: A closer focus**

A number of scholars have indicated that the opening of doors to HE for all candidates, including first-generation black students, has increased dramatically over the years, at least from 1993 until present (Boughey & McKenna, 2015; Shay, 2015; Shay *et al.*, 2016). However, academic success is still skewed along racial lines (Scott, Yeld & Hendry, 2007). Writing about educational success in HE, Letseka and Maile (2008) argue that "black ... students are the worse affected" (p. 4.), as such, these students "continue to bear the brunt of poor performance of the system overall, with many taking longer than regulation time to complete the

qualifications for which they are registered or failing to complete them altogether” (Boughey & McKenna, 2015, p. 1). In relation to this point, Boughey and McKenna (2015) posit that this is catastrophic regarding teaching and learning in common-sense discourses related to HE. It is partly for this reason that my study aimed to answer the research questions and thus explain the factors that constrain and/ or enable the teaching and learning of students from rural backgrounds in HE.

The “enabling and constraining” considerations in the research question are conceptually drawn from the underlying depth ontology of CR. Data from sub-questions could potentially allow me to access these enablements and constraints. Through this ontology, it is maintained that researchers are required to identify mechanisms at the level of the “Real”. In addition, the question(s) require an interrogation of the notion of “rurality”, the context of teaching and learning in HE in South Africa, the practices with scientific underpinnings that students from rural areas bring with them, and their analysis for genuine epistemological access to the discipline of science.

This study is therefore an attempt to initiate a conscious and deliberate re-thinking of how university science practitioners can consider the social aspect of learning (Boughey & McKenna, in press; Gee, 1990, 2008; Street, 1984). To do this, the study relies on focus group interviews in the form of experiential biographical data drawn from curriculum developers’ experiences as module designers and/or academic teachers. Using this data, the study attempts to locate and to some extent investigate the extent to which, as academic teachers in the field of science, we know who the students are that we teach, what the literacies that they bring with them are, and how these literacies might be viable for knowledge construction in the sciences. Documentary evidence in the form of science curriculum reviews was also seen as relevant for the analytical morphogenesis/stasis framework, as it provided a pathway for elaboration or reproduction of teachers’ approaches in the teaching of science, given that the demographics of the student body have changed.

### **3.5 Sampling strategy**

Students were selected as co-researchers through purposive sampling. This section begins by outlining the sample size and criteria which were used. The motivation for selecting second year science students is then given. The section then briefly discusses the concept of rurality and how rural areas are defined in this study. Finally, it discusses the justifications for selecting qualitative sampling methods.

In this study, 12 co-researchers, who were in the second year of study at a university in the field of science, were selected using a matrix to achieve a balance of race/ethnicity, gender, geographical origin, country of birth and first generation at university. Given the objectives of this study, mentioned in the introductory section of this chapter, second year students were chosen for the following reasons:

I, as a researcher, believed that these students (after spending a year at university) would have developed some grounding on which to base their experiences, and would have developed a language to express these, something that might not have been easy for someone who had just enrolled. These students were expected to describe how they had learnt in the home, community and school environments, and how this subsequently influenced their learning at university. Given the nature of data to collect, first year students were perceived not to be ready to provide such data, in light of the time it would take to collect it (7 months). Asking first year students to engage in such a demanding study would be unfair, since the first year of study is challenging for many students whether they come from rural areas or not. Moreover, the focus of the study was to engage with and carefully document lived experiences that would provide rich accounts of the participants.

These students were further expected to describe how they had navigated the university space, from registration, accessing lecture halls, academic language and so on. Lastly, in this study, the move from rural home environments to university is perceived as an identity-shifting process of being and becoming a member of a community, but one within which the community itself also changes. As a researcher, I believed that second year students would be able to respond to questions that this study is asking.

To be selected to participate in this study, students were asked to complete a short questionnaire based on the following sampling criteria and more detailed questions on their home address, school attended and general context to determine criterion 1. Students who met the criteria were then invited to take part in the study. The intention was also to aim for a balanced sample across criteria 4 and 6. This information is presented in Table 4 below.

**Table 4:** Categories for selecting students in this study.

1	From a rural background: “formal rural” (e.g. farm, small holding) or “tribal area” (e.g. tribal settlement). No fewer than 6 students should come from a tribal area.
2	Lived in rural area for first 16 years. No fewer than 8 students.
3	Attended school in a rural area for at least seven years.
4	Gender: male/female. As balanced as possible.
5	Ethnicity: indigenous black community likely to be majority. Approximately 8:4 black/white disadvantaged students.
6	Study programme: STEM.
7	First generation in university (parents with no higher education background).
8	Country of birth: South Africa and other countries. No fewer than 6 students from South Africa.

In this study, the categories of “formal rural” and “tribal area” have been adopted to differentiate the types of rural areas. These differentiations are based on the categories of rurality provided by the South African Statistics Agency, specifically from their publication investigating appropriate definitions of urban and rural areas (Statistics South Africa, 2003). Rurality is both spatial and non-spatial, and so sampling was conducted using both types of indicators. For example, a rural area is defined in terms of low population density but also in terms of the civic and commercial amenities available, including schools. This is because some areas, particularly tribal areas, may have an equivalent population density to some urban areas in South Africa, so population density alone is not sufficient to determine a rural area or background (Laldaparsad, 2006). The interest in this study is specifically in students who have lived and attended school in a rural area (formal rural or tribal area) for at least 16 years of their lives (all students must have attended a rural school for at least seven years). This is because there is a proportion of young people who are sent to fee-paying boarding schools in rural areas, but their family home is in an urban area and they are not part of the target sample. The school attended is therefore critical. In 2015, the Department of Basic Education (DBE) noted that 10,252 public ordinary schools are designated as rural schools.

Qualitative sampling methods were used in this study, which do not aim for a representative sample. Previous in-depth participatory research studies with student co-researchers have demonstrated that it is possible to obtain sufficient data to answer the research questions from a sample consisting of 12 students (Kitzinger, 1995; Marshall & Rossman, 2006), because the data generation will be very in-depth and longitudinal over a six- to seven-month period and include multiple datasets.

I was mindful of the possible risks when selecting students, in particular of some students dropping out, which is why I had recruited 12 students initially to allow for some possible attrition. This was done in order to increase the sample (students and/or academics) if the need arose to achieve saturation, extend the data collection period, or consider a second round of data generation. That, however, was not necessary, as no student withdrew from the study, nor did lecturers. Furthermore, data generation was being reviewed and reflected upon in all stages of PAR, and co-researcher participation and progress were regularly monitored. The next section discusses the relevance of qualitative data for this study.

### **3.6 Relevance of qualitative data**

Qualitative research is relevant for capturing the particulars of social experience, studying and representing others (Ellis & Adams, 2014). The methods of qualitative research integrate, among others, techniques such as observing, documenting, analysing, and interpreting characteristics, patterns, attributes, and meanings of human phenomena under study (Gillis & Jackson, 2002; Leininger, 1985). The purpose of qualitative methodology is to describe and understand, rather than to predict and control (Streubert & Carpenter, 1995). Qualitative methods focus on the whole of human experience and the meanings ascribed by individuals living the experience; broader understanding and deeper insight into complex human behaviours thus occurs as a result (Lincoln, 1992; Mason, 2006). Lincoln (1992) argues that qualitative methods are naturalistic, participatory modes of inquiry that disclose the lived experiences of individuals. Consequently, “there is no single, objective reality, there are multiple realities based on subjective experience and circumstance” (Wuest, 1995, p. 30). These are some of the reasons why qualitative data is relevant for this study, because it aims to capture the lived experiences of participants from their own understanding of such experiences. However, based on the philosophical nature of this study informed by stratified reality, I intend to move beyond participants’ interpretations of their immediate experiences (and observations thereof) but to the deeper abstract level, so as to come as close as possible to why participants experience what they do the way they do. CR and SR allow me to do this.

The primary goal of qualitative research is to interpret and document an entire phenomenon from an individual’s viewpoint or frame of reference (Creswell, 1998; Leininger, 1985; Mason, 2006). Greenhalgh and Taylor (1997) contend that researchers who employ qualitative research seek deeper truths while aiming “to study things in their natural setting, attempting to make sense of, or interpret, phenomena in terms of the meanings that people bring to them” (p. 740). Similarly, Gilbert (2001) maintains that qualitative researchers aspire to uncover the world

through another's eyes, in an exploratory process that is deeply experienced. Qualitative features of the individual's feelings, views, and patterns are revealed without control or manipulation from the researcher (Leininger, 1985). Qualitative research reflects the values of subjectivity, individualism, relativism and interpretation (Streubert & Carpenter, 1995). Furthermore, it permits information sharing between the researcher and participants, affording both an opportunity to share and learn. This study discusses PAR, one option for conducting qualitative research and a methodological option for this study. PAR is a qualitative inquiry that is considered democratic, equitable, liberating, and life-enhancing (Koch, Selim & Kralik, 2002; McDonald, 2012), and which remains distinct from other qualitative methodologies, particularly concerning the roles played by the researcher and the participants, which is why students as participants in this study are viewed as co-researchers (Gibson, 2002). The next section discusses PAR as a methodological design for this study.

### **3.7 Participatory action research (PAR)**

PAR is considered a subset of action research, which is the “systematic collection and analysis of data for the purpose of taking action and making change” by generating practical knowledge (Gillis & Jackson, 2002, p. 264). Action research discourse includes myriad terms, such as: participatory action research, participatory research, community-based participatory research, and other forms of inquiry, which may seem ambiguous for novice researchers intending to conduct action research (Greenwood & Levin, 1998; Gibson, Gibson & MacAulay, 2001). Ideally, the purpose of all action research is to impart social change, with a specific action (or actions) as the ultimate goal (Greenwood & Levin, 1998; Koch *et al.* (2002); McNiff & Whitehead, 2006).

In this study, PAR is used and focuses specifically on the experiences of students who have lived and learned in rural areas and at a university, as well as the experiences of lecturers who teach these students. The aims of this qualitative PAR research study have been highlighted in the introductory section of this chapter and are to do with how second year Science students informally acquire science in the rural home context, with a view to understanding how this informal, yet powerful learning might be harnessed to facilitate access to formal, disciplinary knowledge, the structure of which makes access challenging. In particular, these aims are to do with how students gain epistemic access to higher education given their peculiar lived home learning experiences.

The role of Action Research in this study is regarded as “systematic and orientated around generation of transitive data and the generation of interpretations directly tested in the field of action” (Greenwood & Levin, 1998, p.122). Action research involves an action researcher and community or organisation members who are seeking to improve their situation. Therefore, action research is concerned with an agenda for social change that embodies the belief of pooling knowledge from and with study participants to define a problem in order for it to be resolved (Greenwood & Levin, 1998). Yet, ontological commitments that underpin action research encompass action being value-laden and morally committed. Thus, action researchers view themselves in relation to other individuals in their social contexts, while the epistemological assumptions underpinning action research embrace knowledge creation as an active process, knowledge being uncertain and the object of the enquiry being the “I” (McNiff & Whitehead, 2006, p. 26). In this way, as a member of the organisation (a university) my experiences have informed this research, and it is these experiences which allowed me to deeply explore the subjects herein.

The philosophical underpinnings of PAR are congruent with “postmodern tradition that embraces a dialectic of shifting understandings” whereby “objectivity is impossible” and “multiple or shared realities exist” (Kelly, 2005, p. 66). It is for this reason that this study is an attempt to unsettle unquestioned science traditions. Attwood (1997) explains that PAR’s philosophy embodies “the concept that people have a right to determine their own development and recognises the need for local people to participate meaningfully in the process of analysing their own solutions, over which they have (or share, as some would argue) power and control, in order to lead to sustainable development” (p. 2). In this way, students’ voices could play a part in shaping what is taught and how it is taught in the field of science. This experience is embodied within PAR. By using PAR, there may be the formation of public spaces whereby participants and researchers can reshape their knowledge of how political, social, economic, and familial contexts in communities may impact daily life (McIntyre, 2002). In the context of this study, students are expected to be active participants in the construction of knowledge in lecture halls, for example, but the reality is that students from privileged middle-class educated homes get rewarded in higher education for their privilege, since there is a juxtaposition between their primary Discourses and secondary academic Discourses (Boughey & Mckenna, 2015; Boughey, 2012). While I value the relative nature of PAR as it embraces multiple realities, I believe there is an objective world out there that we might not know about which is

responsible for what we eventually experience and observe, and it is this abstract world that this study seeks to uncover.

In research, there are two broad positions, that is, relativist and realist. What CR does is to bring these positions together philosophically by acknowledging that reality is layered, consisting of the “Actual” and “Empirical” realms, which are relativist, and I seek to move from them to the “Real” domain. Most importantly and for the focus of this study, CR is emancipatory and empowering, because it is critical with a potential to engage with social justice issues. Through exploration of the experiences of students, I am going to move towards their empowerment. I acknowledge that scientists would find it difficult to understand the relativist position, but as I have mentioned, the philosophical nature of this study enables me to bring together two positions.

Participatory action research is variously termed as a dynamic educative process, an approach to social investigation, and an approach to address a problem or engage in socio-political action (Gillis & Jackson, 2002; Koch *et al.* 2002; Marshall & Rossman, 2006; McTaggart, 1989; Morris, 2002; Selenger, 1997). According to Stringer (1999), the traditional social sciences are challenged by action research, which seeks full collaboration by all participants, who are often engaging in socio-political changes. By maintaining commitment to local contexts rather than the quest for truth, PAR liberates research from conventional prescriptive methods and seeks to decentralise traditional research (Marshall & Rossman, 2006). Thus, PAR is considered an alternative approach to traditional social or scientific research, as it moves social inquiry from a linear cause and effect perspective to a participatory framework that considers the contexts of people’s lives (Chandler & Torbet, 2003; Kelly, 2005; Young, 2006). Moreover, PAR involves a cyclic process of research, reflection and action (Marshall & Rossman, 2006; Selener, 1997) that “offers a critique of, and challenge to, dominant positivist social science research as the only legitimate and valid source of knowledge” (Maguire, 1987, p. 10). A common framework for PAR encompasses a “cyclical process of fact finding, action, reflection, leading to further inquiry and action for change” (Minker, 2000, p. 191). PAR then offers a radical alternative to knowledge development in its mandate to remain a collective, self-reflective inquiry for the purpose of improving a situation (Koch *et al.*, 2002; Maguire, 1987).

### **3.8 The strength of participatory action research**

Participatory action research recognises and values that people are social beings, within political, economic, and social contexts (McTaggart, 1991; Kemmis & McTaggart, 2000). PAR

“is strongly value orientated, seeking to address issues of significance concerning the flourishing of human persons, their communities, and the wider ecology in which we participate” (Reason & Bradbury, 2002, p. xxii). Consequently, participants are not subjects of research, but rather, active contributors who participate in all phases of the research process (Chandler & Torbet, 2003; Kelly, 2005). In section 3.10 below, it is clearly elaborated how students as co-researchers participated in different phases of data generation in this study. The process of PAR helps rebuild individuals’ capacity “to be creative actors in the world” while being active participants in meaningful decision-making (Maguire, 1987, p. 30). In PAR, collective inquiry builds ownership of information, and therefore, the research process becomes demystified, creating space for trust to be developed (Maguire, 1987; McTaggart, 1991).

The ultimate aim of PAR is the empowerment of oppressed individuals to partner in social change, which encourages capacity development of all who participate (McTaggart, 1997). In the context of this study, co-researchers revealed that some learning experiences from home are not part of formal learning at university. This aspect of data is elaborated on more in Chapter 6 of this dissertation. It is demonstrated through the collaboration of individuals with diverse knowledge, skills, and expertise which foster the sharing of knowledge development. Individuals, during data generation, also learned by doing, specifically by drawing on their life of learning in the home, school or church in rural areas. Activities like these strengthen participants’ belief in their abilities and resources, as well as further develop their skills in collecting, analysing, and utilising information (Maguire, 1987). In this way, participants are not treated as objects of study but contributors to the knowledge being created or sought. As a consequence, the PAR process is potentially empowering, liberating, and consciousness-raising for individuals, as it provides critical understanding and reflection on social issues (Greenwood, Whyte, & Harkavy, 1993; Greenwood & Levin, 1998; McTaggart, 1997). Ideally, it is the community group, in collaboration with the researcher, which determines what the existing social issues are, and which one(s) they want to eliminate or change (Maguire, 1987). There are, however, noticeable challenges with PAR and these are addressed below.

### **3.9 The challenges of participatory action research**

Although PAR has a number of strengths, it also presents a number of challenges for the researcher and the participants. The first challenge relates to the diversity in meanings of PAR, and the interchangeable use of terms such as “action research,” “PAR,” and “participatory

research”. This may be confusing to novice researchers and others first learning this type of research approach. Greenwood and Levin (1998) state that “there is generally lack of access to a sufficiently comprehensive and balanced way to learn about the diverse origins, theories, methods, motives, and problems associated with this complex field” (p. 5).

PAR can also be challenging due to its inclusion of community members in the research team, who may struggle to maintain their commitment to the research project over time (Gillis & Jackson, 2002). PAR requires time, knowledge of the community, and sensitivity on the part of the researcher to participants’ agendas (Gillis & Jackson, 2002; Young, 2006). Moreover, there may be a divergence of perspectives, values, and abilities among community members, or lack of consensus on what social issues require attention. The timeframe anticipated for the change might thus be difficult (Gillis & Jackson, 2002; McNiff & Whitehead, 2006). In this study, as highlighted in section 3.10 below, in our first meeting with participants, there were a number of issues which we discussed and agreed upon before data generation began. For example, we defined our understanding of rurality and its relevance to this study. Furthermore, topics to cover in each session were elaborated on first, before the actual session for data generation. In that way, we knew beforehand of issues for discussion. Most importantly, we emphasised the social justice aspect which the study is designed to address, as well as the role they could play in democratising knowledge generation and dissemination. This last point seems to have addressed to a large degree the challenges accompanying the use of PAR.

This shows the importance of addressing issues of power imbalances and the establishment of egalitarian relationships prior to initiating PAR research (Gillis & Jackson; Maguire, 1987). This is because there may be misunderstandings regarding the participants’ perceptions and the social issues to be addressed, as well as conflict about the interpretations and analysis of the research (Wadsworth, 1998). Wadsworth (1998) notes that there can be uncertainty or a lack of agreement regarding the direction and overall purpose of the inquiry, which can lead to the wrong questions being asked, or the wrong direction taken, resulting in irrelevant data. These issues were subjected to the philosophical foundations of this study so that ontological questions were not confused with epistemological questions, since epistemology was assumed to be secondary to ontology in this study. It is through CR and SR that the potential challenge of asking the wrong questions and thus getting the wrong answers was dealt with. Issues of power imbalances are discussed in section 3.11 below, in ethical considerations.

According to Gillis & Jackson (2002), all members of the research team must be sensitive and responsive to the different forms of leadership required at different times in the research project. For instance, it may be necessary for the researcher to lead in the area of data analysis, whereas community members may be required to lead in implementing strategies for improving the identified social issue. Participants must be informed that PAR is time-consuming and requires the commitment of the research team. Education is required for all to participate, and time must be allotted to enable full community participation, for the cyclical process to proceed as intended (Gillis & Jackson, 2002). Furthermore, the researcher must gain access to the community of interest, which may present a challenge, especially if the researcher is not familiar with the community or from a different cultural background. In the case of this study, for example, I am a researcher conducting PAR for the first time in a Historically White University (HWU), about rurality issues which are mostly experienced by black students in South Africa.

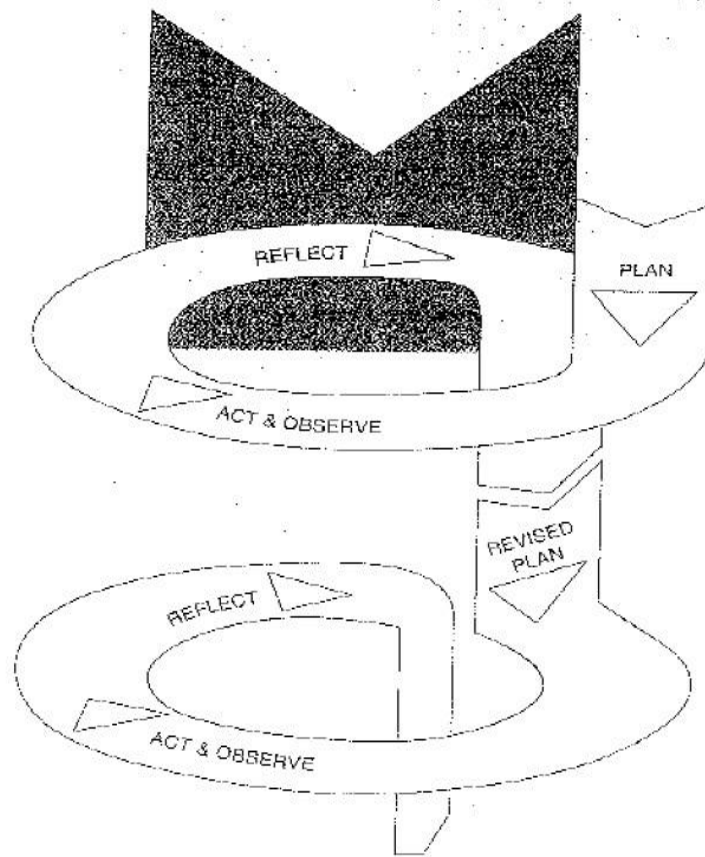
Because of employing the PAR methodology, researchers may have to prove legitimacy to other, more conventional, researchers who are unused to working with open-ended research designs. One of the most frequent criticisms of PAR is that, from a scientific perspective, it is a “soft” method of research (Young, 2006), therefore, those employing a PAR methodology may be challenged by other researchers not familiar with PAR to legitimise their research, as “PAR focuses on voice and everyday experiences” (p. 501) and not hard data, as is normally the case in the sciences. I have already discussed how the philosophical foundations of this study allow for the relative realm of everyday experience and the objective world of science. The next section discusses how transitive data was generated through PAR.

### **3.10 Data generation instruments/methods**

PAR design is generally thought to involve a spiral of self-reflective cycles of the following:

Planning a change; Acting and Observing the process and consequences of the change; Reflecting on these processes and consequences; Replanning; Acting and Observing again and; Reflecting again, and so on (Kemmis & McTaggart, 2000, p. 563).

Figure 4 below represents the spiral of self-reflection in a diagrammatic form. It must be noted that in reality, however, the process might not be as neat as this spiral of self-contained cycles implies. Nevertheless, the spiral of action research is repeated for as long as it is necessary.



**Figure 4:** The Action Research Spiral, adapted from Kemmis and McTaggart (2000).

For the purpose of this study, PAR was implemented in one cycle which involved three steps of *planning*, *acting*, as well as *reflecting*, slightly different from the one demonstrated in Figure 1 above (Kemmis & McTaggart, 2000). In this study, the *Acting Phase* involved six sessions or stages. Kemmis and McTaggart (2000) mention that the spiral steps of action research are not fixed but can be adopted to fit with the context where the research is undertaken. What follows is a schematic representation of the approach, instruments and data generation in this study (Table 5). Such a representation aims to provide an overview of the different phases or stages of action research, as well as various data generation methods deployed in each phase. In each phase, there was a reflection on what transpired in the previous phase, so that the phase was either re-done or improved upon.

**Table 5:** Schematic representation of approach, instruments, data generation of the study.

PHASE	AIM OF PHASE	SAMPLE	RESEARCH INSTRUMENTS/ METHODS
<p><b>PLANNING (and reflection)</b></p> <p>Information gathering phase</p>	<p>Familiarizing and introducing the participants to the aims of the study and then establishing their understanding of “rurality” based on their experiences of living and learning in rural areas, teaching in the Science Faculty and to answer 1<sup>st</sup> and 3<sup>rd</sup> sub-question:</p> <p>1. What practices shape the learning habits of second year science from rural backgrounds at a South African University?</p> <p>3. How do academics who teach second year science students understand the knowledge resources that students from rural areas bring to their classrooms?</p>	<p>12 students</p> <p>3 academic teachers</p>	<p>Focus groups discussions (co-researchers)</p> <p>Focus group interviews (academic teachers)</p>
<p><b>ACTING PHASE (and reflection)</b></p> <p>Employing PAR/PLA (co-researchers)</p> <p>PLA not administered to academic teachers and senior leaders.</p>	<p>To answer the research sub-questions:</p> <p>1. What practices shape the learning habits of second year science students from rural backgrounds at a South African University?</p> <p>2. What knowledge, cultural and technological resources do second year science students from rural backgrounds bring to negotiate epistemological access in the sciences?</p>	<p>12 students</p>	<p>Focus groups (co-researchers, academic teachers and senior leaders)</p> <p>Participatory Learning and Action Techniques (PLA) (co-researchers)</p> <p>Digital recorders (co-researchers and academic teachers)</p> <p>IPads (co-</p>
<p><b>REFLECTIONS</b></p> <p>Making sense of the enabling and constraining factors that influence teaching and learning of second year science students from rural backgrounds at a South African University.</p>	<p>Were the objectives of the study achieved, and research questions rigorously answered?</p>	<p>12 students</p> <p>3 academic teachers</p> <p>2 senior leaders</p>	<p>Reflect on whether the research questions were rigorously answered using the above-mentioned instruments and methods.</p>

Data generation began with the *Planning Phase* (information gathering phase) in Phase One, where information about study participants (students’ co-researchers) and academic teachers was gathered (Figure 4 and Table 5). During this phase, an invitation to take part in this study was issued to the Faculty of Science to assist in identifying second year students who come from rural areas. More concretely, volunteers were initially identified with the help of the

faculty of science administrator, and those students who self-identified as coming from rural backgrounds. These students were then asked to complete a short questionnaire, on the 22<sup>nd</sup> of February 2017, based on the sampling criteria and more detailed questions on their home address, school attended and context to determine criteria fit for the sample (see Table 5).

Students who met the criteria were then invited to take part in the study. These students were then invited to a meeting, using a matrix to achieve a balance of race/ethnicity, gender, geographical origin, country of birth and first generation at university. An equal number of males and females comprised the overall sample, since gender might well prove to be a telling factor in understanding exposure to science, both at school level and at university level. Lecturers who teach these students were also invited to take part in the study.

On 25 March 2017, Phase two (Session One), *Acting* stage, was coordinated with a welcoming event for students who met the sampling criteria. In this event, introductions were carried out between myself and students. Furthermore, the presentation of the study was made, where among other things, students were informed that the data generation was going to be conducted in a number of phases of one cycle of PAR, and that each phase would be structured around certain topics. In relation to this point, Gillis and Jackson (2002) note that even though the topic of discussion is left up to the focus group, which of course was not the case in this study, “the facilitator typically provides some structure” (p. 235). During this phase, consent forms for student co-researchers were provided, discussed, signed and collected. Ethics regarding the study were also discussed. These are further elaborated on in section 3.11 of this chapter. Collectively, we drafted “rules of engagement” including issues of confidentiality, managing disagreement, helping each other, how we would build the community and how we would communicate. The meaning of “rurality” was also discussed. We used drums or clapping exercises wherein each person in defining their understanding of rurality began with “Rural means...” This activity was audio recorded using high-quality digital recorders, one per group of 4 students making up the sample of 12 students. They were also used for the plenary sessions with large groups to ensure good quality recordings.

Focus groups were conducted during this phase regarding participants’ understanding of the concept of rurality and practices that shape their learning habits, as well as the sense that they make of learning at home and learning at university. According to Kitzinger (1995), a focus group is a “form of group interview that capitalises on communication between the research participants in order to generate data” (p. 299), hence they are socially orientated. In the focus

group, research participants must share certain characteristics relevant to the focus of the study. In this study, research participants have lived and learned in rural areas. Since focus groups generally consist of seven to twelve participants (Marshall & Rossman, 2006), optimal communication among participants is facilitated and this increases the potential for useful data to be generated. This method of gathering data allows for students' voices and understandings of their own experiences to emerge. As a researcher, I had to create a supportive environment in which discussion and differing points of view were encouraged (Marshall & Rossman, 2006). That is why students were given an opportunity to define their understanding of rurality.

Ideally, in PAR, all participants' viewpoints are recognised and valued, as all participants have an opportunity to communicate (McTaggart, 1991). The focus group was therefore one of the useful qualitative approaches used to ascertain students' experiences. In addition to focus group interviews, the biographical information of participants was also obtained, which elicited ideas and beliefs that are formed in contexts (Townsend & Weiner, 2011) such as rural homes.

This phase (April – May 2018) also included the selection of three academic teachers who have an interest in teaching and learning. Again, an invitation was sent through the Faculty of Science administrator. The purpose and the nature of the study was included in this invitation. Teachers were asked to share their understanding of “rurality” and the impact this might have on their teaching. They were also asked to share their understanding of the knowledge resources that students bring from rural areas to their classrooms. Focus group interviews were also a method that was used with teachers and senior leaders to ascertain their understanding of “rurality” and how this affected [their] teaching based on the primary Discourses of co-researchers. These interviews also explored how the institution manages disciplinary access and support of underrepresented groups of students around issues of inclusivity and diversity within the curriculum and pedagogic practices. The purpose was to answer sub-question 3: *How do academics who teach second year science students understand the knowledge resources that students from rural areas bring to their classrooms?*

On 1 April 2017, we met with students for another Phase Two (Session Two), *Acting stage*, of data generation. The topic for this session was *Learning in rural areas – Part One*. Participatory Learning and Action (PLA) activity was engaged in, whereby co-researchers depicted “Mapping my rural learning world”. Instructions for this activity included informing co-researchers to set out the different places of learning, places that influenced their learning, and show these places in relation to each other. Co-researchers were told to use icons or symbols to

show them as resources, challenges, absences, etc. They were given an A3 sheet of paper and drawing pens with different colours for this activity. To draw their learning world, students were advised not to use light colours, especially yellow, because this could be a problem for later use. In groups of four, they discussed their drawings (these discussions were recorded). Then there were plenary debriefings in a large group (recorded). This purpose was to partly answer sub-question 1: *What practices shape the learning habits of second year science students from rural backgrounds at a South African University?*

After the discussions, co-researchers photographed their drawings. They were then asked to write a short biography: who you are, what you like doing, what you are studying, where you are from. This information was recorded on iPads via the Evernote application. Biographical data served the following purposes in this study: 1) to gain support for the research; 2) to explore views on rurality from a cross-section of participants; 3) to give students practice using Evernote, as such information helped me as a researcher to place a student in context. After the students drew and discussed their learning experiences in a rural area, information for the next session was given about what we would be doing in session three of the *Acting Phase*, and participants were encouraged to think about it in advance.

On 2 May 2017, we met for the third time with co-researchers for Phase Two (Session Three), *Acting Phase* of data generation, with a focus on *Learning in rural areas – Part Two: Critical Incidents and Story-Telling*. In this session, co-researchers were given time to select one critical incident from learning in rural areas in diverse settings (for example, family, school, church, traditional cultural activities, using technology) and to compose this into a story, including an explanation of why they chose it. It was clarified that the story could only illustrate one aspect of learning in a rural area, so it was important for co-researchers to choose it well. The story to be told should last no more than ten minutes. In groups of four, co-researchers narrated their stories. After the stories had been told, co-researchers had to comment on each other's stories, indicate what was interesting, what was different, what was common. After discussing in small groups, debriefing in a large group was facilitated. The stories and ensuing discussion were audio taped. The purpose of this session was to answer sub-question 1 (*What practices shape the learning habits of second year science students from rural backgrounds at a South African University?*) and sub-question 2 (*What knowledge, cultural and technological resources do second year science students from rural backgrounds bring to negotiate epistemological access in the sciences?*) and also to start collecting for students' eventual digital documentaries. Then, instructions for the next session were given. This involved informing co-researchers to capture

three to six items to upload onto Evernote, specifically on learning at university. They were also asked to think about one of these, or an actual physical object, if they chose to, that they could use for discussion at the next session.

The fourth meeting took place on 22 July 2017, the fourth Session of the *Acting Phase*. The focus topic for this session was transition to higher education. Co-researchers drew on iPads a lifeline or “river of life”, depicting their educational trajectories, including growing up, school and university. They were initially given A3-size papers and felt-tip pens to draw with. They were asked to consider strengths/supports, hurdles/challenges, and how they navigated the transition. In groups of four, they discussed their drawings (which were recorded). They were then given a chance to engage in debriefing (which was also recorded). Drawings were photographed. Photographs and recordings were then saved on Evernote. The purpose of session four activities was to partly answer sub-question 1 and 2. After these activities, instructions for the next activity were given. Co-researchers were asked to capture three to six items to upload onto Evernote specifically on learning at university. They were also asked to think about one of these or an actual physical object, if they chose to, that they could use for discussion at the next session.

The fifth meeting was scheduled to take place on 12 August 2017. The focus of this activity was on *Learning at university* with the purpose of answering sub-question 1 and sub-question 2, also mentioned above. During this activity, co-researchers shared one item they had collected on Evernote in groups of four, discussing what these activities meant to them, with the following prompts:

- How is this typical of your experience of university teaching and learning?
- How might it be similar to or different from learning before university?
- What special steps has this required of you, if any?

After this activity, there were plenary report-backs and debriefing (which were recorded). Photographs and recordings were saved on Evernote. Instructions for next session were then given, wherein students were asked, among other things, to produce three to six items (text, screenshots, audio clips, photos and captions) on the following more specific issues (with the purpose of answering sub-questions 1, 2 and 3):

a) Digital technologies - how have these helped or hindered your transition from home to university?

b) Connection to home - how have you sustained your connection to home, if you have, and what has helped? Has your connection to home been important to you, and why or how? What kinds of connections or conversations or communications have been important, and with whom?

The sixth session took place on 30 September August 2017. The focus of this session was on *Learning and Value(s)* with the purpose of answering sub-questions 1 and 2. In groups of 4, co-researchers were asked to discuss the following questions:

- What is valued in rural areas?
- What is valued in university?
- What is valuable to you now? (in either)

After 15/20 minutes of these discussions, the big group discussed how this resonates with them. Again, after 15/20 minutes, the original groups were asked to share what has been valuable for them in witnessing the team's conversation. Co-researchers were then asked to record or write an item on Evernote to discuss how they have experienced the session and if they had learnt from it. The recording of the whole session was then uploaded and saved on Evernote. Instructions for the next session were then given. Such instructions involved asking co-researchers to prepare for making the five-minute documentary. Co-researchers received training before preparing documentaries and were supported technically in relation to producing good documentaries. A YouTube tutorial was arranged wherein examples of good personal or digital documentaries were shown. In this session, there were discussions held on ethical issues regarding photos.

The last and seventh session with co-researchers in Phase 2, *Acting phase*, was scheduled for 28 October 2017. The focus of this session was on *Sharing documentaries*. Co-researchers shared their documentaries with the whole group. Some initial findings or thoughts about the digital stories and the research more broadly were shared (where research questions were also highlighted); co-researchers were also asked how they had experienced the research process, what had been valuable, what had been challenging. Such discussions were recorded. Co-researchers' consent was once again obtained in this session, with items to agree to, and it was noted that certain criteria had to be met before documentaries could be uploaded to the internet. Co-researchers were also reminded that they could ask for references. The session was then closed. Co-Researchers were thanked and certificates of participation were handed out, which

were endorsed by the university. It was also agreed that we would share ways in which students could stay involved, for example, blog posts.

Student recordings of the small group discussions were uploaded to Evernote. The plenary discussions were recorded on the digital recorders. All data was then transcribed and labelled accordingly, for example: Focus group discussion, NX, 4 February 2017.

Given the above deliberations, it becomes clear that Phase Two, *Acting Phase*, was geared toward stimulating participants' thinking about the influence of rurality, the challenges and the strengths that this brings to their academic success. This phase, through all its sessions, captured students' accounts of their past and current practices via visual techniques such as Participatory Learning Action (PLA), which is characterised by the use of drawing and sharing thereof in a group (Nykiforuk, Vallianatos & Nieuwendyk, 2011). PLA has been described as a "decolonising" mode by Bozalek (2011) and Leibowitz *et al.* (2019). It has the advantage of reducing students' reliance on writing and language, especially when the dominant language and language in which they might communicate is a second language. Bozalek (2011) demonstrates how these techniques allow for powerful, literal and metaphorical associations of place and practice to emerge. The technique of drawing is favoured, as it elicits spontaneous and easy formulations for students in a manner that catalyses further discussion. This approach was used to great success in a project wherein PLA techniques such as drawing one's community or a "river of life" was used with university students (Leibowitz *et al.*, 2012). Green and Reid (2014) refer to drawings that focus on place and relationships for educational research as "educational cartography", which they maintain is increasingly used in "literacy, environmental, indigenous and rural education" (Green & Reid, 2014, p. 33). This approach is particularly exciting, as maps allow for both focus on the moment and on "mobility", "multiplicity", "mutability" and "complexity" (Green & Reid, 2014, p. 30), which are important aspects of the experience of rurality for many South African students.

At the beginning of Phase Two, students were trained in the use of techniques to create digital documentaries. An iPad was seen as more flexible than a camera, and it rewarded students in a meaningful way for their participation in the study. An iPad also allowed students to upload their documentaries for sharing with other participants for data generation. This method of using an iPad and an application such as Evernote made the process of recording discussions easy and interesting for students. They could capture data as they went about their studies and in informal settings. It also ensured that students were committed to the research process and

that they benefited from the research as they explored their own practices and detailed everyday experiences of learning and studying. Students worked on the production of stories together.

The third phase of the first cycle of this research was on *Reflecting*, where I as a researcher, together with the study participants, reflected on whether the research questions were rigorously answered using the above-mentioned tools. It should be noted, however, that reflections were taking place throughout the study. This phase was also used as a form of member checking and to report back to those interviewed. During member checking, co-researchers participated in preliminary data analysis workshops held in April 2018. These discussions included discussions on findings and presentations. As a result of these discussions, co-researchers initiated and wrote a publication aimed at school students in the rural areas from which they come, called [Going to university: stories from rural students](http://sarihe.org.za/going-to-university/) (see <http://sarihe.org.za/going-to-university/>). The publication has now been translated into the 11 official languages. The official launch of the publication was held on 7 March 2019, at University of Johannesburg. There has already been a wide distribution of the publication into rural communities through the co-researchers, through university networks and contacts in basic education and rural development. Student co-researchers have also been involved in the provision of the blog posts on the SARIHE website and been involved in media broadcasts about the booklets. Academic teachers and senior leaders were given opportunities to ask questions and to review the scripts once transcribed. This approach is seen as ethical and encouraging of sustainability and trustworthiness, or catalytic validity (Lather, 1986). The final purpose of the report-back discussions to study participants and lecturers was to collectively consider strategies to make the curriculum more inclusive. This phase therefore had to do with some aspect of data analysis.

### **3.11 Data analysis**

Earlier in this chapter, I indicated that PAR is used to gather data that is already available to our senses. But to dig deeper and come as close as possible to an understanding of why co-researchers experience what they experience, as well as teachers' observations of such experiences, a theoretical lens was needed. This is the reason why data generated in the ways suggested in section 3.10 above had to be subjected to the application of Archer's morphogenesis/stasis framework. This framework provides a pathway for researchers to investigate the mechanisms that are responsible for the emergence of an investigated phenomenon, the establishment of the conditions shaping the investigated social environment. Consequently, prior to actual data analysis, the historical and political conditions responsible for shaping what and how co-researchers think, act and understand, as well as how academic

teachers think, act and understand, were identified. Before they came to university, co-researchers were socially and culturally conditioned to think, act and understand in certain ways. Also, the historical conditions responsible for shaping the South African Higher Education (SAHE) environment had to be identified. These are presented in Chapter 4.

In the context of higher education, Archer's morphogenesis/stasis framework would thus allow us to understand how working-class students from rural areas interact with the learning required of them at university level, given their previous conditioning. It would also allow us to see how efforts to enhance teaching and learning, such as drawing on students' home-based knowledge practices, can result in change or non-change. The theoretical lenses of critical realism and social realism thus have the potential to allow for more sophisticated understandings of the need for prior experience to be welcomed in the university classroom.

It is important to note that the structural and cultural "parts" conditioning circumstances were shaped by agents from a historical period, and current agents are involuntarily presented with those conditioning factors shaping their thinking, action and understanding. As pointed out in chapter 2 of this dissertation, at T<sub>1</sub>, co-researchers had no immediate power to change their conditions or contexts or the institutional culture embodied in language, technologies, pedagogies and relationships between staff and students, nor the influence these could have on students' sense of belonging and their academic progress and trajectories. It is at T<sub>2</sub>-T<sub>3</sub> where co-researchers exercised their reflective powers to pursue their interests, as they worked around the cultures and structures at a university which might be either constraining or enabling. The curriculum strategies resulting from educational policy in South Africa (SA) and the perceived interplay between "rurality" and education, as well as coloniality as a condition, were used to analyse the structuring conditions at T<sub>1</sub> leading to what emerged at T<sub>2</sub>-T<sub>3</sub>. This means that academic teachers were also part of the environment which preceded them at T<sub>1</sub>, and so when they delivered the curriculum at T<sub>2</sub>-T<sub>3</sub>, they did this having been conditioned by the institutional culture embodied in curriculum, the language and technologies of the university.

In chapter 4 of this dissertation I review the literature on HE in SA. This literature concerns itself with the discourse of the decontextualized, common sense understanding of teaching and learning (Boughey & McKenna, in press; Boughey, 2012a; Boughey, 2013). It is also concerned with the critique of the obstinacy of "coloniality" in African Universities or Universities in Africa and the research site is the university in the southern part of Africa. This literature allowed me to outline the core conditions into which working class students in general and

those from rural areas in particular, enrolled at university, interact with the learning that is required of them given their previous conditioning.

In engaging with what constitutes enablement, it was important to consider how literature critiques activities that are less likely to enhance teaching and learning in general and science in particular (Boughey, 2012a; Boughey & Mckenna, in press; Ellery, 2016; Gee, 2008; 1990; Luckett, 2016; Mamdani, 2018; Mqgwashu, 2018; Street, 1984). Therefore, interventions, activities and events in the Science Faculty that have the potential for better educational outcomes, even for students who come from rural areas, had to be identified, as well as those activities which could be considered constraining.

Activities which could be considered constraining could constitute an environment with structural and cultural factors that lead to the emergence of events (in the “Actual” domain) and add little or no value to the enhancement of teaching and learning. As a consequence, in a constrained environment, the beliefs and world views embodying how and what students have learned at home might clash with how and what they are learning at university. For this reason, it was necessary to seek the kind of data that draws on co-researchers’ experiences before joining the university. The clash may negatively impact on students’ sense of being, as well as their attitudes towards knowledge and coming to know in the sciences. How students might have been structurally and culturally conditioned at home may be legitimated in academic environments, or may act as hindrances to success (Boughey, 2018). It is possible to understand this because when students from middle-class educated homes enter university, they enter a space that they have been prepared for; the kinds of people that they would be required to be as students are not too different from the people they had been at home (Boughey, 2018; Heath, 1983). On the contrary, for the majority of black students (of which a large number come from working class and possibly rural backgrounds) such preparations might not have taken place, and therefore a university space is likely to be alienating (Boughey, 2018).

According to Archer (1995), identifying conditioning factors at  $T_1$  is crucial. It is these factors that conditioned whether the structure and enactment of science curriculum environment was constrained or enabled, taking into consideration how co-researchers have been socialised from home and how this resonates with the learning required of them at university in the field of science. These factors influence whether or not students are able to draw from home literacies with scientific underpinnings when teaching and learning take place. Archer (1995) explains that the parts are generally enduring, until agents exercise their own powers (collectively). The

human will and capability exercised through reflexivity (PEP) to activate the CEPs and SEPs of the parts are crucial for agents to exercise their powers. When agents exercise their powers, they would either reconfigure or protect a given environment in line with their interest, projects or goals. In this conditioning, agents will draw on these “parts” to pursue a project which will allow for the attainment of goals. In the case of students in higher education, they would draw on Discourses about what constitutes knowledge and appropriate ways of learning, as well as structures such as the location of their home and social class of their family, in order to generate events that would lead to the attainment of their goal, a qualification. Students from working class rural backgrounds could thus be expected to draw on very different mechanisms to those from middle-class, educated urban homes.

After determining  $T_1$ , including the fundamental conditions at play before the co-researchers joined the university and when they enrolled at university in the field of science, the analysis moved on to the  $T_2$ - $T_3$  period, where the experiences of students regarding the enacted science curriculum, values from home to university, home influence on university learning, clash or interaction between primary and secondary academic Discourse, are analysed. As far as SR, the basis of scientific enquiry should be on an understanding of social relations and agential interactions with cultures and structures in a given social environment.

Based on the MM framework, the point of departure for my enquiry necessitated the identification of structural and cultural factors that conditioned students before joining the university captured through PAR. Then, I had to observe what was presented in the curriculum review documents, from which what was experienced by agents could be drawn, as well as the activities and practices of academic teachers and senior leaders. The purpose of this process was to establish a broad understanding of how co-researchers’ experiences of the science curriculum and HE had emerged and how academic teachers have observed and responded to such experiences.

Using Nvivo to code data, it was then possible to classify and allocate descriptions to conceptions and constructs that are overtly present in data (Rudestam & Newton, 2015). The idea behind the process was determining whether the identified data was showing specific themes/nodes or patterns which could be related to the problem statement, without necessarily imposing framing theory on data at this initial stage. Data was then coded into nodes that were emerging, presented in Table 6 below (Maton & Chen, 2015).

**Table 6:** Emerging nodes.

Emerging Nodes	Description of Nodes
Values	Some of the values emerging from data include, but are not limited to, hard work, adapting to different contexts (rural environment to urban university environment), collaboration, Ubuntu, respect, ancestral beliefs and so on.
Practices	Some practices which emerge from data include, but are not limited to, sharing; group-work; cultural/social practices like respect, taking decisive decisions, independent and to face life challenges; perseverance; learning about the unpredictability of life/time; herding cattle and goats in the bush; preparing “Umqombothi” (African beer).
Space and place	This node demonstrated “a socially and culturally constructed realm of interpretation in which particular characters and actors are recognised, significance is assigned to certain acts, and particular outcomes are valued over others” (Holland <i>et al.</i> , 1998, p. 52). Through this node the experiences of students from rural areas were identified as predominantly absent in knowledge construction in HE.
Identities	Identity is said to be politically informed, thanks to apartheid, and because of the materiality of space, students from rural areas are the most marginalised, having been cut off from mainstream life.
Rurality	It was clear that the concept of rurality is a complex one to define, but Robert and Green’s (2013) conceptualisation of it as demographic, geographic and contextual fits well within the context of the study. This is so because this conceptualisation provides opportunities to talk about space as a political phenomenon, especially in the context of South Africa, where indigenous people were displaced and cut off from mainstream life. This displacement had a negative effect on the home fabric in rural areas.
Decoloniality/ coloniality	Coloniality, for this research, is understood to be a condition of thinking or mentality that views anything which is not white/Euro-American as inferior. Decoloniality therefore is an attempt to unmask the coloniality disguised in books, social institutions like churches, the home, universities, language and so on.
Curriculum/ teaching and learning	Data emerging from curriculum is tandem to data emerging from the theme of place and space, in that both demonstrate that as much as students have knowledge but university structures like curriculum do not always acknowledge the knowledge or the knowledge resources that students bring with them from home.

There is the likelihood that relying on empirical evidence in order to answer research questions could be faulty, given our human biases, interpretation and thought processes, which undermine our capacity to comprehend reality (Bhaskar, 2008; Danermark *et al.*, 2002). The strength of critical realism, in dealing with the challenge mentioned above, is to enable scientific enquiry to distinguish ontology from epistemology and to separate structure, culture and agency for the purposes of data analysis. In this way ontology is made primary to epistemology because our

knowledge of the world and the world itself are not necessarily the same. According to Hedlund-de Witt (2012), this is because what we know (epistemology) about the world cannot simply be reduced to our conception of it.

It is due to the above-mentioned flawed nature of our human biases that I had to be careful of “epistemic fallacy” by not answering ontological questions with epistemological questions. The adopted theoretical framework in this study necessitated that I use a layered depth ontology approach in answering my research questions. Furthermore, data extracted through PAR design is in the “Empirical” domain (what is experienced). There is, however, an abstract (intransitive) world that is accountable for the way that data has been presented or emerged from co-researchers’ interpretations of their experiences, both of the home and of the enacted science curriculum, as well as teachers’ observations thereof (Empirical and Actual domains). The underlying philosophy of CR necessitated that I go beyond the “Empirical” and the “Actual” domains to excavate the “Real” domain, in order to unearth the generative mechanisms at work (the intransitive). It was therefore necessary to use both the transitive (data from PAR design) and the intransitive (CR/SR) in answering the research question(s) of my enquiry. In order to access the intransitive domain, to which I did not have direct access, Archer’s (1995, 1996) analytical and explanatory tools were used, helping me understand the mechanisms at work in the “Real” domain.

It was then possible to use a more formal theoretical lens in the second phase of data analysis. Through this theoretical lens, I was able to align the nodes to the analytical framework. These are presented in Table 7 below.

**Table 7:** Alignment of nodes to theory.

Name of node	Descriptions of nodes
Structure	Descriptions of structures by way of CR theory
Culture	Descriptions of values and beliefs
Agency	Descriptions of actions or decisions by agents
Primary agents	Agents whose actions create collective outcomes in an establishment
Corporate agents	Agents with emergent powers to reconstruct an establishment within which primary agents operate
Constraining factors	Factors identified as challenges for epistemic access in the sciences for better educational outcomes.
Enabling factors	Factors that enabled epistemic access in the sciences involving teaching and learning activities as well as assessment strategies embedded in curriculum.

The alignment of these nodes was arranged in line with the research question(s), as well as the theoretical concepts of CR and SR that framed the study. Following Bhaskar (1995, 1996, 2008) and Archer (1995, 1996), Table 8 below graphically represents the manner through which the “Real” domain, was accessed.

**Table 8:** Significance of CR and SR analytical framework, adapted from Hedlund-de Witt (2012).

Empirical (Experiences and observations)	Experiences of students from rural areas in science classrooms. Academic teachers’ as well as senior leaders’ observations of those experiences. Accounts of everyday practices from rural homes, focus group interviews and discussions.	
Actual (Events)	Home literacy practices or primary Discourses; HE literacy practices or academic secondary Discourses; students from rural areas drawing on literacy practices different from middle-class educated families.	
Real (Relatively unchanging generative structures and mechanisms) The interplay of these structures and mechanisms leads to the emergence of the events in the “Actual” domain. These structures constitute generative mechanisms that can be actualised by agents or can remain dormant. Archer’s theoretical lens allowed me to investigate the SEPs, CEPs and PEPs leading to the events at the level of the “Actual” and experiences at the level of the “Empirical”. These may involve social class; education system (curriculum); location; Discourses; beliefs, values and practices; Academic teachers, senior leaders and students (co-researchers).		
Structural Emergent Properties	Cultural Emergent Properties	Agential Emergent Properties

The means by which the causal mechanisms are unearthed comprised answering the question: what must the world be like in the “Real” domain for the phenomena in the “Actual” and “Empirical” realms to emerge and be experienced in the way that they are? To answer this question, retrodution was used, a process which involves moving empirical data, from for example, a description of experiences provided by a student, to subjecting a description of these experiences to the tenets of CR and SR. As a result, using Bhaskar’s (1995, 1996, 2008) work as a suitable methodology for unearthing new knowledge of the observed phenomenon, I was able to confidently arrive at possible mechanisms in contrast to “superficial” methodologies that are only concerned with predictions and generalizations, which are constructionist in nature (Bhaskar, 2008; Danermark *et al.*, 2002; Hoddy, 2019).

The teaching and learning environment in science classrooms was enabled or constrained by the identified conditioning factors, which were also responsible for influencing how agents acted to teach in ways that acknowledge the prior learning of students from rural areas (or the social aspect of learning).

Digging deeper in the “Real” domain in order to generate explanations of the interplay of the mechanisms required me to employ tools provided by Archer’s (1995, 1996) SR. Reason being that Bhaskar’s (1995, 1996, 2008) CR theory does not provide comprehensive methodological tools with which to navigate the “Real” domain. It is through Archer’s (1995, 1996) morphogenesis/stasis framework that I was able to access the intransitive world. Furthermore, analytical dualism allowed me to separately identify the possible generative mechanisms, as a result of their interplay, could have been influential in enabling or constraining the genuine epistemic access in the sciences in ways that recognizes the social aspect of learning. It was possible, through this process, to recognize and explain how certain phenomena were elaborated or reproduced as a result of either structure, culture or agency.

It should be noted that during the initial stage of data analysis, the identification of the interplay of structures and mechanisms was likely to be shallow and muddled. It was through the MM framework that this interplay had to be abstracted systematically, through abduction and retrodution (Boughey & Mckenna, in press; Rudestan & Newton, 2015) so that the objects’ (“parts” and “people”) emergent properties could be known. This process provided explanations of the contribution of each entity to what emerged in what was experienced by co-researchers at home, in the community and in science classrooms, as well as curriculum review processes in the Faculty of Science at Nxakanxaka University.

In methodically answering the research question(s) of my study, not only did I identify the factors that conditioned the experiences of students who come from rural areas in the field of Science at the research site, as well as teachers' observations thereof, but I also probed the manner in which these factors shaped the interactions of agents with cultures and structures, both from students' home environments and within science classrooms. This meant that I had to examine how these factors developed in shaping students' literacy practices and their theoretical persuasions in designing their modules the way they did. In this way, it was possible to establish whether agents reproduced or elaborated these factors or the environment of teaching and learning in Science classrooms. All of this took place at T<sub>2</sub>-T<sub>3</sub>, the analytical period of the study. A detailed analysis of this period is deliberated on in Chapter 6 and Chapter 7 of this study.

### **3.12 Reliability and validity: quality indicators in the research process**

It is essential that the researcher situated in qualitative research is aware of his or her biases, so they do not find what they expect to find. Researchers should also be conscious that people might lie and reveal only the information they think researchers want to hear. In some cases, the mere presence of the researcher might cause participants to behave in ways different from their normal behaviour and then contaminate the data (Mgqwashu, 2015). It is the responsibility of the researcher to ensure that data sources are trustworthy for findings to make a significant contribution. Given the nature of the study and its critical stance, construct validity (Cohen, Manion & Morrison, 2007) was relevant in terms of the political nature of data sourced through the research questions.

The philosophical foundations of this study and its theoretical framework enabled me to pay careful attention to the nature of concepts being researched, for example, structure, culture and agency, and not to conflate these into a "conceptual vice" (Archer, 1996; Mgqwashu, n.d.). These concepts reflected the ways in which the participants actually experienced and interpreted their circumstances, while the use of various methods of sourcing data, such as focus group discussions, documentaries and drawings demonstrated a "relatively high inter-correlation" among these sources of data (Chen *et al.*, 2007, p. 138). Data was not just analysed from the transitive realm but generative mechanisms were explored. This was done through critical orientation to research and this enabled me as a researcher to explain why there were tensions and/or interactions between rural home literacies and university based literacies.

During discussions, participants realized the constructed nature of their rural setting and were thus energized to better transform their circumstances and catalytic validity was relevant in this regard (Lather, 1986). Ethical issues form a great part of ensuring the reliability and validity of findings. More so, a member check was conducted with participants for the appropriateness of findings.

### **3.13 Ethical considerations**

The ways in which students were selected as study participants were vulnerable to “deficit” discourse, which has already been discussed in Chapter 1 of this dissertation; this had the potential to open them to “othering” (Gristy, 2014). In order to manage this sensitivity, careful sensitization of myself as a researcher, alongside the research approach adopted, pre-empted this by informing the participants of the potential benefits of the study, as well as treating them as co-researchers as opposed to objects. Such benefits include, among other things, contribution to new knowledge. Also, when it came to questioning during focus groups, for example, students answered in their own words and used drawings to illustrate their understanding of the phenomenon under study. There was minimal interference on my part as a researcher, as far as describing their lived experiences. So, open-ended questions were preferable.

Research ethics were given prominent attention in this study, given the personal, visual and sensitive information that the university students might have wished to divulge, and given that this information was going to be available for the attention of lecturers at the same university. Examples from other studies on rurality are illustrative, and were considered. One example of this is from Bran-Barrett (2014), who used various visual methods in her work in rural Canada. She, in particular, advised the students to focus on places rather than people, especially when the descriptions were of a sensitive nature. This calls for careful training of the students in particular, which was done in this study. In addition to the standard ethical procedures, students were reminded before data was collected and at key stages thereafter, of the possibility that visual images or digital clips could be revealing of their identities. Attention was thus paid to what data was collected and students were advised of the implications of how they present themselves and their circumstances in the initial training that they received. The identity of the participating university would not easily be protected in a research report, given the attention paid to issues of locality and context specificity. This calls for a respectful and at all times ethical approach to the writing of the research report which was done in this study and so, the name of the institution is predominantly referred to as the research site and/or is given a

pseudonym in this study. Likewise, the names of academic teachers are not revealed as well as those of senior leaders.

As much as I have strived for a thorough protection of the anonymity of participants to avoid tracking back the outcomes of research to individuals, in certain circumstances this was not possible as it would substantially compromise the research outcome, for example, the academic ranks of participants, the Faculty involved in the investigation and so on, as these were relevant in this study. A compromised anonymity was thus accepted suggesting that individuals could be tracked back in some cases of the research outcomes. Nonetheless, confidentiality for the data that was generated and anonymity of the published results was ensured through data storage. In addition, data was discussed with participants before publication through member checks and the publication of results was approved.

Approval to conduct this research was obtained from the university where participants are studying and teaching, respectively, using the same information and approach. All participants were provided with an information sheet, including a study description, why participants were being asked to take part, potential benefits of participation, the voluntary nature of participation, the right to withdraw, a contact point for more information, and details regarding the storage and usage of data obtained. Limits of confidentiality (e.g. legal) were explained to participants. Information sheets were written in accessible language in English. Participants' anonymity and confidentiality were respected in all reporting, where possible. Paper data was to be held securely in locked cabinets and passwords would be required for access to electronic data. Data will only be shared in a secure manner. Data sets will only be held on the computer used by the researcher, supervisor and the registrar of the participating university.

### **3.14 Limitations**

One of the limitations in this study has to do with my positionality in relation to students as co-researchers. Although treating students as co-researchers had the potential to flatten power relations between myself as a researcher and those I was studying, this ideal might not be realistic in real situations. For example, the way in which I dealt with this challenge was to acknowledge these difficulties and to stress the role of the researcher as listener, and be seen to practice that. There was also the danger that, among such students, there could be those whose voices could be privileged because they have more cultural capital, even though they come from rural areas (Gristy, 2014). The way around this was to ensure that the space for all participants to voice their opinions was provided in group discussions. Engaging in PLA

exercises, for example, in both drawing and reflecting about their communities and life trajectories, led to more participatory parity between students. In this way, students participated in an equitable way as full partners in interaction with others. They were not afraid because they might not express themselves well in a second language, or they might not write well. Another challenge was defining rurality.

It was clear that the concept of rurality is a complex one to define, but it was eventually Robert and Green's (2013) conceptualisation of rurality as demographic, geographic and contextual that fit well within the context of the project. This is so because this conceptualisation provides opportunities to talk about space as a political phenomenon, especially in the context of South Africa, where indigenous people were displaced and cut off from mainstream life. This displacement had a negative effect on schooling and living in rural areas. The use of technology like Evernote was yet another challenge.

As far as digital practices, data shows that students from rural areas have not had genuine access to digital practices as there are few, if any, internet cafes where they live. Even if one could go into a café, they would not know how to use the computer, and the money they had would be used up having not done what they wanted to do, for example, filling in an application form or searching for information. But in this study, co-researchers were expected to use technology whilst not fully acknowledging the complexities thereof. Training with the help of a technologist was given to students to counter this challenge.

### **3.15 Conclusion**

Chapter 3 has delineated the methods of enquiry that have been harnessed in my study of how teaching and learning, in the form of curriculum in the field of science, have emerged from the historical conditioning of the institution and the emergence of students' experiences from such conditioning, by also considering their conditioning before they joined university. This chapter also indicated that teachers' observations of these experiences form part of this enquiry as well as senior leaders' roles in that regard. The following chapter presents the application of Archer's social theory and the concept of analytical dualism in identifying mechanisms responsible for the emergence of the "Actual" and "Empirical" domains.

## CHAPTER 4: T<sub>1</sub>-STRUCTURAL AND CULTURAL CONDITIONS

### 4.1 Introduction

Chapter 2 of this study dealt with the discussion regarding the emergence of events and experiences from the workings of mechanisms at the level of the “Real”. Mechanisms were in existence before students joined the university. In other words, students were conditioned before they joined the university, and when they joined the university they also entered an environment which pre-existed them. The same is true for academic teachers, although the social class and geographical location of teachers are not the same as those of students. The core structural and cultural conditions that shaped students’ experiences (both before joining university and when they had enrolled), as well as teachers’ observations thereof were reviewed at T<sub>1</sub>. It was through PAR and PAL that data from T<sub>1</sub> was generated. A discussion on how data was generated took place in Chapter 3. These findings were to be subjected to the tenets of CR in order to tease out what could have led to the experiences of students in higher education (HE). This chapter engages with the preconditioning mechanisms prior to data analysis in ensuing chapters, particularly Chapters 6 and 7, with the intention of exploring how these mechanisms shaped students’ experiences and teachers’ observations in either constraining or enabling ways. This chapter thus aims to detail how students from rural areas experience HE, particularly in the field of science at a South African university, as well as how the conceptualisation, theorisation and framing of their negotiation and management of these experiences has informed this study.

T<sub>1</sub> is thus complex in that it involves conditions that shaped students’ primary Discourses or home literacy practices with scientific underpinnings, and whether or not these experiences could act as leverage for epistemic access in the field of science. In other words, the agency of students was first shaped or conditioned before they joined the university at T<sub>1</sub>. T<sub>1</sub> also involves academic teachers’ observations of students’ experiences and whether or not they view these as appropriate during science curriculum enactment. These observations extend to period T<sub>2</sub>-T<sub>3</sub>. Therefore, at T<sub>1</sub>, the higher education teaching and learning environment in general is crucial, as well as the teaching and learning environment in the field of science in particular at the research site. I elaborate more on these issues in Chapter 5. T<sub>1</sub> is also crucial, especially in the context of teaching and learning, because it would allow us a “broader critical understanding of the context in which teaching and learning takes place” (Case, 2013, p. 5), in order to tease out the way structure conditions the agency of students in contrast to the way the agency of their academic teachers, who come from very different backgrounds, plays itself out (Madondo,

2018). Having established structural and cultural conditionings at T<sub>1</sub>, it is then possible to look at the way students and/or academic teachers use their agency, either individually or as a group, over a specific time period termed T<sub>2</sub>-T<sub>3</sub>.

The first section of this chapter thus presents conditioning structures at T<sub>1</sub>. These structures involve, but are not limited to, the legacy of colonialism and apartheid. The second section presents the educational policy in terms of how it has responded to the interplay between geographical location of rural students and education. Given the conditions of inequality based on geographical location of different sectors of the South African population, such differentiation could be said to screen out learners from disadvantaged backgrounds prior to tertiary education. The third section thus presents a discussion that accounts for the failure of most of the students from marginalised backgrounds, including rural areas. The last section discusses the historical aspect of curriculum. In the process, persistent apartheid legacy and coloniality are seen to be influencing curriculum decisions.

## **4.2 Conditioning structures at T<sub>1</sub>**

The teaching and learning environment in South Africa (SA) prior to 1994, and perhaps during the early 2000s, has been characterized by segregated institutions designated for certain groups of people in terms of race. This segregation was a result of the racist history of SA under the apartheid regime<sup>4</sup>. During these periods, some institutions were predominantly white and privileged (Boughey, 2018) and the research site was no exception to this. When students from middle-class, educated homes enrolled at the research site, the kinds of people they were required to be were not so different to the kinds of people they had been at home. University education was and is more like a continuation of home literacy practices (Heath, 1983; Boughey, 2018; Street, 1984).

In 2017, when data for this study was generated, the research site was different in terms of student body. During 2017, there were more black students and a large number came from working class and possibly rural backgrounds (Boughey, 2018). Literacy practices (Street, 1984) or what Gee (2008) may refer to as the primary Discourse of these students, which was acquired in rural home contexts, is located at T<sub>1</sub> and is reviewed against secondary or academic Discourse acquired at university (Boughey, 2000, 2003). According to Gee (2008) “Discourses

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<sup>4</sup> The apartheid regime was a system that institutionalised racial segregation and the dominance of white people over other races in South Africa, in terms of political and economic discrimination. This discrimination caused the emergence of a hierarchy of social and financial privilege along racial lines.

involve “role” played by individuals in different social situations and contexts” (p. 154). In relation to this point, Boughey (2018) notes that the acquisition of secondary Discourse could be enabled or constrained depending on the relation of primary to secondary Discourse. These Discourses are discussed to some extent in this chapter as a set of conditioning mechanisms at T<sub>1</sub>, but are also discussed at T<sub>2</sub>-T<sub>3</sub>, in subsequent chapters in this dissertation. However, before deliberating on these conditioning Discourses and their impact on students’ experiences of science curriculum, it is important to first discuss the structural conditioning that led to the emergence of segregated education in South Africa. This policy and the kind of education system emanating from it, as well as the home environments of students, are understood to have emerged from and thus been shaped by the historical formation of the colonial state, which was informed by separate development and apartheid (Mamdani, 1996, 2018; Luckett, 2016). These conditioning structures take place at T<sub>1</sub>. A colonial state is discussed at a macro-level context, while apartheid regime is discussed at meso-level context, and the higher education system and/or curriculum is discussed at micro-level context. Figure 5 below explicates these deliberations. The use of an onion-like diagram provides a structure to reflect on these contexts.

### **4.3 Structural conditioning at T<sub>1</sub>: colonialism**

The historical formation of the colonial state of South Africa is referenced from Mamdani’s (2018) *Citizen and Subject*. In this edition, Mamdani (2018) explains how direct and indirect rule was enforced in the governance of colonial subjects. Direct rule resulted in central control of propertied, enfranchised “citizens” using European Laws (Gencoglu, 2018; Luckett, 2016). These citizens were bestowed with powers for sovereign nationals (Luckett, 2016). With indirect rule, the state controlled the native subjects and split them into the rule of tribal leadership through customary laws, which were used as tools of oppression (Mamdani, 2018). These rules culminated in what could be referred to as “decentralized despotism”, which was sustained by means of racialization of civil society and tribalization of native authority (Luckett, 2016). According to Mamdani, 2018, p. xiii) direct rule was racially discriminatory towards the natives, who were regarded as uncivilised. Indirect rule, on the other hand, was also discriminatory at the tribal level, because tribalism was instrumentally used, if not created, to facilitate indirect rule.

In terms of capitalist social relations of production, these rules meant that rural subjects were forced to temporarily move into the urban areas for cheap labour. This meant that the “natives” were excluded from civil society because they were uncivilized. In relation to this point, Mamdani (2018) asserts that, “Citizenship would be a privilege of the civilised; the uncivilised

would be subject to an all-round tutelage” (p. 18). The so-called “uncivilised” may have few civil rights, but no political rights. Mamdani refers to Cecil Rhodes’ “equal rights for all civilised men” precisely to demonstrate that there were two classes of men in the colony, the civilised and uncivilised (Gencoglu, 2018; Oyedemi, 2018).

Luckett (2016) further notes that the emergence of indigenous civil societies in Africa has not been successful, rather it has subsided into political society. In this way, as far as the civil society is concerned, the tendency has been to deracialize the state but not civil society. Thus, even after independence, neither the deracialization of the inherited civil society, nor the detribalization of native authorities is achieved, asserts Luckett (2016). Hence, the continuation of racism, ethnicity and tribalism that impede the achievement of democratic and civil rights for all. This resonates with the social reality at present (Gencoglu, 2018). Furthermore, Mamdani (2018) cautions us that colonialists like General Smuts had tried to “de-Africanize the African”. This is what General Smuts had to say in his talk at Oxford in 1929, “De-Africanize the African and turn him either into a beast of the field or into a pseudo European. African was good as a potential European; his social and political culture was bad, barbaric and only deserving to be stamped out root and branch” (Mamdani, 2018, p. 5-6). Evidently, Smuts’ aim was not just a territorial segregation but also a racial one, events which evidenced a white supremacist attempt to erase African ways of life in the process of colonizing African states, including South Africa.

The system of racial domination was reinforced by the brotherhood of Boer supremacists in South Africa, which was referred to as “institutional segregation” by Smuts (Mamdani, 2018). These were harsh events for “natives” in South Africa. To this effect, Mamdani (1996, 2018) asserts that, “the context in which Apartheid came to be implemented made for its particularly harsh features, for to rule natives through their institutions, one first had to push natives back into the confines of native institutions” (p. 7). I elaborate on the issue of the impact of homelands or Bantustans on the “natives” in section 4.4 below. Mamdani (2018) maintains that the central objective for the implementation of these laws was to keep “natives” under control, first by British colonialism and then by the Afrikaner apartheid system. Mamdani (2018) notes that neither institutional segregation nor apartheid were of South African invention (Gencoglu, 2018). “Apartheid was a form of despotism in the colonial state, both ethnic and racial” (Mamdani, 2018, p. 26). Crucially, through this analysis of the colonial state, it is possible to discern the political structures that endure in the post-colonial era (Mamdani, 2018), what Ndlovu-Gatsheni (2013) refers to as coloniality, discussed at length in section 4.8 below. The

reality today is that the state has been deracialized, but not civil society (Luckett, 2016) with the result that the majority still function as “subjects of political society” rather than as “citizens of civil society”, especially marginalized groups (Chatterjee, 2004). Thus, the perpetuation of different treatment for different population groups, for example, “the continued use of the colonial four racialized groups to implement equity and redress policies by the South African state” (Luckett, 2016, p. 426).

Based on Mamdani’s analysis, the urban elite continue to enjoy the rights granted to them as “citizens of civil society” (in the Western idea of a nation state), while the majority remain “subjects of political society” (Luckett, 2016). From this analysis, it is possible to see that the operation of ex-colonial universities, as they are part of the communities from which they have emerged, could serve to sustain or reinforce civil society and as a result, function to replicate the elite citizenry (Castells, 2001; Garuba, 2012; Nyamjoh, 2012, 2016). Nyamjoh (2016), for example, asserts that “whiteness” as a social construct has less to do with pigmentation but more to do with historical privilege and positionality. In this way, such a construct has the potential power to afford a culture of control and authority to those who historically occupy privileged positions. Race becomes an organising principle in this privileged position in society (Ndlovu-Gatsheni, 2013), and through the construct of race, we can begin to better reflect on marginalized groups’ experiences, including those of students from rural areas (Yosso, 2005).

According to Luckett (2016), based on Mamdani’s enquiry, these universities admit at least two groups of students, namely, those who are structurally conditioned to behave as “citizens” of civil society and exercise the civil liberties provided by the liberal, discursive space of the academy, and those who are structurally conditioned as “subjects” of political society. Luckett (2016) further notes that the second group of students often experiences severe alienation when they enter the cultural and discursive space of the post-colonial university. It is possible to understand this alienation as Mamdani’s (2016) reflection on the post-colonial African university when he argues that such a university’s institutional form and intellectual content were inspired by the Enlightenment period in Europe. Leibowitz (2017b), for example, alerts us to the pedagogic experiences of the colonized with reference to knowledge production or harm generated by Western Enlightenment knowledge. In relation to this point, de Oliveira Andreotti *et al.* (2015) and Kerr (2014) note that HEIs continue to perpetuate and support structures of colonialism.

Writing about the South African condition, Vorster and Quinn (2017) maintain that the cultural milieu (in terms of symbols, ceremonies and rituals) continue to privilege the traditions of the colonial Western universities from which South Africa emerged. Vorster and Quinn also suggest that many black students feel that these institutional features render their presence on campus invisible, and are thus alienating. Students have also challenged academics to reconsider the appropriateness of disciplinary knowledge traditions and underpinning values. As Vorster and Quinn (2017) explain: “For black students, curricula and pedagogic processes are often not aligned with who they are as people, and it is not possible to divorce themselves – their being – from what is taught and how it is taught” (p. 39). In Chapter 6, I use Archer’s (1996, 1998) MM framework to analyse continuing structural inequalities discussed above.

I argue elsewhere that black students, especially those who come from marginalized backgrounds, do not see themselves in university structures like curriculum or in institutional cultures (Madondo, 2018). Post-colonial universities are, for example, prone to perpetuating the norms and standards that favour selected groups of students to the exclusion of the majority that is beginning to enter HE (Reay, Crozier & Clayton, 2010). According to Fraser (2008), these students are *mis-recognised* and *mis-represented* by these structural and cultural conditionings, and this tends to adversely affect participation in knowledge construction, especially in the field of science.

In order for students to participate fully in the construction of knowledge, or in social interactions, Fraser (2000, 2003, 2008) proposes what is called “parity of participation”, which involves equity of access into HE and equity of educational outcomes. There has been, for example, increased attention to social inclusion, widening access and lifelong learning, internationally, which has led to considerable interest in how students experience HE. It is recognized that underrepresented groups of students can face a number of challenges in negotiating HE’s powerful knowledge of the disciplines, and they are therefore less likely than other groups to complete their studies (Wilson *et al.*, 2016). However, the HE experiences of underrepresented groups, particularly rural students, have been less extensively researched.

Fraser (2003) argues that for “parity of participation” to take place, a particular social arrangement is required that will enable “...all to participate as peers in social life” (p. 73), for example, in the case under study in HE. The implication for this is that, whether a student comes from a middle-class educated family or a lower-class uneducated family, the fact that they have gained access to HE means they should all have equal chances of success. In other words,

backgrounds should not be a determinant for success at university, rather the institutional obstacles must be dismantled so that all students see education as a continuation of the literacies they already have. This includes those who come from lower-class backgrounds, including those from rural areas. A number of scholars argue that curriculum in itself is not a problem, but rather how it is constructed and what it contains tend to favour certain world views over others (Boughey & McKenna in press; Mbembe 2013, 2015; Ndlovu-Gatsheni, 2013). In this way, curriculum structure and enactment are positioned as an unequal construct, because they fail to recognise different ways of creating and expressing scientific knowledge. This has the potential to adversely affect access to the Discourse of the discipline of science, particularly for students who come from marginalized backgrounds.

Research shows that equity of success is still skewed along racial lines in favour of students from white middle-class backgrounds from educated families (Shay & Peseta, 2018; Shay, Wolff & Clarence-Fincham 2016). Globally, HE has undergone significant changes in the last two decades. Most significant has been the trend toward mass institutions and universal HE (Gale & Parker, 2014a), and the widening of participation to include historically under-represented groups and non-traditional students (Hart, 2008). It has been claimed that massification has potentially led to paying less attention to the needs of students (Leese, 2010). Students have entered university from a diverse range of demographic, socio-economic, attitudinal and educational backgrounds, with a correspondingly wide range of needs for which higher education institutions have not always been prepared. This has meant that HEIs have had to respond to students with different learning experiences and skill sets.

This more diversified undergraduate student population has included first-in-family, mature students, ethnic minorities, part-timers, and students with caring responsibilities, sometimes collectively referred to as “non-traditional”, “historically under-represented” or “atypical” students, descriptors that have also been applied to students from rural areas and students from low-income households. The move to higher education for them has been likened to both entering an “alien environment and culture” as well as a “positive learning environment” in terms of supportive academic communities and wider social networks (Askham, 2008), suggesting that the university experience can be both challenging and rewarding/stimulating/satisfying. These challenges can be worse for historically underrepresented groups of students. Boughey (2019), for example, notes that traditional students who come from families wherein HE is the norm are better equipped in terms of confidence and security in their abilities. Such families are more able to access secondary

education which focuses on developing independent learning skills required in the discipline of science and, in addition, can often offer increased levels of financial and emotional support.

In this study, I argue that dismantling institutional obstacles such as those embedded in the curriculum would require the need to clarify and share complex scientific language so that everyone can use it, and also introduce and share the language used at home for scientific practices. This will enable a condition whereby everyone in the classroom can also use this language. Here, language does not mean mastering the forms of language or the language skills in neutral ways. Rather, the suggestion is that language is embedded in social context with an understanding of using it to engage with meaning in academic contexts (Boughey & McKenna 2016). Constructing meaning in science classrooms using language seems to favour certain world views, and this has the potential to adversely affect participation of other students in the construction of science knowledge. For example, the idea that mastering “neutral” English language skills would enable access to disciplinary knowledge has long been challenged in literature (Boughey, 2012; Boughey & McKenna, 2016; Street, 1984).

Language issues should thus concern themselves with both what is taught as well as how it is taught and learnt. The findings in this study, for example, express some of the challenges student co-researchers face as a result of the domination of English as a medium of instruction. In relation to this challenge, Ndlovu-Gatsheni (2013) posits that the continued use of colonial languages perpetuates the marginalisation of subjugated groups. Depending on how we view language as academic teachers, this impacts on accessing disciplinary knowledge. If we do not consider the sophisticated understanding of how social history and social context impact on language use, then we run the risk of making assumptions that language, like learning, is disembodied from social context and as such consists of neutral “skills” (see, for example, Halliday, 1973, 1978, 1985). In this situation, the form of the language and the skills necessary to encode and decode meanings into speech and writing become the interest of academic teachers. Boughey (2002, 2007, 2012, 2013) and Wilmort and McKenna (2018), for example, shed some light on the language issue when they write about the historical issues of language teaching in South Africa, academic literacies and academic development as influenced by social and cultural approaches.

Taking on a “decolonial gaze”, which I engage with more in section 4.7.1 below, allows an exploration of structural and cultural constraints that might be faced by students, at least those whose mother tongue is not English in HE, and the challenges that they might encounter in

terms of pedagogic relations (Bernstein, 2000) in the post-colonial university (Luckett, 2016). During the colonial era and the apartheid period, black South Africans experienced constraints in the form of unequal access to civil society, unequal access to linguistic proficiency in the colonial languages, including English, and a lack of recognition for their identities, histories and cultures (Luckett, 2016). These constraints operated to impede the full emergence of students' agentive and creative powers. It is possible to see these constraints when looking at the critique of education as a public good in the age of coloniality by Mgqwashu (2019a). Mgqwashu (2019a), for example, argues "that coloniality continues to influence pedagogical practices in ways that privilege the historically favoured social classes at the expense of the historically marginalised majority" (p. 65).

These constraints are further highlighted by Luckett (2016) when she postulates that a fundamental cultural resource for the emergence of human agency is language. Given the history of colonialism and apartheid, it is possible to see why the idea of first language proficiency and cultural competence in the colonial language works as a severe constraint to the academic success of the majority of black students, for example, when they enter the monolingual contexts of post-colonial universities (Luckett, 2016). Luckett further notes that these students frequently experience a contradiction between the equity policy that admits them (a structural enablement) and the cultural and linguistic demands of the institution (a cultural constraint), leading to their correction or elimination (academic exclusion). Given the cultural intermission of the colonial hegemony and its racial ideology, all black students, whether structurally conditioned as "new citizens" or still "subjects" of the postcolonial state, will perpetually experience a cultural system and curriculum that devalues and negates their home languages, cultures, histories and identities, thus positioning them as culturally deficient (Luckett, 2016). The big question for me then is how do we, as academic teachers in the field of science, work with students who might be coming from backgrounds wherein there are practices with scientific underpinnings but are unable to express these because they are not proficient in English (Alexander, 2002)? These are serious social justice issues.

In order to explore the construct of participation and social justice issues, as one of the motivations for this study, Fraser's multi-dimensional framework of justice that affects parity of participation is explored. It involves *economic*, *cultural* and *political* dimensions.

From an economic point of view, access or no access to material resources like wealth or income would enable or constrain individuals' abilities to interact on equal footing in social

contexts. Economic deprivation would result in what is termed distributive injustice. In this way, because of lack of economic resources, some students may not get access to HE. This is referred to as distributive injustice. Also, distributive injustice could be extended to the students' inability to gain access to powerful knowledge of the discipline. This is in line with what Morrow (2009) refers to as epistemological access, that is, access to the ways of being, thinking, doing and what is valued in a discipline. Institutional cultures tend to covertly determine who gets epistemological access based on their home backgrounds. I argue that recognizing the literacies that students bring with them into HE could be a useful resource in accessing powerful knowledge. This is because there are ways of knowing and being in rural areas which are valid and have scientific underpinnings, yet are simply ignored in the construction of knowledge in HE. I am, however, aware of not conflating home practices with scientific underpinnings and science knowledge. One might be involved in a practice that has scientific underpinnings, such as the making of "Umqombothi" (an African beer), but that does not necessarily mean that a person will also know the chemistry involved in the process thereof. Rather, that such a practice could be used to enable an understanding of how chemical processes work, by drawing on resources that students already have.

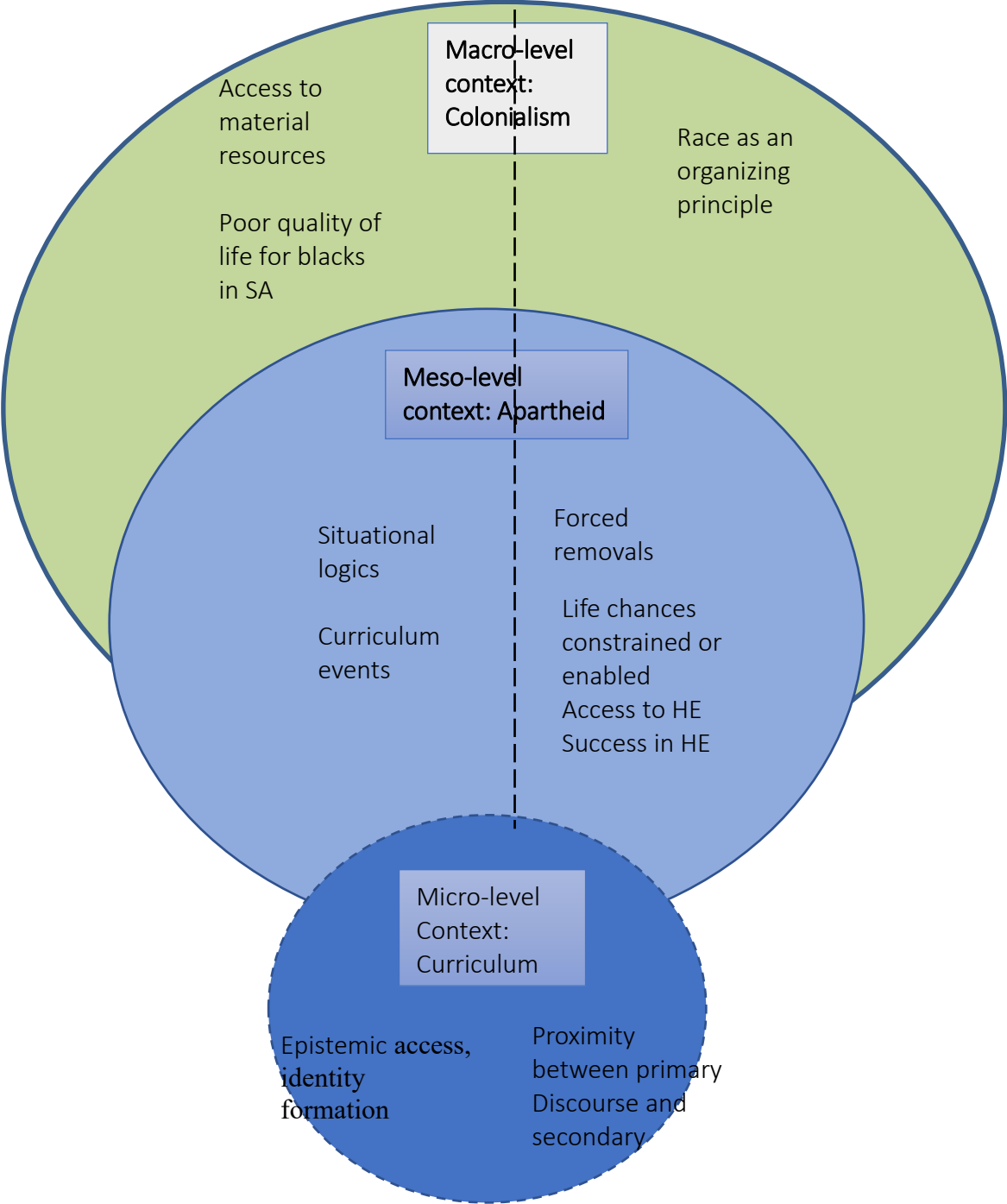
From a cultural perspective, institutional discourses and practices have the potential to be exclusionary in the sense that students are prevented from achieving educational success. This could happen when the attributes associated with people or activities in which they are engaged are not valued in social arrangement. Parity of participation would be prevented when the cultural dimensions of those involved in social interactions are *mis-recognized* (Fataar, 2018; Fraser, 2000, 2003). This might mean that students do not see themselves in terms of institutional structures such as curriculum, and therefore remain largely unknown. This *mis-recognition* is explicated when engaging with data analysis in the latter chapters of this dissertation.

From a political perspective, Fraser (2008) argues that for parity of participation, social arrangements should be such that all social actors are equitably represented. In other words, in social interactions, for example, in the conceptualization of concepts in science classrooms, those involved must be accorded equal voice in the construction of knowledge such that they can see their world views being represented in the curriculum. This point is important when considering the "...mainstreaming of Eurocentric science as the objectified truth over indigenous knowledge... being taught to African students in many sub-Saharan African countries, post-independence" (Otulaja & Ogunniyi, 2017, p. 2). When the world views or

home literacies of students from rural areas are not represented in curriculum, the likely outcome is exclusion. This exclusion is referred to as *mis-framing* (Fraser, 2008). Through the construct of *mis-framing* it is possible to see who is included or excluded from justice claims in HE, especially in the field of science. This can be seen through the kinds of examples that are used to clarify concepts. It is thus possible to observe curriculum contradictions that are experienced by black students; such contradictions are not only in the sciences, as they are structural. This is because of persistent coloniality (see, for example, section 4.8 below).

Based on the structural and cultural constraints discussed above, I have found it useful to think of  $T_1$  as layers of an onion presented (Figure 5), to represent macro-level, meso-level and micro-level contexts. I have started with the big analysis of colonialism, discussed in section 4.3 above, at macro-level. That is to say, colonialism is a global phenomenon, it does not matter which state practised it. Through Figure 5 and the discussion based thereon, we can see how colonialism gave birth to apartheid as well as other forms of structural inequality experienced through the education system or inherited curricula. Having established the macro level of colonialism, I now move to the meso level of apartheid, discussed in section 4.4 below. Apartheid gave birth to a curriculum that was inherited by public schools and universities. I engage at length with curriculum as a structure at  $T_1$ , noting that it led to events and experiences at the level of the “Actual” and “Empirical”. I do this in section 4.7 below. Figure 5 below succinctly demonstrates the interconnectedness between colonialism, apartheid and curriculum events, not only in public schooling in general, but in HE in particular.

Preconditioning mechanisms leading to experiences and observations at the level of the 'Actual' and 'Empirical'



**Figure 5:** Situational logics accounting for T<sub>1</sub>, T<sub>2</sub>-T<sub>3</sub> periods: structural conditioning.

Coming into the inner layer of the onion (Figure 5), I am looking specifically at South Africa both during and after apartheid. It is important to consider events with regard to the “Homelands” and the Pass system, where then prime minister Verwoerd of the National Party declared that there was no place for black people in white South Africa other than as a labourers, thus conditioning life chances for black people in SA at T<sub>1</sub> (Christie & Collins, 1982). These issues are captured in the first inner layer of the onion in Figure 5 above, at a meso-level context. During apartheid, at T<sub>1</sub>, there was the group areas Act of 1953, a policy which resulted in the formation of “Homelands” or “Bantustans” whereby black people were pushed to the peripheries of white South Africa. These events had implications for quality of life as well as the resultant education system. I now turn to this discussion.

#### **4.4 Structural conditioning at T<sub>1</sub> (Apartheid)**

Apartheid could be said to be another set of conditioning mechanisms at T<sub>1</sub>. According to Christie and Collins (1982), the basis of apartheid policy centred on an environment of enforced segregation of people into different areas. These authors point out that the Nationalist Party, which mainly represented Afrikaner people, was isolationist and racially prejudiced against black people because they viewed themselves as a pure race which needed to maintain its purity through racial segregation. The policy of apartheid was therefore geared towards forming and maintaining the identity of the Afrikaner people, in the process removing other groups either geographically or culturally from themselves. The forceful removals culminated in “Bantustans”. These were rural areas created by apartheid to accommodate blacks who lived in those regions, those who originated from those areas but worked in the cities of white South Africa (but were required to have a document allowing them to be in the cities, referred to as a “Dompas”) and those that were forcibly removed to the Bantustans from various places (Christie & Collins, 1982; Moyo, 2018). These Homelands or Bantustans were underdeveloped and impoverished, with little or no infrastructure (McKenna & Boughey, 2014). The idea was to effectively control these groups, since the Nationalist Party government had both political and economic power. Control of black people by the Nationalist Party government also translated to ideologically controlling black schooling (Christie & Collins, 1982). In black schools, asserts Christie and Collins (1982),

...blacks would be taught not just the value of their own tribal cultures but that such cultures were of a lower order and that, in general, the blacks should learn how to prepare themselves for a realistic place in white-dominated society (at that point in time) to be “hewers of wood and carriers of water” (p. 60).

These different environmental contexts shaped the emergence of the experiences of the South African population based on their geographical location and access to material resources. T<sub>1</sub> was thus shaped by the unproductive and uneven system which defined the South African population in terms of racial categorisation. This categorisation of people had implications for quality of life, represented in Figure 5 above, that was shaped by the ideology of separate development. In this way, it was first through British colonial rule that separate development was envisaged in SA, as I have already discussed in section 4.3 above, and then through apartheid. Hence certain groups in SA were privileged over others based on racial categorisation (Heleta, 2016). We can then observe that in the social world, people occupy different positions (through birth or through voluntary or involuntary placement) which imbue them with certain powers (*ibid*, p. 177 - 185). These positions structure life chances for people. Thus, people are born into contexts of advantage or disadvantage. Attached to positions are certain material resources and therefore vested interests. People occupying these positions may wish to maintain them and their interests, or may wish to improve their situation in life. Social groups and the positions that people occupy could thus be interpreted as structures that lead to events, observations and experiences. Based on this understanding, it is possible to see how apartheid policy structured life chances in either enabling or constraining ways for different groups of people in SA.

When it comes to Higher Education (HE), for example, the life chances that are conditioned by the positions that people occupy in society tend to impact on who gets access to the academy and who flourishes within it (Boughey & McKenna, in press). In relation to this point, Boughey and McKenna (in press) continue to argue that globally, universities are inclined to privilege the already privileged. They posit that “In every country where there are statistics on the issue, we see that it is socioeconomic background more than any other characteristic that correlates to student success” (p. 1). It is then possible to argue that economic development was also stratified along racial lines and geographical location. Black people in SA, for example, were forcefully moved into rural impoverished areas, as opposed to their White counterparts. Rural areas are generally characterised by poorly resourced schools, located in isolated areas, with high levels of poverty, disease and unemployment (HSRC, 2005), as well as disadvantage and lack of economic and educational opportunities (Trends in International Mathematics and Science Study, 2015).

Although black people did not have access to the same high quality of life as their White counterparts (Bunting, 2002; Ntshoe & De Villiers, 2008), this institutionalised structural

inequality did not mean that as a people, they are deficit or have “lacks” (Ndlovu-Gatsheni, 2013). Hence, learning taking place from home, or home literacy practices could have value in assisting students to access disciplinary knowledge so that they do not see education as divorced from their lived experiences (Boughey & McKenna, in press; Gee, 2008; Street, 1984). This study is therefore interested in finding out the home literacy practices that academics in the field of science could tap into to enable epistemic access in ways that are not alien, while also being aware of the tendency of structural and cultural systems to constrain or enable the agency of these students.

Based on the apartheid policy at T<sub>1</sub>, one can observe that access to structural material resources such as wealth, systems of interaction and expertise (Archer, 1995) had a conditioning effect on the experiences and thus human behaviour and relations of the segregated sections of the SA population. These experiences were and are marked by persistent levels of inequality (McKenna & Boughey, 2014). The structural system of apartheid therefore enables certain roles which set up differential power relations and thus access to material resources. In this way, the daily events and experiences that people are confronted with are conditioned as such, in enabling or constraining ways that shape the emergence of human agency. These conditions are however, not determined (Archer, 1996), but have enduring conditioning effects on human agency. Critical to Bhaskar’s thinking is that, although structures and mechanisms have enduring causal powers, they are not strictly causal. An example below is an attempt to clarify the tendential causal powers that mechanisms possess.

While apartheid policy, as far as the education of black people in SA goes, regulated that they should be given education that would prepare them to supply cheap labour to white-dominated SA (Christie & Collins, 1982, Moyo, 2018), myself and many others like me who received education under apartheid<sup>5</sup> were able to become academics, not factory workers. What matters

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<sup>5</sup> I received my primary education from 1979 – 1982 (as it was then categorised in SA); senior primary education from 1983 – 1985; secondary education from 1986 – 1987. During 1988 and 1989, I was unable to attend school because of the then ‘black on black violence’. My hometown – Mpumalanga Township in Hammarsdale, KwaZulu-Natal Province in South Africa – was one of the black townships that was wracked with the scourge of violence. In 1990, I fled from the police to hide in Bergville, then a deep rural area, where I was able to enrol for Grade 11 in one of the schools, but I failed because I had spent two years without any schooling, either running away from police or from members of the Inkatha Freedom Party, since I was a member of the United Democratic Front, then a wing of the African National Congress (ANC). The ANC was banned by the SA National Party Government from 1960 until 1990. In my township, and the rest of South Africa, you were either killed because you belonged to one or another political party, or you were detained without trial. Then, in 1991, I progressed to do Grade 12, which I passed with a star. Based on these experiences, it is possible to see how the workings of the apartheid structure led to unfavourable life chances, but this did not determine my future to work in a factory. I guess from an early age I was motivated to be an educated person, having been raised by a single parent – my mother. I guess I wanted to lead a better life and support my mother and my siblings in the process. So, this

are structures and mechanisms at play that lead to particular events, which then lead to the emergence of particular experiences, such as loving to read science textbooks or hating to read them. The emergence or non-emergence of events or experiences is related to the interplay and interaction of the agents with other mechanisms and structures. It is for this reason that in critical realist research, we are therefore looking at the tendency of a structure or mechanism to make something emerge. I will return to this point in Chapters 6 and 7 of this dissertation.

The interplay of structures and mechanisms at the level of the “Real” generally cannot be accessed directly using the senses. One might have been able to isolate and view my success as an academic but the interplay of my motivation and beliefs about leading a better life in the future could not be observed directly. The idea that the level of the “Real” cannot be accessed directly is important in critical realist research. A researcher can only work with empirical data (accessed through PAR, discussed in Chapter 3 of this study), data that can be accessed via the senses, and therefore only at the levels of the “Empirical” and the “Actual”. In order to begin to explore the level of the “Real”, and particularly when working with social phenomena, one has to use a number of tools, most notably those of abduction and retroduction, discussed in Chapter 2.

As a consequence of the interaction between agents, mechanisms and structures, roles and what people could do or not do are severely constrained or enabled in the “Actual” and “Empirical” domains, because of unequal access to material resources. Based on Archer’s (1995, 1996) situational logics, discussed in Chapter 2, it is possible to observe how these logics play out as academic teachers interact with students from rural areas. This is because structural/cultural conditioning occurs when structural properties *a priori* and objectively shape situations that agents confront involuntarily, predisposing them (non-deterministically) to act in certain ways (Luckett, 2016). Since apartheid policy also shaped curriculum events in SA, using Archer’s analysis it is possible to see that a curriculum could be described as having “culturally emergent properties”, whereby structural and cultural conditioning have already been set up before students joined the university, as they interact with other agents, structures and cultures of the academy (Luckett, 2016). In chapters 6, 7 and 8 of this study, I engage with how students interacted with science curriculum and the contradictions it set up for students from lower-middle-class and marginalised backgrounds, including those from rural areas.

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motivation must have been a driving force for my determination to succeed. The apartheid regime was finally dismantled in 1994.

The structural inequalities deliberated on above, which maintained the inequities and disparities that were imposed by apartheid, shaped the environment and conditions under which students use their agency, either individually or as groups, over a specific time period termed T<sub>2</sub> - T<sub>3</sub>. Crucially, the environment within which teaching and learning takes place in HE in general is still reflective of the past with regard to who gets access to HE and who succeeds within it (Boughey & McKenna, in press), a point made in Chapter 2 and in section 4.3 of this chapter. Boughey and McKenna (2015), for example, acknowledge the university as an inherently social, political, historical and cultural space, to which some students have privileged epistemic access by virtue of their previous experiences. Hence, as academic teachers, what we could do is accept that universities, the knowledge and the learning that sustains them are not neutral. Later chapters in this dissertation would thus raise questions as to whether this acknowledgement was considered by academic teachers at T<sub>2</sub>-T<sub>3</sub>. Not acknowledging that a university is not a neutral space might be the reason why the statistics indicate that black students in higher education bear the brunt of failure rates (Chereni, Leibowitz & de Wet, 2017; Boughey & McKenna, 2015; Boughey, 2010), an observation which has resulted in the use of policy, such as the Foundation Programme Grant Policy (DET 2004) to improve access and success.

Based on the above brief discussion of the structural factors conditioning human agency, there is vast research regarding black working-class students' experiences of entering universities in South Africa. For example, using Archer's (1995, 1996, 1998) social realism, Case (2015) and Case, Marshall, McKenna and Mogashana (2018) draw on the concept of agency in order to interrogate the way students negotiate the alien spaces of university. Writing the foreword of the book titled Going to University by these authors, Sue Clegg, Emeritus Professor of Higher Education, Leeds Metropolitan University, writes that these authors provide,

...an argument that we need not just look at embedded structural constraints but that we should also consider how people understand their situation and their own abilities to act; hence the importance of narratives. It offers readers an opportunity to think about broader questions of agency and constraint, and issues of race, class and gender. It is an invitation to consider these matters because they have wider societal and political significance (Case, Marshall, McKenna and Mogashana, 2018, p. v-vi).

#### **4.5 South African policy: a structural constraint for success?**

Chereni *et al.* (2017) have investigated the ways in which educational policy, or the curriculum strategies and practices that result from it, have responded to the perceived interplay between geographical location and education. In doing so, they have identified a close relationship

between the place of residence, for example, rural versus urban, and access and success. Geographical location is understood as a structure, already discussed in section 4.4 above, that has the potential to shape the quality of life and life chances of people, and thus has a tendency to condition their experiences and interactions with other agents, structures and mechanisms. People are born into contexts and environments which are not of their making. Such an environment is located at T<sub>1</sub>. Other scholars, for example, (Mahlomaholo, 2012; Masinire, 2015; Moletsane, 2012) point out that the place of residence influences post-secondary educational trajectories and career choices, and has a significant impact on educational outcomes. If we consider colonialism and apartheid policies as structural systems discussed in the above sections, it is possible to see that educational policies shaped by the segregation of apartheid resulted in white supremacy and the monopoly of resources in education (Statistics South Africa, 2011). Such policies ensured that blacks received inferior education (Hart & Padayachee, 2013). According to Roscigno and Crowley (2009), educational outcomes between racial groups in South Africa varied significantly because of such policies.

A further outcome of these policies was the disruption of “the ontological security among blacks” (Chereni *et al.*, 2017, p. 6). There was thus a disjuncture between students’ home literacies (I use the term “literacies” in the sense of Street’s (1984) ideological model explained in section 4.6 below, and school-based literacies (Department of Basic Education 2005; Human Sciences Research Council 2015; Statistics South Africa 2011). This observation was also made by students in the #FeesMustFall protests of 2015 and 2016. Students from universities across South Africa have expressed concerns that curricula in the disciplines are not connected to their lived experiences and ways of being in their home communities (Mbembe 2016; 2015; Ndlovu-Gatsheni 2013; Vorster & Queen, 2017). Street’s (1984) ideological model is used with Gee’s (2008) construct of Discourse (see section 4.6 below) to explain the social aspect of learning, which is not normally acknowledged in science classrooms (Ellery, 2016, 2017). I also use Bernstein’s (2000) (see section 4.6 below) constructs of vertical and horizontal knowledge structures to explain the relevance of home-based, rural-originated literacies to be used as pathways to access the powerful knowledge of the Science discipline.

The disjuncture between home literacies and formal school-based literacies can be understood as the contradictions that the inherited curriculum sets up for black students, especially those who come from marginalised backgrounds (Luckett, 2016). Using Archer’s morphogenetic cycle and Bernstein’s pedagogic device, it is possible to tease out what contestation for control of the curriculum entails (Luckett, 2016), especially in the field of science. Engaging with

curriculum in the ways mentioned above enables an identification of how the situational logic of the post-colonial university offers very different opportunities for agential development and therefore academic success. At the level of pedagogy, we can begin to ask questions about how the nature of the field affects the way we teach, and whether how we teach has the potential to alienate some groups of students but not others. I engage with these issues in Chapter 5.

The alienation that might be experienced by some students in our classrooms could be the reason that equity of outcomes, defined as success, is still split along racial lines, although recent research shows that racial and gender barriers involved in accessing higher education have been reduced over the past seven or so years (Chereni *et al.*, 2017). In a similar vein, Chereni *et al.* (2017) note that students who come from low-income families, including rural communities, bear the brunt of underachievement at Grade 12 level. Chereni *et al.* (2017) go on to argue that “conditions of inequality screen out learners from disadvantaged backgrounds prior to post-secondary education” (p. 16). The implication of this observation is that, at university, equity of outcomes for these students is negatively affected.

#### **4.6 Accounting for failure**

Numerous researchers (Badat, 2011; Case, 2013; Chereni *et al.*, 2017; Boughey & McKenna, 2015) argue that equity of outcomes or academic achievement cannot simply be related to factors such as intelligence, motivation or skills, and that the clash between broader institutional contexts and those of the families and communities in which students were raised also have to be taken into account. It is thus the “social” aspect of teaching and learning that this study argues could play a significant role in positively affecting equity of outcomes or academic achievement of students. The argument is therefore that the informal acquisition of scientific practices in home contexts has the potential to be harnessed to facilitate access to formal, disciplinary science knowledge and ways of knowing.

This is especially the case given that immersion in the academic context of a university can undermine a student’s way of being and of understanding the world in profound ways, a process that then impacts both psychologically and emotionally on the learner and thus, on learning itself. When students are presented with knowledge that seems completely separate from them, their identities, their heritage, their backgrounds and value systems, accessing that knowledge can seem inordinately difficult. There is therefore a clear need to bring something “from home” into our teaching as a means of reassuring students that all is not foreign and that what they already know is valuable.

Boughey and McKenna (2015) identify two models, existing at either end of a continuum, in understanding success and failure in higher education. The first model, “the model of the student as a decontextualized learner” constructs the ability to succeed in factors inherent to the individual, such as intelligence, motivation and aptitude. At institutional levels, this means that blame for failure is allocated to the student and the university, and its staff are absolved of all responsibility. If universities are treated as ahistorical, apolitical, asocial and acultural spaces (Street, 1984) then it is possible to construct failure as inherent to individuals, and ignore conditions that colonialism and apartheid policies ideologically fabricated. See for example, section 4.3 and section 4.4 above. The “model of the student as a decontextualized learner” is contrasted with a second model at the opposite end of a conceptual continuum, “the model of the student as a social being” (Boughey & McKenna, 2015). This model acknowledges the university as an inherently social, political, historical and cultural space to which some students have privileged access by virtue of their previous experiences. A key step in exploring what academic teachers could do to make students feel that they belong would thus be to accept that universities, the knowledge and the learning that sustains them, are not neutral.

Related to this understanding of sites of learning as social, cultural and political spaces is Street’s (1984) identification of two models of literacy, the “autonomous model” and the “ideological model”. The “autonomous model” understands literacy as a set of neutral, apolitical, acultural, asocial “skills” involving the encoding and decoding of printed text. In contrast, the “ideological model” sees literacy as a set of practices, developed from birth thanks to the contexts into which individuals are born and raised. Literacy practices not only involve ways of interacting with text, but also influence the texts with which a reader or writer is prepared to engage. Following this understanding of literacy as socially embedded, academic literacy (i.e. ways of engaging with certain kinds of texts privileged by the university) is understood as but one literacy in a multiple field. Significant in the context of this study is that literacy practices in the academy are underpinned by values and attitudes regarding what can count as knowledge and how that knowledge can be known (Boughey, 2013). In the field of science, for example, knowledge is understood to exist independently of human thought and action, with the result that objectivity is valued in the process of “coming to know”. In language use, this then results in practices involving the passive, which effectively elide the agency of the researcher.

Gee (2008, 2012) expands the notion of practice to involve all learning practices which are understood to be socially embedded. This would mean, for example, that the willingness of a

student to ask and answer questions in class would be seen as a practice stemming from previous experiences at T<sub>1</sub>, from values related to what can count as knowledge, whether knowledge is “fixed” or constructed through interaction, and how that knowledge can be generated, i.e. through interaction with another person. The social entrenchment of learning is differentiated by Gee (2005, 2008, 2012) between d/Discourses, where discourse (small d) contains a constricted meaning of “language-in-use or stretches of language” and Discourse (capital D) is generally linked with “ways of being in the world” (*ibid.* p. 7). Gee, in his former work, refers to Discourse as ways of “thinking, feeling, believing, valuing, and acting” (1990, p. 143). Gee provides a detailed definition of Discourse in his latter work as,

...a socially accepted association among ways of using language and other symbolic expressions, of thinking, feeling, believing, valuing and acting, as well as using various tools, technologies, or props that can be used to identify oneself as a member of a socially meaningful group or “social network”, to signal (that one is playing) a socially meaningful “role”, or to signal that one is filling a social niche in a distinctively recognizable fashion (Gee 2012, p. 158).

From the above quotation, it is possible to see that there is more to Discourse than just language and/or discourse. Gee (2005) posits that other “non-language” features are characteristic of a particular Discourse for a particular context (p. 7). Consequentially, as a member of a Discourse and to participate fully therein, one need not only be able to speak, read and write, but should also be able to act and use tools and symbols in similar and recognizable ways to other members of the Discourse. It is, however, not well defined where the “boundary” lies in Gee’s definition. When referring to HE, it could be construed as Discourse of disciplines or, more broadly, as Discourse of academic or learning context. The relevance of these interpretations is adopted in this study. As I have mentioned in Chapter 2 of this dissertation, in order for students to participate fully in the construction of knowledge in science, they need more than language, but need to think, act, etc. in ways valued in the discipline. In this study, I argue that some of the ways of being that are valued in the discipline of science are also found in the homes of students in rural areas, and could be used as leverage to access disciplinary knowledge. These ways are discussed in Chapter 6.

According to Gee (2008, 2012) all individuals acquire primary Discourse which is developed by virtue of the social contexts into which they are born or, put differently, through our home socialisation. To conceptualise the world, individuals draw on this primary Discourse. Any number of additional secondary Discourses can be acquired depending on the contexts to which individuals gain access, for example, school, church, social groups, university, etc. (Gee 2012).

In the context of this study, the move from home to university involves the acquisition of one or more academic Discourses (Boughey, 2000, 2013), a process which may be eased by the proximity of the primary to secondary Discourses (Boughey, 2018). The acquisition of secondary Discourses such as those of academic Discourses are therefore secondary Discourses, and by implication, early socialisation at home with practices that interconnect with later school or academic Discourses can make acquisition of such secondary Discourses simpler. Gee (2012) postulates that the impetus of achieving secondary Discourse is not effectively attained through acquiring skills, but rather through developing “values, attitudes, motivations, ways of interacting and perspectives” (p. 155). There is empirical evidence which seems to validate the idea of early socialisation practices (Boughey, 2002, 2008) and prior educational experiences (Chen, 2010; Niven, 2011) and these could considerably enable or constrain access to and uptake of tertiary academic Discourses, including acquiring science Discourse.

Gee defines literacy as “mastery of a secondary Discourse” (2012, p. 173). Since there are many Discourses, there are always multiple literacies. The question arises, how then do we attain such mastery? In this regard, Gee (2012) distinguishes between acquisition and learning. Acquisition is a process of acquiring something and we achieve this through a process of enculturation within a particular social setting, by being exposed to behaviours, models, and language appropriate to the context. Learning is instead a process involving conscious gaining of knowledge and can be taught through the breaking down of things to be learned into component parts, providing “meta-knowledge” on the context (*ibid.* p. 167). Although Gee is adamant that you cannot overtly teach someone a Discourse (for example, you cannot overtly teach someone to “be a Scientist”), he acknowledges that both tacit acquisition and to a lesser extent, explicit teaching (and therefore learning) are both aspects of Discourse uptake, but that explicit teaching should be preceded by implicit acquisition (*ibid.* p. 168). He also suggests that critique of a Discourse can be enabled through teaching. This distinction between acquisition and learning is useful in this study, as it helps explain difficulties students encounter in taking up norms and values not previously encountered. This could be true for students who come from marginalized backgrounds in higher education, including those from rural areas.

Using overt approaches (such as explicit instruction) as a means of enabling acquisition of a Discourse is increasingly mentioned in the literature (Ballard and Clanchy 1988; Boughey 2002, 2005; Marshall & Case 2010). Boughey argues that in order to acquire a Discourse and thus enable epistemological access, we need to focus on “making the rules and conventions of

academic ways of thinking, valuing, acting, speaking, reading and writing overt to students” (2002, p. 306). In science, arguments and explanations are valued. In rural areas, there are instances where arguments and explanations are encountered, and these could be used as pathways to access science Discourse. This point is deliberated on in chapters 6 and 7. However, since much of the knowledge of the Discourse is in fact tacit and very difficult for insiders to articulate, I argue that knowledge resources that rural students bring with them could be used as an effective means of making the rules of the game overt (Jacobs 2007; Allie *et al.* 2009; Chanock, Horton, Reedman & Stephenson 2012; Goozee & Manathunga, 2007; Wilmot & McKenna, 2018).

Since acquiring academic literacies is about taking on norms, values and practices of academic Discourses, where one is required to not only know but also to act and behave in ways that are appropriate for the context, it is also about taking on new identities (McKenna 2004). The idea of identity development, and ontological becoming and being, is therefore an integral part of taking up an academic Discourse, and a result also of epistemological access work. While an understanding of d/Discourse is seen as vital in engaging with issues of epistemic access, it is also necessary to draw on a theory that will allow an understanding of the social aspect of learning, since students and academic teachers are social beings who interact in a world that pre-existed them (Archer, 1995. 1996). An uptake of this theory would enable the kind of teaching and learning that is not decontextualized.

Boughey and McKenna’s (2015) work on the “model of the student as a social being” and the “model of the student as a decontextualized learner” along with the work of theorists such as Street (1984) and Gee (2008, 2012) acknowledges learning and the practices associated with it as profoundly social. From this perspective, there are no “correct” ways of learning per se. Rather, there are multiple ways of learning, with some privileged in some contexts, as they are understood to be more productive. Drawing on understandings which acknowledge learning as social is essential if we are to understand the differences in our universities and the differences in success and failure. The alternative, involving the attribution of success to factors inherent to the individual, is too horrendous to contemplate, given that cohort studies (see for example CHE 2016) unfailingly show that black students experience more failure than their white peers.

## **4.7 Historicity of curriculum structure in South Africa**

In Chapter 2 of this dissertation and section 4.3 above, I have indicated that curriculum is imbued with “culturally emergent properties”. In this way, curriculum conditions learning that has already been put in place prior to social actors (students and academic teachers) beginning to interact with each other. Curriculum events were structurally and culturally conditioned at T<sub>1</sub> before these social actors experienced these curriculum events, thanks to apartheid and colonialism. A detailed discussion on these socio-political and historical structures has already been given in section 4.3 and section 4.4 above. The curriculum reforms, particularly those that relate to academic development and students’ support initiatives that have taken place in SA over the years, are commendable (I address these in Chapter 5) but one cannot talk of these reforms without contextualising them.

I have also mentioned that a university in a post-colonial context with structures like curriculum cannot be divorced from the environment in which it emerged. What this means is that one cannot talk about curriculum issues and what they set up for black working-class people in South Africa without referring to socio-political structures informed by colonialism and apartheid. In this way, curriculum could act to construct and imagine the ideal learner or knower; this could be referred to as curriculum’s regulative discourse (Bernstein, 1996). In this way, it is possible to see how content and pedagogy could be regulated given the socio-political context from which curriculum emerges. Given the legacy of apartheid and now coloniality, it is possible to see how curriculum acted to exclude other world views in knowledge construction, thus perpetuating inequality among knowers in classrooms (Leibowitz, 2017b). Racial injustices inherent in the education system in SA have had a tendency to negatively affect the ontological density of black students in most HE classrooms in terms of how knowledge making is perceived, and this has had an effect on these students’ actualisation of their agency, at T<sub>2</sub>-T<sub>3</sub>.

While my intention in this section is not just to re-describe and explore cultural and structural conditions that curriculum might present for students from marginalised backgrounds, I intend to critically show the covert potential of curriculum to be limiting, silencing, constraining and exclusionary, and thus adversely affecting epistemic access for these students. I also show these issues in Chapter 5. Students, especially black students from lower-class and marginalised backgrounds, argue that HE curricula do not resonate with them or their communities (Mbembe, 2015, 2016). Luckett (2016) and Mamdani (2018) have made an important point in that universities in the post-colonial context must be understood in relation to their historical,

political and cultural contexts, and that they cannot be understood independently of the communities from which they have emerged. To this end, Nxakanxaka University could be understood as a Historically White University designed to serve predominantly white and privileged students (Boughey, 2018). This meant that these students, as Boughey (2018) asserts, having been raised from middle-class, educated homes, have already been prepared for the experience of studying and living at an institution like Nxakanxaka University. Their university experience, including that of curriculum, is not too different from their home literacy experiences. In relation to the congruence between home taught ways and mainstream or formal school taught ways Heath (1983) notes,

As school-oriented parents and their children interact in the pre-school years, adults give their children, through modeling and specific instruction, ways of taking from books which seem natural in school and in numerous institutional settings such as banks, post offices, businesses, or government offices. These mainstream ways exist in societies around the world that rely on formal educational systems to prepare children for participation in settings involving literacy. In some communities these ways of schools and institutions are very similar to the ways learned at home; in other communities the ways of school are merely an overlay on the home-taught ways and may be in conflict with them (p. 50).

While the above is true, universities both globally and in South Africa (and Nxakanxaka University in particular) have opened doors so that other population groups can gain access to formal higher education, which is laudable. However, this has meant that HWUs must now accommodate various groups of students, which will require closer attention to curriculum structure and design, its implementation, and how all of this impact on learning and learners involved, what Shay *et al.* (2016) refer to as curriculum conditions. This is especially important given our history of structural inequalities that shaped the SA education system to be unfavourable for certain world views. In this vein, Shay *et al.* (2016) further argue that it is necessary to theorise curriculum structure, particularly curriculum conditions that enable epistemic access. For this, they use a social realist framework informed by the work of Basil Bernstein. I theorise curriculum structure in Chapter 5. Below, I discuss how apartheid and coloniality might have shaped decisions about intended curriculum (Vorster & Quinn, 2017). In this study, a broad view of curriculum is adopted, which includes disciplinary knowledge, learning and teaching methods, methods of assessments, use of technologies, studying methods and resources.

#### **4.7.1 Curriculum decisions: apartheid and coloniality at T<sub>1</sub>**

The legacy of apartheid and its impacts on learning for a black child in SA have been discussed at length in the above sections. In this section, I focus more on coloniality as a condition that could help us understand the socio-historical and political reasons for the persistently skewed educational outcomes in most SAHWUs (Boughey & Mckenna, 2015; Luckett, 2016; Shay, 2015). We can then ask the pertinent question: “What must the world be like for black students at a post-colonial university to experience such educational outcomes?” The answer could lie in the condition of coloniality, which continued beyond colonisation (Grosfuguel, 2011). In line with the theoretical framework of this study, coloniality could thus be understood as a mechanism at the level of the “Real” in terms of understanding the constructs of blackness and whiteness, and how these have been conditioned as a privilege for some and a constraint for others. Maldonado-Torres (2007), a leading philosopher in decolonial thought, has defined coloniality as,

...different from colonialism. Colonialism denotes a political and economic relation in which the sovereignty of a nation or a people rests on the power of another nation, which makes such a nation an empire. Coloniality, instead, refers to long-standing patterns of power that emerged as a result of colonialism, but that define culture, labour, intersubjectivity relations, and knowledge production well beyond the strict limits of colonial administrations. Thus, coloniality survives colonialism. It is maintained alive in books, in the criteria for academic performance, in cultural patterns, in common sense, in the self-image of peoples, in aspirations of self, and so many other aspects of our modern experience. In a way, as modern subjects we breathe coloniality all the time and every day (p. 243).

Also, Maldonado-Torres (2007) asserts that coloniality is a name for the “darker side” of modernity that needs to be unmasked, because it exists as “an embedded logic that enforces control, domination, and exploitation disguised in the language of salvation, progress, modernization, and being good for everyone” (p. 244).

There are three concepts associated with coloniality which could be used to grapple with the issues raised above and thus provide a framework of “dismantling of relations of power and conceptions of knowledge that foment the reproduction of racial, gender, and geo-political hierarchies that came into being or found new and more powerful forms of expression in the modern/colonial world” (Maldonado-Torres, 2011, p. 11). These concepts are understood as Power, Being and Knowledge from the Latin perspective (Wynter, Grosfuguel, Madonaldo-Torres, Mignolo & Lewis Gordon). Ndlovu-Gatsheni (2013), a South African scholar, elaborates on these concepts.

As far as the coloniality of power is concerned, a proposition is made by Ndlovu-Gatsheni (2013) that research should be conducted on how the current “global political environment” was constructed and constituted into an asymmetrical, modern power structure, occasioning unequal relations of power between the Euro-American world observed as the “Zone of Being” and the non-Euro-American world experienced as the “Zone of Non-being”. Coloniality of power, understood as dominance over the “racialised, gendered and disenfranchised political subjects, asserts itself in several means by for example, the aesthetics of being, expression and doing, within and outside the academy in ways that mirror power relations between “Zone of Being” and “Zone of Non-being” (Ndlovu-Gatsheni, 2013, p. 11). It could thus be argued that the knowledge resources that black students from lower-class backgrounds have are located in the “Zone of Non-being”.

The above-mentioned point is further echoed by Sylvia Wynter when she differentiates between “Man” and other “genres of the human”. She postulates that modern Man’s (Euro-descended, middle-class, college educated) declaration of being the pinnacle of humanity regards all other humans (not only racialized peoples, but also the jobless, the incarcerated, the homeless) to be sub- or non-human (Wynter, 2003, 1995). It is then possible to see how humanity has been hierarchically justified to over-represent Man’s interests and subject others to subordinate positions based on his inclination (Stein, 2016). Wynter (2003) provides an analysis of how European modernity necessitated a transfiguration, starting in the 15th century, from a world view that gave supreme power to the church and the desire for salvation, to one that afforded it to the State and secularized knowledge. Nonetheless, such transfigurations were not internally produced within Europe, but rather were enabled through indigenous colonization and black enslavement (Stein, 2016). These events then gave way to both the material and conceptual conditions for the emergence of the West, comprising how the nation-state, capital, and modern university were designed. In this way, one can observe that the world was conceptualised from European conceptions, which then rejected others and their distinct modes of thinking and gave them the status of “alternative modes of being human” (Wynter, 2003, p. 282). The classification of black people as non-human and evolutionarily inferior justified their relegation to the “Zone of Non-being”, maintains Fanon (2008, p. xii).

The second concept, notes Ndlovu-Gatsheni (2013), is that of coloniality of knowledge. The foundation of this concept is based on Descartes’ motto “*Cogito ergo sum*” wherein the white, heterosexual, able-bodied male is recognised as a legitimate thinker. This construct allows an elicitation of epistemological issues, politics of knowledge generation, as well as questions of

who generates what knowledge, and for what purpose (Ndlovu-Gatsheni, 2013). According to Grosfuguel (2013), the reproduction of coloniality of knowledge can be observed in the Westernised University and the post-colonial African university (Mamdani, 2017), in terms of legitimate, scholarly knowledge as well as questions about who gets privileged as a thinker, and the interests that dominate (de Sousa Santos, 2007). To this effect, Mgqwashu (2016) notes that we cannot dissociate the work we do, within our disciplines, from a reflection on its political and institutional conditions.

Writing about legitimate scholarly knowledge, Boughey and McKenna (in press) and Young (2008b) distinguish between powerful knowledge and knowledge of the powerful. Boughey and McKenna (in press), for example, maintain that knowledge of the powerful is the knowledge of those who have previously exerted power over others, or still do, and whose conceptions of the world and subjective missions are often the processes by which theories about the knowledge are explained. So, the powerful often get to decide not only what counts as knowledge, but also how it should be produced and who should be allowed to produce it (Boughey & McKenna, in press). Crucially, these scholars question who gets admitted into the academy and who flourishes within it. They argue that we want to believe that higher education is a meritocracy wherein hard work and bright minds result in success, but the reality is that around the world, middle-class students get rewarded for their privilege. In essence, Boughey and McKenna posit that the knowledge of the powerful is about more than just who gets to access knowledge in the academy, but about who gets to teach it and what it comprises. Arguments against powerful knowledge include the idea of separating knowledge from knowing, and the question becomes: can knowledge be separated from being?

Nyerere (1995, 1968) has argued that the blueprint for colonial knowledge was unequivocally about superseding traditional knowledge forms with the knowledge of those in power, in order to vanquish the colonised. The problems we choose to consider in the university, the lenses we use to consider them, the canon of texts to which we refer, almost all of these emerge from the interests and concerns of a narrow slice of society (Boughey & McKenna, in press). Essentially, those in power have determined who gets to learn, who gets to teach and what gets taught. De Sousa Santos (2014) has also argued against the “abyssal thinking” which normalises and privileges some forms of knowledge while rendering others invisible, by looking at ways in which the historical privileging of particular forms of knowledge has rendered other potentially powerful forms of knowledge invisible (Boughey & McKenna, in press). Our colonial histories have meant that there is a wealth of knowledge that has never been studied for potential

specialization, or, to put it in other words, the academy's powerful knowledge has been built only from the knowledge of the powerful (Boughey & McKenna, in press). Through the above analysis, it is possible to discern the condition of coloniality of knowledge.

The construct of decoloniality of knowledge is then proposed, as it enables one to challenge the above-mentioned patriarchal and heteronormative, racist and ableist positions on knowledge and what constitutes a legitimate thinker. Through decoloniality, the Euro-American agency to determine what counts as knowledge is challenged. To this effect, Ndlovu-Gatsheni (2013) asserts that through decoloniality, the modern world can be understood from the experiences of ex-colonised epistemologies, as opposed to the imperial version of history that has a tendency to universalise how the modern world is understood. In this way, argues Ndlovu-Gatsheni (2013), decoloniality of knowledge should be realised as a crucial measure to challenge the objectification of Africa and her peoples. In that context, Africa and her people should be realised as co-creators of global knowledge rather than objects of study. Colonial history has ensured that other forms of knowledge are not scrutinised for their potential power to be explanatory or to be specialist knowledge. Specialist, principled and/or theoretical knowledge is necessary at university, but this knowledge has been largely built from the knowledge of the powerful. But to be able to reflect on and critique the knowledge of the powerful, students should be introduced to powerful knowledge.

I am, however, aware that not all knowledge is equal. In other words, I have no intention of conflating practices embedded in our knowledge and in our very being but which we cannot pronounce. The concept of judgemental rationality was crucial for this realisation. For example, students from rural areas might be exposed to home practices which have scientific underpinnings. In most rural homes, leaves or roots of trees are used as remedies for ailments (Brendler & van Wyk, 2008). The practice of using leaves or roots to treat, for example, diarrhoea, fever or pain relies on soil pH, chemical constituents, antibacterial and antifungal properties of the plant, but the average student (or even the parent from whom the student might be learning said practice) is unlikely to be aware of these properties. My argument therefore is that students from rural areas can draw on this knowledge, which Bernstein (2000) refers to as horizontal knowledge, to access university knowledge, referred to as vertical knowledge by Bernstein (2000). In light of this, Boughey and McKenna (in press) note that while some forms of powerful knowledge in the academy may have close ties to the "real world" in which knowledge will be used, and others will be more abstracted from the "real", all have in common the fact that they are based on specialised principles and not simply context-based skills. This

is why students should be introduced to knowledge that extends beyond, or is not bound to specific contexts, so that students based in different contexts will still be able to use the knowledge.

The implication for the above discussion is that knowledge that is fixed only to one context, or wherein the underlying principles are not explicit, is not considered to be valuable in the academy (Boughey & McKenna, in press). The emphasis on the ways in which academic knowledge is specialised is not to say that knowledge outside of the academy should be rejected. Importantly, and for the focus of this dissertation, specialisation should never be a basis for denying respect or value to the non-specialist knowledge that people draw on (Boughey & McKenna, in press). Specialist knowledge will not necessarily help one to mix medicine from plants in order to treat ailments, but the difference between specialised and non-specialised knowledge is a difference of purpose and a difference of structure; “it is not a difference of value, except in relation to those purposes” (Young & Muller 2013, p. 231). Recognising the specialist nature of knowledge of the academy should thus not be a rejection of other forms of knowledge. I concur with Boughey and McKenna when they argue that a focus on the specialised, powerful knowledge in the academy is crucial, because any attempts at making higher education success more widely attainable which fail to take the specialised nature of such knowledge into account can have serious consequences for the students involved. However, in the context of this I argue for a curriculum that dialectically “joins the systematising powers of scientific knowledge with rich funds of knowledge from learners’ everyday life-worlds” Zipin et al., 2015, 3).

My research question(s), for example, purposefully and specifically address the issues raised above. They investigate the extent to which students’ existing knowledge and cultural resources are used to frame their acquisition of dominant forms of academic capital, or whether they are excluded. I intend to ascertain how inclusive and living curricula can be developed, building on the experiences of all students, including those from a South African rural context, taking from the broad view of curriculum adopted in this study.

The third concept is that of colonality of being, wherein the ontological density of human beings is put under scrutiny. In terms of colonality of being, we need to engage with the construct that was promulgated by philosophers like Rene Descartes, and the long-term implications of his motto “*Cogito ergo sum*” (I think, therefore, I am) on understandings of subjectivity (Ndlovu-Gatsheni, 2013). Ndlovu-Gatsheni (2013) further notes race as an

organising principle, in that whiteness gained ontological density far above blackness, which essentially meant the dehumanisation or disintegration of being for blackness. This is in line with what General Smuts declared in his talk at Oxford in 1929. Smuts postulated that an African must be de-Africanised because his social and political culture were barbaric and should be discarded in all their forms (Mamdani, 2018).

When it comes to HE, there is the potential for curriculum to present dominant colonial epistemic logic, with its power to alienate, marginalise and exclude people and black bodies in particular (Boughey, 2015; Lockett, 2016, 2012; Ndlovu-Gatsheni, 2013)). If I could take a moment and reflect back on the collective of students as they protested during the #FeesMustFall and #RhodesMustFall campaigns of 2015 and 2016, respectively, it is possible to see that students were able to exercise their agency at T<sub>2</sub>-T<sub>3</sub> as they raised issues about curriculum in terms of its heavy reliance on content shaped by the knowledge of the powerful. Students' utterances resonated with competing views of knowledge and how different forms are valued, recognised or unrewarded.

Curricula have enduring connections with social practices by accentuating what is valued and legitimated as credible knowledge by society. It is not surprising then that the students' protests challenged traditional curricula, with an explicit focus on knowledge and how it serves to include and exclude in covert ways, a point I have been making throughout this dissertation. For this study then, it is important to interrogate the coloniality of power, being and knowledge as they manifest in disciplinary curricula. Based on the above analysis, it is possible to observe how useful a decolonial gaze is in re-describing the structural and cultural conditions of the post-colonial University (Lockett, 2016), as well as their potential impact on the agency of students. The central idea from students is that universities need to question their practices, cultures and curricula to embrace the modern (in this case, African) student (Wilmort & Mckenna, 2018). All of this has profound implications for academic literacy practices, as it is through the development of these practices that many hegemonic academic values are entrenched and perpetuated in our institutions (Clarence & McKenna, 2017; Vorster, 2016).

The colonial matrix of power could thus be confronted by not removing European culture, knowledge, innovations and ideologies, because that would be impractical and parochial (Oyedemi, 2018). The point is to destabilise the hegemony of European culture in representing Africa and its people as unhistorical, underdeveloped, devoid of morality, devoid of knowledge, lacking civilisation and lacking political constitution (Hegel, 1956).

Given the above deliberations, in Chapter 5, I theorise an enabling curriculum structure and thus an enactment that will have the potential to create conditions that would enable epistemic access in the field of science, even for students who come from marginalised backgrounds, including rural areas.

## **4.8 Conclusion**

Chapter 4 has offered various conditioning factors in the structural and cultural domains that shaped human agency at  $T_1$ . I have drawn on the literature to develop, as best I can, an overview of the central conditions for teaching and learning in general, and in the field of science in particular. The focus and purpose of Chapter 4 has also been to establish how created situational logics of complementarity and contradiction have shaped students' success or failure in HE. It has been identified that the existence of largely constraining structures, in the form of historical policies of colonialism and apartheid, and the existing institutional cultures all conditioned the environment within which teaching and learning was undertaken at  $T_1$ , and thus shaped teaching and learning conditions at the  $T_2$ - $T_3$  period. Having introduced the key conditions at  $T_1$ , especially how the curriculum has been conditioned, the study now moves to theorising an enabling curriculum structure and thus an enactment for epistemic access, including students who come from marginalised backgrounds.

# CHAPTER 5: THEORIZING AN ENABLING CURRICULUM STRUCTURE

## 5.1 Introduction

Many of us often use the terms syllabus and curriculum synonymously. While syllabus refers to the topics and content to be covered in a course, curriculum refers to something much broader (Mgqwashu, 2017).

Pinar (2004) defines curriculum theory as the interdisciplinary study of educational experience. Educational experience implies more than just the topics covered in a course. It encompasses attitudes, the values, dispositions, worldviews, that get learned, un-learned, re-learned, re-formed, de-constructed, and re-constructed, as a result of the tuition our students are exposed to through their degrees (Mgqwashu, 2017).

This is clearly beyond getting “good” grades, dean’s commendation certificates, or even summa cum laude passes (Mgqwashu, 2017).

In Chapter 4, curriculum was identified as one of the structures that regulates access to knowledge and knowing (Boughey & McKenna, in press) and it was argued that it has the potential not to treat all those involved equally as legitimate knowers in curriculum events. Persistent coloniality and apartheid legacy, as well as clashes between primary Discourse and secondary academic Discourse, were identified as mechanisms that lead to unequal access to knowledge and knowing conditioned by unequal access to material resources, which then influence who gets access to higher education and who flourishes within it. In this chapter, the argument is extended to theorising how an enabling curriculum could be conceptualised that would have potential positive effects for better educational outcomes for all students.

This chapter thus engages with issues of epistemic access where curriculum, pedagogical issues and assessment practices are discussed. The chapter then moves to pre-theoretical knowledge, that is, the knowledge drawn from rural homes. A section on theorising an enabling science curriculum structure then follows. This is followed by a discussion on how the nature of the disciplinary field legitimizes itself, but in the process alienates some students based on the properties of knowledge and pedagogic practices. The identity of the student is thus affected in the process. The pedagogic device is then proposed to understand how the field could be made to be welcoming to all students. Then the home experiences of students from rural areas are validated in terms of how they could be integrated with formal disciplinary science. The chapter then concludes by engaging with the field of academic development in South Africa, in order to understand the impact of historical inequalities on epistemic access.

## **5.2 Epistemic access: curriculum, pedagogic and assessment practices**

Theorising an enabling curriculum necessitates consideration of theoretical tools that would enable both a conceptualisation of the enabling curriculum structure, as well as the general curriculum reform principles underpinning the enabling structure (Shay, Wolff & Clarence-Fincham, 2016). The potential result for such considerations would be curriculum models or conditions which enable epistemic access and development. Epistemic access could be defined as the ability to access “valid knowledge” of the discipline through pedagogy (Bernstein, 1975, p. 85). It was Wally Morrow (2009) who developed the term epistemological access in the initial post-apartheid era. In doing so, Morrow (2009) underscored the likely disconnect between formal or physical access to the institutions generating knowledge, and access to this knowledge. Morrow’s conviction is that universities play several roles. Not only do they have to give physical access to a varied cohort of students from diverse language backgrounds, cultural backgrounds, classes and geographical home locations, universities must also give access to “epistemic values” (Morrow, 2009, p. 37), for example, the procedures needed to form investigations in the disciplines. According to Morrow (2009), this conviction warrants more than disciplinary content, but also includes how each discipline constructs itself or its identity through language. In relation to this point Mgqwashu (2019b) argues that what is known is overwhelmingly determined by the way it is known in that not only what is known should be the focus of epistemological access but how it is known. This is because disciplines construct knowledge in very specific ways. Mgqwashu (2019b) and Morrow (2009b) further note that it is through our pedagogic practices that we can make explicit what counts as a way of generating knowledge in the disciplines. I engage with the idea that there could be more than one way of generating knowledge in the discipline of science, in chapters 6, 7 and 8; in the process make an argument that canonised or privileged ways of generating knowledge might be biased towards certain cultures, identities and languages.

Muller (2015) brings in Winch’s (2013) argument that epistemic access could be understood as access to both propositional knowledge (know-that), though these propositions “are not isolated but embedded within a conceptual structure” (Winch, 2013, p. 130), and procedural knowledge (know-how), that is, the knowledge of how to do something such as performing an experiment, developing an aim and hypothesis, and so on. This could be said to be access to scientific Discourse. When engaging with issues of epistemic access, it is important to realise the interconnectedness that might exist between propositional (know that) and procedural (know how) knowledge, posits Winch (2003). This relation is crucial when considering that in all

disciplines, there is always knowledge and there are always knowers (Ellery, 2016; Maton, 2014). I engage with the constructs of knowledge and knowers later in this chapter. The knowledge structure is therefore necessary to consider when designing a curriculum that will enable epistemic access, but for this study, what is more important is the identity of agents, both teachers and students. While I acknowledge the necessity of realising the conceptual complexity involved in both know-that and know-how, I also posit that a starting point, whether we choose to stick with propositional knowledge or procedural knowledge, should be to acknowledge the resources that students bring with them in our classrooms, and contextualise the concepts we want to teach in relation to students' lived experiences. This means that we need to think about epistemic obstacles and pedagogic devices, as well as assessment structures that could constrain or enable epistemic access.

Shay *et al.* (2016) and Scott (2019) acknowledge that curriculum structure alone, though necessary for equity of access and educational outcomes, is not sufficient. Shay *et al.* (2016), for example, argue that pedagogic issues and assessment practices, among other conditions, should also be considered. Scott (2019) maintains that curriculum is very important, especially if it is conceptualised broadly, not just as a syllabus, in that while we can worry about the “what” of the syllabus, the “how”, that is the pedagogy and the relationships within it in context, are equally important. This is because particular ways of teaching promote particular ways of learning (Case, 2011). This is one of the reasons why this study maintains that pedagogic practices that do not acknowledge knowledge resources that students bring with them, including students from rural areas, could be constraining epistemic access.

### **5.3 Drawing on pre-theoretical knowledge**

This study draws on co-researchers' personal accounts and discussions to demonstrate how family and community, including religious groups, and study and self-help groups, influenced their learning practices at home, and how these could act as enablements or constraints for epistemic access in the field of science. Through data from co-researchers, I show how institutional cultures embodied in language, technologies, pedagogies and relationships between staff and students influence students' sense of belonging and their academic progress and trajectories at T<sub>1</sub> and at T<sub>2</sub> and T<sub>3</sub>, and thereby propose strategies that could be adopted to support students more effectively at T<sub>4</sub>. I engage with these issues in chapters 6, 7 and 8 of this dissertation. But first, I deliberate on the science curriculum structure and enactment at the research site, in order to establish the extent of its potential for epistemic access.

#### **5.4 Theorising science curriculum structure for epistemic access**

Nxakanxaka University was the setting for Ellery's (2016) study and my enquiry. While I am only engaging with one aspect of the science component from Ellery's study, it does shed some light on the structure and enactment of the science curriculum. The idea here is not just to report on Ellery's study, but to demonstrate how my study appreciates her argument and then extend this argument by drawing on students' home practices in the process of knowledge construction, working toward ease of epistemic access. Ellery's study (2016) draws on the aspects of disciplinary concepts related to a number of disciplines, including Chemistry, Physics, Human Kinetic and Ergonomics, and Geology. For this study, I draw on her engagement with Geology. Ellery (2016) used the social realist Legitimation Code Theory (LCT) to realise that science and scientific disciplines legitimate knowledge codes (Maton, 2014). In this respect, LCT with its tools of specialisation provides a way of understanding the extent to which different disciplines and fields are specialised in different ways. Accordingly, the knowledge code is the field in which it is the acquisition of knowledge, skills and practices that is the core mechanism for legitimation, implying that being a particular kind of knower with a particular set of attributes, a particular way of being in the world is less important in science. But this does not necessarily mean that being a particular knower ... is completely unimportant in science. LCT therefore allows for the fact that there is always knowledge and there are always knowers, but the knowledge code is one in which the core basis of legitimation or recognition and validation in the discipline is the ability to demonstrate knowledge, skills and practices.

Ellery's work focused on Nxakanxka's University Science Extended Studies Programme (SESP), and she investigated teaching done by mainstream academic teachers, since students from the science extended programme are being prepared for mainstream courses. She found that the work that academic teachers do in the mainstream disciplines accentuates a relatively stronger knowledge code.

As far as the discipline of geology is concerned, for example, Ellery (2016) notes that the hand-outs that the academic teacher issues to students demonstrate how such hand-outs focus on geological conceptual knowledge linked to the principles of rock and mineral formation, the rock cycle, and how this links to the theory of plate tectonics. Ellery (2016) further notes that assessment tasks could ask students low-order questions, for example, "State the three main processes involved in rock formation" or high-order questions, for example, "Using a well-annotated diagram, explain the process of subduction in plate tectonics" that draw on the conceptual knowledge associated with the principles of rock and mineral formation. Again,

drawing on Ellery's study, geological procedures for this section of the course are primarily taught in the practical sessions, and one of the laboratory exercises requires identification of the three main rock types based on their origin, composition and texture using a simple key. In a follow-up exercise in the field, Ellery (2016) notes that students are expected to be able to relate broad-scale rock formation processes in terms of the geological features they observe.

By and large, the assessment tasks students with describing the processes that gave rise to a particular feature, such as the shale beds at the road cutting, or the glacial deposits at the quarry (Ellery, 2016). This demonstrates the extent to which students are expected to have a grasp of specialised knowledge. In her study, Ellery observed that it is the relations to the knowledge that are most strongly legitimated in scientific disciplines, including geology. This effectively implies that being a particular kind of knower with particular dispositions is not as important. In this context, Ellery (2016) maintains that student dispositions, behavioural attributes and opinions are significantly downplayed.

Ellery (2016) observes that the categorisation that focuses less on student dispositions, behavioural attributes and opinions in scientific disciplines could be linked to the assessment task on the field trip of the geology discipline. Whilst the stated primary purpose of the geological field trip is to enable "careful, rigorous and systematic observation" notes Ellery (2016), (which could represent student dispositions, behavioural attributes and opinions linked to a particular way of working) marks are allocated instead for correct identification of certain features and correct use of scientific descriptors of rock characteristics, representing less focus on student dispositions, behavioural attributes and opinions. Based on the above discussion, it could be argued that the social aspect of learning in the field of science is not highlighted. This is however, not as straightforward as it may sound here.

Even though Ellery's study (2016) is based on the science discipline, it shows that in the process of knowledge construction, there are always knowers and there is always a way of being, and this could have implications for curriculum and pedagogy and thus, students' success.

## **5.5 Nature of the field: impact on curriculum, pedagogy and assessment**

While the previous discussion has shown that knowledge code is legitimated in the sciences, in some fields, the whole field is just about the way of being, dispositions and attributes of the students that are legitimated, such as in political studies. Mlamuli Hlatshwayo's (2018) study, for example, found that in political studies, although knowing facts, history and theories such as Marxist theory, feminist theory and so on is important, the knowledge of these is not as

important as being a particular kind of knower: a person who is critical and able to form an argument in a very particular disciplinary way in order to be legitimated. This is opposite to the sciences in that, while one has to be a particular kind of knower, this is less important. What is interesting in the above discussion is that, whether we refer to science or political studies, all this is about the nature of the field. So if that is the nature of the disciplinary field, then what does this mean for pedagogy and assessment?

The nature of the field has such an effect on how we teach and assess that if one is a scientist, for example, and has been inducted into the field, literacy practices become common sense (Boughey, 2012, 2013), not just the writing practices but all the practices; the way we act, talk, think, and the way that we form knowledge, which seems obvious. All these events take place at  $T_1$  but can also play out at  $T_2$  and  $T_3$ . If I can refer back to the example of a lecturer, discussed in chapters 2 of this dissertation, at  $T_1$ , she views herself as a scientist and the key form of legitimation for her is knowledge-based, while the way of being and the gaze in the world are not as important as who she is, her identity as a scientist. However, as a teacher, she is not just a scientist but also an academic.

What this effectively means is that the ways of being that have been so successful and have allowed a scientist academic teacher to be the legitimate knower in the field translates into the classroom. It is then possible for the scientist teacher to assume, not consciously in most situations, that her or his job as a teacher is to get through the knowledge and principles in her his teaching and in the process undermines the way of being, thinking and acting in the discipline, which could be crucial in the process of knowledge construction. Ellery's (2016) study shows this in that sciences foregrounds knowledge, skills and practices and backgrounds dispositions. Such pedagogic practices have the potential effect of alienating students because there is no explicit conversation or induction into the ways of being of the discipline (Ellery, 2016, Jacobs, 2007; Mgqwashu, 2019b). This does not mean that induction and ways of being are not important, because they are still there, for example, objectivity, honesty, careful observations, valuing of empirical data and so on. But these are not made as explicit, because they seem to be unimportant compared to the knowledge, skills and practices. But when you look at political studies, the opposite happens, because therein it is all about the ways of being. Students spend a lot of time being inducted into how to debate, argue and take a critical position. In the process, what is often undermined is the extent to which there is knowledge. In chapter 4 I have made an argument to the effect that,

Powerful knowledge provides more reliable explanations ... for engaging in political, moral, and other kinds of debates.... In modern societies, powerful knowledge is, increasingly, specialized knowledge; and schooling, from this perspective, is about providing access to the specialized knowledge that is embodied in different knowledge domains (Young, 2008b, p. 14).

Then, if knowledge is backgrounded, this might constrain students for greater intellectual power for more reliable explanations.

Another relevant example is provided by Mkhize's (2015) study, which looked at accounting. Mkhize (2015) argues that accounting, like science, legitimizes a particular knowledge code and in the process backgrounds students' dispositions. While the discussion regarding political studies and accounting may sound off the current topic, it does shed some light on how the nature of the field potentially affects how we as teachers approach our teaching, with potential effects on students' identities, learning and success. Crucial to my study is that all disciplines require ways of understanding, seeing, knowing and constructing. Some of this is already there in experiences from home. Sometimes, some elements are introduced as if students already understood them, as Ellery's (2016) study has shown; however, they need induction. Others need to be linked to previous knowledge and ways of learning that are likely to ease access to disciplinary knowledge.

In light of the above analysis, Foucault (2003) informs us that our disciplines discipline us. We learn how to see in the way of our disciplines and that we cannot see in any other way. What is interesting from LCT and Ellery's (2016) study, as well as Mkhize (2015) and Hlatshwayo's (2018) studies, is that they all show that the nature of the discipline and the extent to which its knowers or knowledge are validated or legitimated, that is, what it takes to be legitimate in the disciplines, has an effect on curriculum. We develop curricula according to the norms and values of the field or disciplines, which is correct, but in the process, we may underestimate the aspects that are less important in the field, or which are valued in different contexts and cultures. We may underestimate so much in the curriculum that students may not be inducted, or may not even find the space to challenge it, because the way of being as a scientist, for example, is obvious, so there is no need to open a space for debate on what it means to be a scientist, how to act, how to dress or talk. There is no need to talk about these aspects because they are unimportant. What is needed is to get through the knowledge. Everybody knows these aspects, except that not everybody does. So, taking things as they are assumed to be not only alienates students, but also means that it is impossible to challenge these assumptions, because these other aspects are assumed to be obvious. It is only when we become explicit about these and

explain them that they become obvious. Otherwise, if one challenges these other aspects, one will look ignorant. It would seem that they do not understand how things work here.

However, research is beginning to show that in all disciplinary fields, there is always knowledge and there are always knowers (Ellery, 2016; Maton 2014a). On the one hand, this means access to the content of the discipline and what is required to address the requirements of an increasing number of students in engagement with the constructs of academic knowledge and knowing *per se*. Boughey (2012) cautions us that we need to engage with questions of what can count as knowledge and knowing in different disciplines and how these could be made available to students. I have already discussed situational logics presented by curriculum for the “citizens of civil society” and the “subjects of political society” (Archer, 1995, 1998; Luckett, 2016; Mamdani, 2018) in Chapter 4. In this sense, some students find university education more like a continuation of home literacy practices, in which case there is complementarity between primary Discourse and secondary academic Discourse (Gee, 2008, 2012; Archer, 1995.1996), while there is contradiction for other students, particularly those who come from marginalised backgrounds.

The issues that have been raised above are crucial, because when we teach in lecture halls or in the field, we are in the process of meaning making. When it comes to meaning making in the disciplines, ontological and epistemological assumptions come into play. From an empirical point of view, common in science courses, knowledge is viewed as being objective, de-contextualised and certain. In this way, knowledge is understood to be independent of human action and thought, as has been argued in the sections above, and thus has the potential to affect the agency of those involved, for example, students in terms of how they engage with the processes of coming to know in the sciences. Critical realism (CR) shares with empiricists the “notion of an objective reality or world “out there” and the possibility of producing causal explanations, although it differs with it in terms of the nature of causation and the extent to which that reality can be observed” (Hoddy, 2019, p. 113). This discussion was provided in Chapter 2.

From an interpretivist position, knowledge is viewed as being individually (or socially) constructed in particular contexts, and is reduced to knowing (Hoddy, 2018). CR shares with interpretivism the view that social phenomena are concept-dependent (Sayer, 2010) but differs from it in emphasising the role of real structures and mechanisms operating beyond people’s conceptions of their actions and intentions. It is possible to see that CR blends a realist ontology

with an interpretive epistemology (Bygstad, Munkvold & Volkoff, 2016). Critical realism asserts that the world is real in that there are existing objects independent of our perceptions of them and our beliefs, and that our understanding of these objects is socially constructed or concept-dependent. In line with the notions of ontology and epistemology when making meaning in the disciplines, it becomes necessary and important to consider research that shows that when meaning making is just viewed in terms of either empiricist or interpretive conceptualisations “the intrinsic properties and powers of knowledge itself are ignored” (Muller 2000, p. 57) as well as the impact of such properties on the material element of social life (Bhaskar 2016; Sayer, 2010).

## **5.6 Structural powers and properties of knowledge**

In this study, I have used in-depth focus group discussions and interviews wherein questions about connections between the home and academic environments and their impact on students’ “sense of being”, as well as their values and attitudes towards knowledge and knowing, were asked. In this respect, knowledge is treated as an object in its own right (Maton, 2012), with its own structural powers and properties (Archer, 1995). This allows the connection between the local knowledge of students and academic knowledge to be investigated. More specifically, the interviews investigated the impact of the home on the “ways of being and knowing” which are legitimated in academic environments, and which may act as constraints or enablers of success. The nature of the study allows an investigation of the potential clashes or connections between Discourses and environments over time. These issues are discussed at length in chapters 6 and 7.

Having mentioned that knowledge has its structural emergent properties, Young (2008a) argues against what could be termed “knowledge blindness” (Maton, 2014, p. 7). Young maintains that there is a great deal of literature on the sociology of education which questions the extent to which knowledge is accessible to all, or whether it reproduces social inequalities. Furthermore, he posits that there is a wealth of literature on education as a social structure, but there is very little literature on knowledge as a mechanism, which then constitutes knowledge blindness. Surely, one might argue, all educational research focuses on knowledge, but a lot of it focuses on the role of education in society, either to reproduce or to dismantle inequalities. This is important, it is good, but it does not necessarily focus on the idea that knowledge looks different in different fields, and that has effects on the curriculum and students’ dispositions as I have demonstrated in sections 5.4 and 5.5 above. Therefore, an understanding of how knowledge is structured in the discipline of science is crucial. This understanding could provide

space for a realisation of the importance of the social aspect of learning, in that even though students need to acquire knowledge of the discipline, as we now have students from different backgrounds, simply focusing on knowledge could be alienating for some.

In order to account for the social aspect of learning, social realism was adopted in this study as a practical explanatory theory that has, as its focus, social phenomena (Archer, 1998). In the educational field, it calls particularly for a focus on knowledge as an object of study. Social realism recognises the social nature of knowledge production, though it also allows for knowledge to have an objective reality and thus cannot be completely reduced to the social (Ellery, 2017; Hoddy, 2018). When knowledge is regarded in the ways mentioned above, it is then possible to consider it as an object of study that has structure, emergent properties, tendencies and powers of its own, all of which can have consequences for learning and thus shape students' identities in either enabling or constraining ways (Archer, 1998).

## **5.7 The identity work**

The discussion on the nature of the field, knowledge and knowers seems to compel us as academics to consider the kinds of knowers our curriculum would shape (Ellery, 2016; Mgwashu, 2017). Whether we are teaching in the Extended Curriculum Programmes (ECPs) or at the mainstream level, in addition to the teaching of knowledge in ways that are informed by a social realist understanding, our key target should also be the identity of a student, that is, our practices should provide access to the practices of the university itself. The argument is that if the focus is only or largely on knowledge, the curriculum might tend not to focus on dispositions and ways of being among students; however, I am arguing that it should, especially given that we are not dealing with a homogenous student body in terms of ways of being, prior knowledge and so on. This could allow a condition wherein home learning practices with scientific underpinnings could be explored.

The above argument could be extended, for example, if we look at how the ways of engaging with texts encompasses socially derived dispositions which have been privileged over time, and how these can function to exclude those who have not had access to the social groups in which these practices dominate (Boughey, 2017). Not considering the social aspect of learning would not be favourable for students who come from marginalised backgrounds, including rural areas. Boughey (2017) in her address titled *Transformation of student support at Rhodes University* succinctly puts these historically developed ways of engaging with texts in the following quotation,

Developing these socially embedded ways of engaging with and relating to texts often impacts on the very “being” of individuals who are discomforted as they do not understand the purpose of what is being required of them because the practices themselves are rooted in values and attitudes about what can count as knowledge and how it can be known which themselves are alien. This sort of understanding requires a very different pedagogical approach to traditional instruction in “study skills”. Even more significantly, it shows how practices differ according to the disciplinary context. Reading and writing in science is different to reading and writing in other areas (p. 1).

Contrary to what Boughey describes from the quotation above, many courses including sciences (see chapter 7 on findings from academic teachers), there is little consideration for who the students are that we teach and how they access the values and ways of being of the disciplines. In order for our practice in HE to draw on what counts as knowledge and knowing in the disciplines, the social aspect of learning should be considered.

## **5.8 The socio-cultural and political nature of learning**

In order to critically engage with and theorise an enabling curriculum structure and thus enactment, given the deliberations above, this study proposes the need to draw on explanatory theory that will allow us to understand learning in our universities as profoundly social, cultural and political. Examples of such theory have been given in the work of Archer (1995, 1996) in Chapter 2, Street (1984) and Gee (2008) in Chapter 4 of this dissertation. To further engage with the notion of epistemic access, I refer to Bernstein’s (1996, 2000) construct of discourses<sup>6</sup>, knowledge structures and pedagogic devices.

### **5.8.1 Discourses and knowledge structures**

As far as discourses and knowledge structures are concerned, Bernstein uses the metaphor of “vertical” modes of knowledge that characterise intellectual disciplines, and compares this to “horizontal” modes that characterise social spaces of everyday life. For the purpose of this study, this horizontal metaphor helps to establish to what extent practical, contextualized and segmented knowledge could be used as a basis for accessing the more abstract powerful or vertical knowledge of the discipline of science, which is independent of context. Vertical discourse is the discourse which is valued in a formal educational environment.

The vertical discourse of the structure of knowledge is further differentiated into horizontal and hierarchical knowledge structures (Bernstein, 2000). Horizontal knowledge structures are

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<sup>6</sup> The construct of discourse from Bernstein’s perspective relates to social activity, as opposed to Gee’s employ of the term which relates to language use or Discourse, that is, interconnection between the ways of thinking, feeling, believing, valuing and acting.

constituted by the intellectual fields where knowledge is built through the accumulation of new language or theories, and it grows through competing claims constituting an ideological foundation. As such, who is making the knowledge claim as opposed to what the claim is, is legitimated (Maton & Muller, 2007). Such fields could include humanities. I have already alluded to the horizontal knowledge field in section 5.4 above regarding political studies. Hierarchical knowledge structure is constituted by fields which build their knowledge by linking and subsuming previous knowledge into more general propositions and theories and have an epistemic or empirical foundation; such fields could include natural sciences.

What is relevant to the discussion above is that whether the focus is on humanities or natural sciences, discourses, particularly academic discourse, involves,

...the use of specific register and vocabulary (including scientific terminology) that implies acceptance of a certain history of ideas, while also demonstrating competence in current ideas... academic discourse includes ways or conventions of speaking, writing and even behaving that can be recognised by others in a certain subject field or situation. It includes shared values and beliefs, as well as the language style, vocabulary and expressions used by all the members of the discipline (Balfour, Mitchell, Seligmann & Shoher, 2014, p. 26).

The above quotation informs us that a d/Discourse has a practical and valuable function, in that it should ideally enable a member of an academic group to communicate successfully with others in the same community, such that their thoughts and ideas can be swiftly and deeply understood. In that way, a person can indicate membership of a specific community. However, we have learned in Chapter 4 (through Nancy Fraser's notion of *mis-recognition* and *mis-framing*, Heath's notion of home literacies and formal school literacies, as well as Morrow's construct of epistemological access and Gee's construct of Discourse) that some students might find it extremely difficult to access the norms and values of the discipline, simply because what they bring with them is not recognised or valued in formal education.

It is then possible to see that d/Discourses have political or power-related implications (Balfour, *et al.*, 2014). For example, if students can use disciplinary discourse in the ways discussed above, then they become "insiders" to the academic community, or "outsiders" if they cannot. This could be true if we refer back to section 5.4 above, where in some subjects it is only the knowledge, skills and practices that are valued in knowledge construction, while in others it is the knowers and their dispositions that are valued. Here we run the risk of alienating some students in our teaching, while validating others and their home ways of being. This point leads

me to theorise about enabling pedagogy, which could have positive educational outcomes for all students regardless of their home geographical location, class or cultural backgrounds.

### **5.8.2 The pedagogic device**

Bernstein's pedagogic device is relevant in this study as an explanatory framework to engage with the notion of epistemic access. Through a pedagogic device, Bernstein (2000) demonstrates the correlation between the field of production, the field of recontextualization and the field of reproduction. In the field of production, knowledge and specifically specialised but not everyday knowledge is generated, arranged and adjusted. Such processes usually take place in universities or other research institutions. The knowledge structure in the field of production is said to be hierarchical or horizontal, and it is in this field that the "relationship between power, social groups, forms of consciousness and practice" is delineated (Bernstein, 2000, p. 28). Through this regulation, it is possible to establish who has access to what knowledge and under what conditions, thus ascertaining the "limits of legitimate discourse" (Bernstein, p. 79). If, for example, formal school knowledge is legitimated in higher education, then there could be little or no room for informal, everyday or home-based knowledge resources that students bring with them, especially students from marginalised rural backgrounds. However, when knowledge is recontextualized into curriculum, teachers have an opportunity to tap into knowledge resources that students bring with them, though of course this will depend on teachers' ideological inclinations.

The field of recontextualization is where knowledge is recontextualized or transformed into curriculum or pedagogic discourse. This is the context wherein intellectual knowledge from the field of production is transformed into pedagogical knowledge and is designed into curriculum. Pedagogic discourse would have implications for disciplinary discourses including, but not limited to, physics and chemistry or geology; as well as educational discourses involving theories of learning and teaching. If I can refer to an example I made in Chapters 2 regarding a teacher joining the university in the Faculty of Science, which translating knowledge into pedagogy, she will be influenced by her ideological persuasions, beliefs and values, or simply put, her teaching philosophies. For example, if the academic teacher assumes her pedagogic practice from a knowledge standpoint and not so much from a knower's perspective, then that is her identity as a scientist. However, as a teacher, one is not just a scientist in the laboratory, one is also an academic, and is also teaching, a point I made earlier. The two discourses involving pedagogic devices could help in highlighting this point.

According to Bernstein (1996, 2000), there are two mechanisms encompassing pedagogic discourse: “the discourse which creates specialised skills and their relationship to each other as instructional discourse, and the moral discourse which creates order, relations and identity [as] regulative discourse... the instructional discourse is embedded in the regulative discourse, and the regulative discourse is the dominant discourse” (1996, p. 46). These mechanisms or discourses are further underpinned by three sets of internal rules: the rules of hierarchy of the regulative discourse, rules of discursive order of the instructional discourse, and the rules of criteria of both the regulative discourse and instructional discourse (*ibid.* p. 13).

The implication for the above is that teaching is not simply the transmission of skills and knowledge in terms of instructional discourse, but also of moral and social order; relations between the transmitter (academic teacher) and acquirer (student). This relation will in turn influence the acquisition of rules of social order, character, and conduct in the pedagogic environment and thus condition the identities of transmitters and acquirers. These are the underpinning rules of hierarchy of the regulative discourse. In a university lecture hall, for example, the moral order that might be transmitted, either wittingly or unwittingly, could be the moral order of inequality, and this could have consequences for students’ identities and their success rates. Inequality would thus be construed as different learning abilities inherent in individual students (Boughey & McKenna, 2015; Rose, 2006).

For this study, the learning environment and epistemic environment are of paramount importance. It has been argued that in most higher education institutions, black students, particularly those from working-class backgrounds, bear the brunt of failure. This could be explained from the pedagogic device. Both the regulative discourse and instructional discourse are underpinned by rules of criteria, or evaluative rules. These rules define what is valid knowledge and learning in the pedagogic and learning environment, forming part of the final field of the pedagogic device, the field of reproduction. In this field, curriculum is transformed into pedagogic practice by way of regulated evaluative rules “condensed” into what counts as valid knowledge and how this could be made available to students (Bernstein, 2000, p. 36).

Through the concept of condensation, we can begin to engage with the construct of enabling or constraining curriculum, or put differently, the question of epistemic access, because we can ask questions about what knowledge is and to which social groups it is being distributed. It has already been argued in this study that there is close proximity between primary Discourse and secondary academic Discourse for some students, especially those from middle-class educated

families, and there is complementarity between the ways of coming to know from home and at university for these students. This might be different for other students, especially those who come from lower-class, marginalised backgrounds, including rural areas. The implication for this is that some students are consistently able to actively engage in classroom activities, to respond successfully to teacher questions (the primary means by which we interact with our students), and to succeed in assessment tasks (Rose, 2006). This condition leads to a situation wherein some students experience curriculum or knowledge that is legitimated in higher education as their pathway to the future, while unsuccessful students eventually come to experience it as irrelevant, even alienating (Rose, 2006).

### **5.9 Shortcomings of Bernstein's theory**

While Bernstein's work is important for this study in explaining why some students might find higher education alienating, given his focus on the social processes of power and exclusion as discussed above, it does not engage with the structure of knowledge itself. However, through the use of critical realism and a decolonial gaze, as well as by combining this with Bernstein's theories, it then becomes possible to investigate the social conditions of power relations associated with knowledge production, recontextualization and reproduction, as well as the structures and content of knowledge itself. This includes the underpinning epistemic nature of knowledge, as well as how these structures and cultural conditions in the post-colonial university set contradictions experienced in curriculum by black students. I have also argued in the preceding sections that while some disciplines legitimise knowledge, skills and practices and others validate knowers, both knowledge and knowers are important when it comes to knowledge construction in the disciplines. What students bring with them, their dispositions, identities, and knowledge resources, are important if we are to engage with the construct of epistemic access. It is for this reason that the knowledge resources that students from rural areas bring with them into higher education could be explored as leverage for epistemic access.

### **5.10 Drawing on and validating rural students' home experiences**

In her Independent Research Project (IRP), which she conducted with students from Science Extended Studies Programme (SESP) at the research site, Ellery (2011) has shown how the design of the project allowed students to draw on their everyday knowledge to "gain Scientific knowledge, concepts and skills" (p. 1081), in order to improve epistemological access. Scientific knowledge is generally abstract and decontextualized in order to expand findings and pronounce objectivity and quantitative measurement (Vygotsky 1987; Bernstein 1999). The abstracted nature of science could be said to be one of the reasons why learners often find

scientific knowledge difficult to access (Daniels, 2001; Ellery, 2011). Contrary to scientific knowledge, Ellery (2011) notes that the attainment of everyday knowledge from a particular socio-cultural work or life context could be used as a pathway to access scientific knowledge. A number of studies have argued that valuing what students already know from their local contexts in the classroom is likely to enable participation in knowledge construction (Fataar, 2018; Mggqwashu, 2019b; Zipin *et al.*, 2018). This acknowledgement is likely to allow students to see that what they can already do, in the sense of coming to conclusions based on observations they make of the world around them, is valued in formal disciplines, including science. Heath (1983) attests to this by asserting that children's environments are partly responsible for the meaning and sense they make of the real world around them. Ellery and Lotz-Sisitka (2011) also maintain that drawing on cultural knowledge from students could encourage them to make explicit what they know and understand, as well as integrate such knowledge into more abstract, academic contexts.

Using IRP, Ellery (2011) argues that IRP presented opportunities for students to work with their everyday knowledge in a scientific context. Reporting on data from her study, Ellery (2011) shows how one student's mother had always sprinkled rooibos tea around the base of vegetables to improve growth, which led the student to examine its chemical properties in order to explain the results of her study. In her oral presentation, another component of the IRP, the student commented on her mother having been right all along, and that she was proud she could now provide a scientific reason for her mother's beliefs, maintains Ellery (2011). According to Ellery (2011), this everyday knowledge was justified and this yielded a platform for the student to access complex scientific knowledge in a productive and meaningful way. This could be said to be one way of transforming curriculum so that it is living and inclusive. However, students should be made aware of not misreading the academic context by just adopting understandings carried from home backgrounds into the university (Boughey & McKenna, 2015), rather such understandings should be contextualised into academic contexts.

Another local practice in rural areas involves the use of primitive technology in roof thatching. According to Zinyeka (2013), for example, there are several concepts regarding this practice which are amenable to scientific principles, facts and experiments. Such concepts relate to shapes, force, materials and angles in terms of support and balancing. There is thus a potential integration of ways of knowing involved in the development of indigenous practices; however, such integration does not suggest that local knowledge should be included under the banner of science (Hodson 2009).

From the examples provided above, it is possible to see that the idea is not to replace Western modern science and civilisation and head back to survival prior to Euro-American innovations, medicine and so forth, but to blend the Western with the local in a form of hybridity, and in the process disrupt the centrality of European culture (Oyedemi, 2018). Critically, it is the case that an analysis of how knowing came to be could assist students in understanding the development of scientific knowledge and thus, knowing.

There are policies that have been developed in SA to address the challenges that non-traditional students face in higher education. I deliberate more on these policies in section 5.11, but note the gaps in these policies in relation to the experiences of these students, particularly black students from marginalised backgrounds (Hlatshwayo & Fomunyam, 2019).

Bernstein's explanatory theory and the realisation of the intrinsic powers of knowledge and a decolonial perspective could be useful in allowing reference to students' local forms of knowledge. These issues are addressed in chapters 6 and 7.

However, it is not enough simply to have explanatory theory, particularly in the context of science, where the social is usually ignored in favour of understandings of reality that are objective and independent of human thought and action. Archer's social realist framework, which is based on Bhaskar's stratified ontology, are therefore proposed as ways to account for the relativism of human experience and the realism of an absolute world (Hoddy, 2018). Scientists are usually sceptical of relativism. The ability to acknowledge an absolute world while, at the same time, also recognizing the relativity of human experiences and observation can therefore be appealing, particularly in contexts where scientists are increasingly being called upon to work in teams with social scientists in order to solve complex problems.

More importantly, in the context of the rigorous theoretical framing such work offers, this study argues for the need to draw on the ways of knowing and the knowledge that students bring with them into our universities, in order to validate them as individuals as well as to contribute to their success. Such theorising would not be enough without contextualising it in terms of how academic support and development have been conceptualised in the South African higher education sector.

## **5.11 Academic development in South Africa**

The impact of historical inequities on epistemic access cannot be underestimated and has been widely raised in literature as a major conditioning factor (Boughey, 2012, 2013; Boughey & McKenna, 2015; Lockett, 2016). While one of the transformation goals of the National Development Plans of 2001 was to widen access to HE, constraints as a result of apartheid-generated inequities at T<sub>1</sub> severely affected epistemic access. Widening access in South African Higher Education took place after the 1994 political transition, and this meant increased enrolments which saw the student body almost doubled at T<sub>1</sub> after 1994. In addition, the number of disadvantaged students in the HE system increased over this period at a higher rate than those of students from advantaged backgrounds, which has important implications for the kinds of teaching required. Historically White Universities (HWUs) mostly experienced an influx of diverse student bodies, and this posed new challenges for teaching development work in terms of responding to issues of equity in access and success. The field known as academic development (AD) has been crucial in shaping teaching development in the SA HE sector. While the focus of AD has been on staff development, this field has also incorporated student development, including but not limited to, the provision of language courses, extra tutorials and offering of an extended curriculum (McKenna, 2012).

It is important for this study to engage with the emergence of teaching and development in HE in SA, and how such development has been conceptualised to enhance teaching and learning. Because of the history of apartheid in SA and the inherited curriculum from such history, it is important to note that the inherited curriculum led to the unequal treatment of all those involved in curriculum events. Given the lens used in this study to understand the world we want to explore, the historicity of events and mechanisms that might have led to those events is necessary to investigate. In this case, the historical development of AD in SA is crucial in order to understand how curriculum reforms have evolved and how these have shaped teaching and learning in SA HE. According to Volbrecht and Boughey (2004), the history of AD in SA could be categorised into three stages: “Academic Support”, “Academic Development”, and “Higher Education Development”. This historical development is located at T<sub>1</sub>.

Exploring the history of academic development could help in understanding the conditions that shaped curriculum structure and enactment at T<sub>1</sub>, and the emergence of curriculum events between T<sub>2</sub> and T<sub>3</sub>. The emergence of curriculum events in each period could be drawn from environmental factors and dominant discourses and what these support mechanisms should

entail. Discourses are understood as mechanisms that enable or constrain human agency, to engage as full participants in the construction of knowledge.

Discourses are not the only mechanisms at play in the ways in which events (such as curriculum events) emerge, or the ways in which events are experienced (captured as co-researchers' group discussions, digital documentaries, and teachers' focus groups reflections on such curriculum events). Multiple mechanisms in the structural and cultural domain would all exert power over how the science curriculum is structured, enacted and experienced, but I am particularly focused on the discursive mechanisms in order to make better sense of the ways in which the participants' experiences related to the emergence of their agency. Agency refers to the ability to take action (Porpora 2013), or the ability of agents to work with the given culture and structure to pursue their own personal projects (Archer 1995, 2000). The ideological understanding of AD work was another mechanism which led to how this work was implemented in HE institutions, and this is delineated in the following literature.

### **5.11.1 The academic support phase**

The history of academic development in South Africa has been well documented (Volbrecht & Boughey 2004; Boughey 2007a). Recently, a consideration of structural, cultural and agential underpinnings of such development has added depth to this narrative (Boughey & Niven 2012; Boughey 2012). In the early 1980s, this development was termed the Academic Support phase (Boughey, 2010, 2012a; McKenna, 2012). During this period, white liberal universities in South Africa provided physical access to meagre numbers of African students. The political system of discrimination against Africans ensured poor access to material resources, and inferior education, so when these students enrolled they were perceived as “disadvantaged” and “underprepared” for higher education (Boughey & Niven, 2012)<sup>7</sup>. The Academic Support initiatives were therefore equity drive, designed to support students in their studies and thus correct their “deficiencies”. This phase tended to be characterised by interventions such as add-ons, practical life skills, language courses (such as English for Academic Purposes, Communication Skills and Academic Literacy Life Skills) and tutorials. These had a remedial

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<sup>7</sup> The construct of the phenomenon of ‘disadvantage’ and ‘under-preparedness’ was perceived as a minority problem specific to Black students. Boughey (2010, p. 5) maintains that during these early approaches, widely held conceptions of disadvantage tended to rely on common sense assumptions in constructing students as (i) lacking skills; (ii) experiencing gaps in conceptual knowledge areas; (iii) in need of language development and (iv) lacking the ability to think critically.

focus on the students as having gaps that required fixing outside of mainstream academia (Volbrecht & Boughey, 2004; Boughey & McKenna, 2016).

The above-mentioned interventions have been critiqued because of their focus on locating the capacity to learn and succeed in HE in an individual's ability, motivation and intelligence, a point raised in Chapter 4 of this dissertation. In this way, these interventions saw learning and teaching as apolitical, asocial and acultural (Boughey & McKenna, 2016, 2010; McKenna & Boughey, 2004, Street, 1984). These discourses were prevalent at T<sub>1</sub> and they conditioned approaches to teaching and development interventions at T<sub>2</sub> - T<sub>3</sub> (Boughey & McKenna, 2016). In the early teaching discourses, learning and teaching were seen as neutral and acontextual, such that the capacity of the student to construct knowledge and meaning rests within themselves, and responsibility for success therefore lies with the student; the teaching practices and the institution are absolved (Boughey, 2012a; Quinn, 2012).

Locating the above discussion in terms of critical realism, it is possible to realise the construct of upward conflation (Archer, 1995; 1996), which privileges human agency and sees society as created by human action. Therefore, all causal powers were assumed to be situated in the agents<sup>8</sup>, thus excluding the roles of cultures and structures in the learning process.

It is possible to see that the interplay of mechanisms in shaping students' success or failure was not considered in this phase. This inconsideration then led to the inability of these discourses to attend to the institutional constraining cultures and structures in the development of teaching and learning (Volbrecht and Boughey, 2004; Quinn, 2012; Maphosa, 2014). The dominant understanding was that the challenges that students faced could be addressed independently of specific disciplinary context (Boughey, 2010).

### **5.11.2 The academic development phase**

The early practices of academic development (AD) focused mainly on small-scale, marginal efforts aimed at addressing students' "deficits", thus, these practices were unable to address systemic issues to do with institutional under-preparedness in dealing with a heterogeneous student cohort. The political upheaval in the 1980s led to the demise of the apartheid system, and this resulted in major shifts in the political and educational environment. One of these shifts was the introduction of the AD phase in some institutions in the 1990s, such as the University

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<sup>8</sup> Comprehending student success and failure as principally emerging from attributes inherent in the individual is not only guilty of upwards conflation, as this disregards the role of structures and cultures, it is also guilty of identifying the student as the only agent, with petite reflection for how the attributes inherent in other agents, such as academic teachers, might also play out.

of Cape Town, University of Natal, Rhodes University and Witwatersrand. In these institutions, there were “attempts to embed AD in faculties and departments in an attempt to bring about change in mainstream practices related to teaching and learning” (Boughey, 2013, p. 15). The political and educational shifts to the Academic Development phase (Boughey, 2012a) were cognisant of theories that conceptualised learning and teaching as “social practices and not socially and culturally dis-imbedded and as learning and achievement in learning being dependent on factors inherent to the individual such as intelligence and skills” (Boughey, 2013, p. 8). The AD phase coincided with the academic support phase, but under the AD phase, the constructs of “disadvantage” and “under-preparedness” were beginning to be differently understood as a broad-scale initiative aimed at addressing curriculum and staff development in order to bring about institutional change. This aspect is important in this study.

It was in the AD phase that the practice of linking student failure to students’ innate abilities was critiqued. Given the theoretical development during this phase, AD practitioners acknowledged that learning is not neutral, and therefore needs to be embedded in a broader context of environmental structures which involve teachers’ “under-preparedness”, curriculum constraints and limitations in pedagogic practices. These developments later influenced the cultural domain of how teaching and learning was theorised and understood. But this understanding did not culminate in similar practices in all South African HE systems, such that theorising AD could not be realised in some institutions due to structural constraints, including staffing matters. This led to common sense approaches toward the support phase (Boughey, 2012a; Boughey & McKenna, 2016).

The composition and operation of academic development has changed from one phase to another over the past 30 or so years. This change has emerged consequential to the interplay of mechanisms, including, but not limited to, structural factors, the enrolment of more marginalised groups into both Historically Disadvantaged Institutions (HDIs) and Historically Advantaged Institutions (HAIs), and cultural factors, a different orientation in the theorisation of teaching and learning work through research and practice. In addition, the work of organisations such as the South African Association for Academic Development and the South African Journal of Higher Education was significant in shaping the practices that began to emerge. Also, the agential work by educators who were part of these institutions led to them being able to publish on and apply the new practices in their respective spaces (Boughey, 2010, 2012a).

The above-mentioned changes from one phase to the next were enabled in some contexts as they were complemented by structural developments. In these contexts, practitioners were beginning to get involved with course content and academics were getting involved in the teaching and learning activities, including staff development (Boughey & McKenna, 2016; Case, 2013; Leibowitz, 2014; Lockett, 2016).

Reporting on teaching- and learning-related data produced as a result of the first cycle of institutional audits in the South African higher education system, and writing from a critical realist perspective, Boughey and McKenna (2016) have identified elaboration or morphogenesis in the domain of structure. These authors note that in all the universities that they investigated, there had been an establishment of committees and other organisational structures, such as teaching and learning strategies. Another significant structural development highlighted by these authors during the AD phase was the development of teaching and learning centres as support structures. These structural developments resulted in the establishment of programmes intended to promote the development of academic staff as educators in HE, either in the form of full programmes at the postgraduate diploma level, or as short courses. As much as there was morphogenesis in the structural domain, Boughey and McKenna (2016) have also identified morphostasis or reproduction in the domain of culture, in that teachers were also likely to draw on discourses which were less productive of more positive events and experiences, and so were arguably less effective in contributing to change. This was likely as a result of the construct of the “decontextualized learner”, discussed in Chapter 4.

So, while there was an acknowledgement of the increasing numbers of first-generation black students, and a realisation by practitioners to work with pedagogy and curriculum and teacher preparedness, there were some challenges and resistance to change. It is important for this study to find out what data is providing in relation to elaboration or reproduction in cultural or structural domains of teaching and learning in the field of science at the research site.

The emergence of the AD phase in some institutions brought with it an understanding of teaching and learning as social practices, and this led to the development of a third phase, acknowledged in literature as the Institutional Development phase.

### **5.11.3 The institutional development phase**

While the third phase of AD is referred to as the institutional development phase (Volbrecht & Boughey, 2004; Boughey, 2007a, 2010, 2012a), there is a significant intersection between phases such that features of each still continue this day. All these phases were/are an attempt by the democratic South African government and universities, especially white liberal universities, to address the imbalances of school education wherein the majority of African learners were subjected to an inferior school education due to prior apartheid policies. In order to bring about institutional change to address students' "deficits", as these African learners were perceived to be "underprepared" for university education, initiatives aimed at addressing curriculum and staff development emerged as efficiency discourses. In this sense, there had to be an improvement and reinforcement of structures for appropriate and efficient realisation of the academic development work. This also meant that justifying constructing students as "underprepared" was questionable; instead, this phase necessitated that academic teachers accept and act on the construct of underprepared institutions (Boughey, 2007a, 2010, 2012a; CHE Report, 2013; Vilakazi & Tema, 1985).

Teaching development interventions were thus conceptualised through the discourse of academic efficiency, where in the work of academic development, movement was constructed "as a resource for institutional efficiency in relation to teaching and learning" (Boughey, 2012a, p. 23). According to Maphosa (2014), it is through institutional development discourse that the establishment of teaching and learning centres in various institutions is facilitated. While there is a significant impact that academic development centres have at various universities and faculties, such an influence varies depending on dominant cultures and structures within institutions (Lockett, 2012). Structurally, some units are endowed with academic teachers in possession of doctoral qualifications, who are producing research in the field, while other units are bestowed with teachers on contract and therefore have constrained HE proficiency (Quinn, 2012; Vorster & Quinn, 2018). There are thus various constraining or enabling factors in place in the discussed structures, in terms of providing strategic guidance to the university regarding teaching development. For this study, it is interesting to establish the extent to which these structures have enabled or constrained epistemic access, or put differently, whether institutions like Nxakanxaka University have been able to prepare themselves not only for physical access of students who come from rural areas, but whether these students are able to see curriculum as something not divorced from who they are, allowing them to draw on their primary Discourse to access secondary academic Discourse.

These students are mainly black and come from marginalised backgrounds. Research shows that black South Africans perform less well academically than their white peers (Boughey, 2007, 2012), regardless of the university at which they are enrolled, their subject area or the type of qualification for which they are registered (CHE, 2016; Scott, Yeld & Henry, 2007). This condition has necessitated, at institutional level, attempts to manage success, throughput and drop-out rates, by appointing key agents such as deans and deputy vice chancellors responsible for teaching and learning. Data in Chapter 7 of this dissertation is analysed to reflect on these agents in terms of the university structures and cultures enabling or constraining the success of students from rural areas. At a national level, apprehension about the general performance of the higher education system has led to the establishment of Teaching Development Grants and later, University Capacity Development Grants (Moyo, 2018), mechanisms which offer “earmarked funding aimed at enhancing the quality of teaching and learning” (Boughey, n.d. p. 1).

While the above initiatives are commendable, recent research (Hlatshwayo & Fomunyam, 2019) shows that black students’ experience of education is not given sufficient attention. These scholars argue that black working-class students’ experiences in HWUs are “complex and at times contradictory, with some seeing the value of the programme and others rejecting it and looking at it as an extension of their marginality in historically white higher education” (p. 1). Expressing the contradictory nature of the initiative, one of the participants in a study said that,

“I hated it [AD programme]. I used to hate it. I never understood. I didn’t get why I was in foundation they gave us the lecture and said it’s not a bridging course but a foundation course. Giving it a fancy name does not help and I got 38 point and I need 40 points for mainstream. Foundation is for black people. I’ve never seen a white person in foundation phase. And I hate the term “for previously disadvantaged people”. Who said I was previously disadvantaged? What makes me disadvantaged? Because it’s nothing but the colour of my skin because I was never disadvantaged. I don’t know how apartheid feels because I wasn’t there. The foundation programme was tedious. I got bored very quickly. I had a fixed timetable for the whole year. I got bored in three months and I had to stick it through.”  
(Lolo, black female).

The above quotation reveals the frustrations that black students from working-class backgrounds sometimes experience in HWUs, which they feel reinforce their marginality and their separateness (Hlatshwayo & Fomunyam, 2019). These experiences have also been highlighted by co-researchers in this study in Chapter 6.

This study thus locates the experiences of black students from lower-class backgrounds, including rural areas, in terms of how they experience higher education. Regarding the challenges that these students are usually confronted with, including epistemological access, this study engages with the issue of theorising an enabling curriculum structure, while bearing in mind that such theorising could be subject to global pressures. Such pressures necessitate a focus on the wider international context and how it could act to enable or constrain students' sense of being valuable members in the field of science in higher education.

### **5.12 Situating the study in a wider international context**

Universities around the world are increasingly structured to produce knowledge workers for the knowledge economy, or the global economy. There is a suggestion that knowledge becomes a product to be produced. Universities are beginning to see knowledge as powerful in enabling access to the knowledge economy. This context is likely to influence how we design curriculum, and approach our teaching and assessment practices. It could mean that we need to introduce students to the knowledge economy. This is because knowledge itself becomes a commodity which can be used to generate wealth, and this means that globalisation requires knowledge workers. In this sense, the university is profoundly impacted by hyper-capitalism and the neoliberalism associated with it, that is, the idea of knowledge as a commodity (Boughey, 2016).

Globalisation is dependent on “reinvention” of existing goods, and reinvention processes require knowledge (research and development, resourcing, management of production). Castells (1991), for example, argues that there is a progressive reliance among new approaches of economic production on knowledge and information technology. In this way, knowledge and “informationalism” have become central to globalisation and development (Castells & Cloete, 2011). Not only is South Africa faced with the idea of knowledge workers, but most countries are structuring their higher education systems in line with this idea, because they see educated workers as key to economic growth.

However, there is some criticism of the idea of the knowledge economy. For example, Jessop (2007) describes it as a fictitious commodity. In addition, the Organisation for Economic Co-operation and Development (OECD), the World Bank and many governments often use it as a kind of ideology to promote certain economic and education policies. Be that as it may, there is a considerable body of literature about the importance of knowledge in economies linked to

the global information society. In light of the above discussions, the following questions could be asked:

- How do we teach for epistemic access without neglecting economic pressures brought about by globalisation, while at the same time not neglecting that universities are social institutions?
- How do we make curriculum and research, teaching and learning ethically and socially relevant in the midst of hyper-capitalism and globalisation?

These are some of the questions for further research.

Given the above brief deliberations, it should be acknowledged that the majority of students in the SAHE sector have lived in poverty all of their lives, especially students from rural backgrounds, and so they want jobs as these are a means of upliftment for their families and communities. However, they are often denied jobs because they fail in university. It is possible to understand this situation given how apartheid policies conditioned and ensured the inferiority of school education for the majority of black scholars in South Africa, contrary to their white counterparts. This condition also impacted on those that did study further, as they usually did so at “African” higher education institutions, with poor facilities and limited opportunities for advancement<sup>9</sup>. Students’ dispositions were automatically not perceived as relevant in the pedagogic environment, and therefore the resources that students brought with them could not be explored to facilitate access to disciplinary Discourse.

My study is an attempt to allow students to draw on strengths that they bring with them into higher education to fulfil this function, among others. Through this study, I attempt to get the students to use the knowledge that they have as a means of accessing powerful, abstract knowledge. At the end, I hope that they are going to get good jobs and uplift their circumstances. But I want something more than that – I want them also to be able to critique the role that has been constructed for them (by globalization or knowledge economy) because, arguably, South Africa’s needs are different. The relevant question to consider for this critique is: What is in our teaching in the sciences that allows students to critique the role that has been constructed for them through globalization? To answer this question, I argue that it is necessary to consider what it is about the experiences that students gain at university that allows them to be critical, that is, from our pedagogy.

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<sup>9</sup> These institutions were subsequently described as Historically Disadvantaged Institutions (HDIs).

It seems to me that the key will be critical reflection, thinking through reflection. So, what can help me, as a student from rural areas, to get that reflective critical thinking? How does the knowledge that I have help me to get to that, or what relationship does it have to critical reflection? How can students start to see that in the future it might be possible to build an African powerful knowledge (distinct from northern global powerful knowledge)? How do you get to what I know and who I am, to be able to produce this powerful African knowledge, while acknowledging that even that which I bring with me is subject to criticism?

### **5.13 Conclusion**

Chapter 5 has presented conditions that could be interpreted as either constraining or enabling epistemic access, both at  $T_1$  and  $T_2$ - $T_3$ . I have described the literature presenting these conditions as best I can. I have shown how d/Discourses could act to constrain or enable epistemic access.

The focus and purpose of Chapter 5 has been to theorise an enabling curriculum structure and thus enactment, so that the construct of the “underprepared” student is construed differently. This is done by not locating students’ failure in factors inherent to the individual, something which could potentially absolve university structures and cultures for this failure. Therefore, it was important to establish whether institutional configurations at the research site created situational logics of complementarity or contradiction for students. It has been identified, for example, that the existence of constraining structures (in the form of historical policies, existing cultures embodied in language, technology and d/Discourses) all conditioned the environment within which the assumption of teaching development occurred at  $T_1$ .

Key conditions have been introduced in Chapter 4, while Chapter 5 further presented conditions that could constrain and/or enable epistemic access. The study now moves to an analysis of the co-researchers’ (primary agents) interpretation of their home experiences, and how these could constrain or enable access to the discipline of science in  $T_2$ - $T_3$ , given the proximity between primary Discourse and secondary academic Discourse. This analysis takes place in Chapter 6. Chapter 7 analyses data from academic teachers (primary agents), and senior leaders (corporate agents).

# CHAPTER 6: T<sub>2</sub>-T<sub>3</sub> PERIOD: A CONSTRAINED OR ENABLED TEACHING AND LEARNING ENVIRONMENT: CO-RESEARCHERS

## 6.1 Introduction

From chapters 4 and 5, we have learned that the actions of agents (students and academic teachers) are tendential to structural and cultural emergent properties, as they pursue their projects using their reflexive abilities (Archer, 1995, 1996), thus conditioning the environment in which agents find themselves (home context and teaching and learning environment). Such conditioning takes place at T<sub>1</sub>. We have also learned that period T<sub>2</sub>-T<sub>3</sub> presents a situation where structural, cultural and agential mechanisms interact. Through such interaction, agents activate structural and cultural emergent properties to either elaborate or reproduce their environment (Archer, 1995, 1996). Both chapters 6 and 7 consider findings analysed from the T<sub>2</sub>-T<sub>3</sub> period. Chapter 6 engages specifically with findings from co-researchers, including mechanisms in place before they joined university and after they have joined the university, while Chapter 7 considers data from academic teachers, though both chapters consider factors that shaped the teaching and learning environment in the field of science. This chapter therefore aimed to answer the research questions:

1. What practices shape the learning habits of second year science students from rural backgrounds at a South African university?
2. What knowledge, cultural and technological resources do second year science students from rural backgrounds bring to negotiate epistemological access in the sciences?

As such, this chapter locates the events that may have led to clashes or interactions between co-researchers' primary Discourses and secondary academic Discourses, and how these might have played out in the teaching and learning environment. Given that the student cohort is no longer homogenous in terms of language, home background and culture, it was interesting in this chapter to draw on events that might have led to change or non-change in the teaching and learning environment from the findings presented by co-researchers and academic teachers both at T<sub>2</sub>-T<sub>3</sub> and T<sub>4</sub>. Chapter 4, for example, demonstrated how at T<sub>1</sub>, colonialism and apartheid shaped and conditioned life chances of the rural population, which then affected success chances at school or university. Research has shown that there is correlation between socio-economic background and success at university (Boughey & McKenna, in press). In addition,

the South African schooling system was historically centred on segregation strategies, which ensured white supremacy and exclusive access to resources and opportunities. Considering these socio-political and cultural conditions is important, given that universities are not immune to socio-political and cultural circumstances shaping the communities from which universities have emerged. Colonialism and apartheid resulted in unequal access to material resources, which then yielded a segregated education system, a system which served the South African population on unequal terms. While we are no longer subjected to a segregated educational system, the legacy of apartheid is still prevalent in most social spheres, including education. This has been discussed at length in previous chapters.

The first part of this chapter thus looks at how colonialism and apartheid, as well as access to material resources, might have shaped agential actions both before joining university and when they were at university. Considering agential action before joining university is important, because mechanisms existed before co-researchers joined the university. As such, while co-researchers' home learning practices might have scientific underpinnings, these were also conditioned by mechanisms which pre-existed them. The second part looks at the shaping effect of the constraining policies of colonialism and apartheid on teaching and learning environments in general, and what emerged in the science classrooms. The chapter also looks at how agency was shaped at universities and how this affected students' participation and success. The last section looks at how institutional culture embodied in language, technologies, pedagogies and relationships between staff and students influence students' sense of belonging and their academic progress and trajectories.

## **6.2 T<sub>2</sub>-T<sub>3</sub>: key constraining or enabling conditions**

The South African (SA) population environment, including the HE environment, are highly resource-differentiated, where such differences undoubtedly have effects on life chances, access to HE, participation and success. The core mechanisms discussed in this chapter have shaped co-researchers' experience of HE in general and learning in the field of science in particular, in either constraining or enabling ways. Period T<sub>1</sub>, for example, demonstrated how the socio-economic and politico-geographical reality of colonialism and apartheid persisted to condition how students from different class and geographical backgrounds experienced HE. Chapter 4 demonstrated how some students experience HE as a continuation of home literacies, while others experience contradictions. This point is encapsulated in Boughey's (2019) Rhodes university Vice Chancellor's Senior Distinguished Teaching Awards, Awarded to Dr Karen Ellery. Boughey (2019) notes,

Some students, by virtue of their previous experiences typically, but not always in the homes of educated middle class caregivers, take on some of the values and practices similar to those associated with the ways of being privileged within the university from a very young age. For others, making these values and practices overt is key to their gaining the “insider” knowledge that will allow them to succeed (p. 2).

Evidently, it is possible to see that the characteristics that are valued by the university in general, and by the field of science in particular, are not neutral. For example, being an “objective” and “autonomous” learner. It was therefore important for this study to find ways to empower students, especially those who experience the university culture and space as alienating, that is, students from marginalized backgrounds, including rural areas. For this reason, in this study, student participants were treated as co-researchers in order to value their voices and their identities (Timmis & Williams, 2013). This technique enables engagement with the data in ways that allow for generating students’ experiences of living and learning in rural areas, as well as learning at university. In other words, sourcing of data in this way allowed for the identification of the participants’ home learning experiences with scientific underpinnings, in order to establish a relation with formal science learning.

The method of gathering data in this study allowed for students’ voices and understandings of their own experience to emerge, as they shared these in groups. This was made possible because, as a researcher, I had to create a supportive environment in which discussion and differing points of view were encouraged (Marshall & Rossman, 2006). Focus group discussions were one of the useful qualitative approaches used to ascertain students’ experiences and the elicitation of ideas and beliefs that are formed in contexts (Townsend & Weiner, 2011) such as rural home learning. In Bhaskar’s critical realist depth ontology, these experiences are located at the “Empirical” domain. The focus group discussions were thus designed to elicit responses that were to indicate the ways in which students’ home practices were congruent or not with practices valued in the construction of science knowledge. To do this, it was important to investigate how prior home learning and cultural experiences of students from rural contexts enabled or constrained epistemic access in the field of science, events which are located in the “Actual” realm. A number of scholars have argued for the necessity of an analytical binary based on Archer’s (1995) concept of “analytical dualism” of the “people” and the “parts” to enable an identification of how different mechanisms work to bring about events and experiences (Ashwin, 2009; Boughey & McKenna, 2016; Case, 2015; Motshoane & McKenna, 2014). The role of structure (geographical location, class, race, system of apartheid, curriculum) and culture (home values, institutional culture/values) cannot be

ignored when trying to explain why students from rural backgrounds experience higher education in the way they do, since the “people” and the “parts” are in a constant interplay.

The goal of analysing data in the ways discussed above was not necessarily to verify certain hypotheses from various conceptual ideas, but to formulate hypotheses based on students’ voices and interpretation of their experiences of learning in rural areas, particularly those aspects of learning which have scientific underpinnings. It was important for me to understand what the participants’ interpretations of their experiences meant, as this data only represented their experiences of learning from home and at university. Obviously, multiple truths or realities were presented by participants. In order for me as a researcher to arrive at an understanding of what all these multiple truths from data meant, a theory was needed that would allow me to understand a reality that is beyond the immediate experiences or observations of participants, a theory that allows for an understanding of the emergence of events (what students do and why) and experiences. Hence Bhaskar’s critical realism and Archer’s social realism are relevant in allowing me to move from the relative data to realist claims, and avoid the “fallacy of conflation” by not jumbling the roles of the “people” and the “parts”, or focusing on one at the expense of the other, which would then give a limited explanation of the whole picture. The research question(s) in this study informed the choices in terms of theory adopted to read the world that students were going to create with me through the research methodological choices of PAR and PLA.

The broader concern of my research had to do with the extent to which the science curriculum draws on students’ home learning experiences in order to enable “parity of participation” in the context of teaching and learning in HE. My research was therefore not about measuring competence. Rather, it represents an attempt to initiate conscious and deliberate critical reflection, re-thinking, and re-theorization of how students from backgrounds that are different to the middle-class educated families that gain access to HE view themselves as *mis-recognized* and *mis-framed* by structures like curriculum, as data will show. By using data from students’ experiences of curriculum in the field of science, and then connecting these to the literacy practices required by the discipline, this study attempts to re-theorize educational disadvantage as it is experienced by students from rural areas, and to argue for social understandings to explore the experiences of students in South African universities. At this point, I wish to present the record and analysis of data generated with participants through focus group discussions and Participatory Learning and Action (PLA) techniques, like drawing a river of life. Since this study’s focus is on students who come from rural areas, and since their voices and identities

were valued, it was important to establish co-researchers' understanding of the concept of "rurality". This was also necessary, because rurality is a difficult concept to define, so we had to have a common understanding of this concept without necessarily imposing my definition, rather one informed by literature by Robert and Green (2013).

### **6.3 Rurality**

Findings discussed in the following segments come from discussions created by the 12 student co-researchers at the research site for this study. Garnering data in this way enabled a "self-generated" understanding of how students' historic and current practices have contributed to their experience of university space, intellectually, ideologically and physically. Subjecting students' own accounts and discussions to critical realism allowed an understanding of how family and community, including religious groups, influenced their experiences of higher education and their access to scientific Discourse. There are seven key broad nodes that emerged from the data, which suggest the ways in which community, family and religious groups, for example, have contributed in assisting students to navigate university space. They also show tensions between what is taught at home and university, or put differently, the proximity between primary Discourse and secondary academic Discourse. One of these nodes was "rurality".

In defining the meaning of "rurality", drums or clapping exercises were used, wherein each person in defining their understanding began with "Rural means..." (This activity was recorded using high-quality digital recorders). These high-quality digital recorders, one per group of 4 students making up the total sample of 12 students, were also used for the plenary sessions with large groups, to ensure good-quality recordings. Below is how co-researchers discussed their understanding of rurality. The letter S represents a given student:

- S1: Rurality is identity
- S2: Rurality is lack of provision of services like clinics
- S3: Rurality is experience of culture
- S4: Rurality is lack of infrastructure
- S5: Rurality is less resources
- S6: Rurality is lack of knowledge and not having access to basic things
- S7: Rurality is being able to revolve
- S8: Rurality is isolation
- S9: Rurality is not having excess in basic information that might lead you to a better life
- S10: Rurality is humble beginnings
- S11: Rurality can be transformed

S12: Rurality is the challenge and motivation.

The above exercise showed different understandings of rurality, but what emerges from co-researchers' understandings is the various interpretation of the concept, the relativist data. A consensus in terms of what this concept could mean for this study was based on Robert and Green (2013). They point out that not all rural contexts are the same, which makes it difficult to categorise rurality. These scholars further maintain that rural contexts exist in a continuum, from peri-urban through to rural, ending in "deep rural". There are also time and flux at play, as each context changes constantly (Robert & Green, 2013). All of these instances of variation point to the need for a contextualised and nuanced understanding of rurality.

In chapters 1 and 4 of this dissertation, it was mentioned that "deep rural" learners frequently attend poorly resourced schools, located in isolated areas, with high levels of poverty, disease and unemployment (HSRC, 2005, p.38). "Deep rural" in the South African context is associated with constrained access to material resources, informed by poverty, disadvantage and lack of economic and educational opportunities (Trends in International Mathematics and Science Study, 2015). What has been highlighted in this study, especially in Chapter 2, is that at the level of the "Real", there are structural systems comprising institutions and roles that are mediated by access to material resources. Structural systems include, but are not limited to, geographical location of co-researchers' homes, a structure which pre-existed them. Archer, *et al.* (1998) maintain that we are born into families or environments which are not of our making. As a consequence, argues Porpora (2013), when people act, they do so within the constraints of social structures and cultural circumstances which they face and/or are presented with and, given their allowable abilities, they are able to either maintain (sustain) or modify their circumstances or environment.

Whilst rurality may indeed be a social "condition" worthy of attention, it is subject to various problematic conceptions. It is frequently subject to homogenising discourses prevalent amongst staff and students, such as traditionalism, disadvantage and backwardness (Roberts & Green, 2013). Students from rural contexts are to become "less" rural, or "other" than what they are (Roberts & Green, 2013). In a sense, there is "othering" of rurality, which is often seen as an unviable resource for knowledge construction. This raises issues of epistemic and cognitive injustice, wherein spaces for knowledge generation could be seen as undemocratic in favour of monolithic world views, which then influence what counts as knowing and what does not. Again, what emerges from data which coincides with the ideas expressed above is a lack of

access to material resources, which impacted on life chances at  $T_1$ , leading to events in the  $T_2$ - $T_3$  period. For example, co-researchers talked about “lack of provision of services like clinics”; “not having access in basic information that might lead you to better life”; “lack of infrastructure” and so on. Using a decolonial gaze to explore structural and cultural constraints that black students experience in higher education, Luckett (2016) notes that these constraints are largely informed by “unequal access to civil society, unequal access to linguistic proficiency in the colonial languages and a lack of recognition of black students’ identities, histories and cultures” (p. 417), all of which is likely to constrain the full emergence of these students’ agentive and creative powers.

Given the above brief deliberations, the policy of apartheid in South Africa (SA) could be understood as a mechanism which conditioned the life chances of black people. Through this policy, different races were forcefully segregated into either impoverished (for blacks) or privileged (whites) geographical locations, and rural areas form part of these underprivileged locations. Crucially, these different environmental contexts could be said to have shaped the emergence of the experiences of the SA population based on their geographical location and access to material resources, hence certain groups in SA were structurally privileged over others as a result of racial categorisation. It could thus be argued that the emergent properties of geographical location could be interpreted as a structure which led to the event that constrained life chances of students from rural areas in accessing quality education obtained in privileged urban areas. This situation thus tends to impact on who gets access to the academy and who thrives within it (Boughey & McKenna, in press). As such, universities are inclined to privilege the already privileged, as it is socio-economic background more than any other characteristic that correlates to student success (p. 1).

If we agree that university education is primarily about knowledge construction, not just knowledge acquisition in the sense that we do not just transmit but construct knowledge, then our pedagogic practices should not be confined to “what to know” but should extend to “how to know” (Mgqwashu, 2019b). Enabling how to know has the potential to provide opportunities for other ways of knowing and cultures, in the process, push boundaries of our disciplines. This is especially relevant in a post-colonial, post-apartheid university where, as a result of massification, there are individuals who are coming into university who were never imagined they would enter the university space, for example, children from lower class backgrounds (Mgqwashu, 2019b). By creating opportunities for various ways of knowing as we enable how to know we are likely to restore pride and confidence in local ontologies, epistemologies and

identities (Mgqwashu, 2016). Such sentiments are captured in the findings when co-researchers present their understanding of rurality as not being a fixed construct in that, while there may be structural constraints like “lack of access to basic things”, it could also mean that the “deficit” circumstances that co-researchers find themselves in could be “transformed” or could be a “challenge that leads to motivation” to become a better person, thus contributing to the betterment of another’s life chances. The impact which these events have on life chances for these students is highlighted in the following findings, which present the challenges of transitioning from rural areas to university life, and perceptions by students that they need to adapt,

“...it is challenging for me personally, because I felt like I was not accommodated as you know, a child from the rural areas, but at the same time university is university, life must go on, and you must just try to find a way to fit in. So, if my experiences can somehow contribute to making another student’s life better, it will like, truly mean a lot to me.” (Focus group discussion, 25 March 2017)

“This project, I think it will really help... us as the first years, or the second-year students... or those people who come to University in years to come, or they will see that this is what is happening and this is how we must adjust, and I believe it will be able to make a difference in their lives also.” (Focus group discussion, 25 March 2017)

“...I’m from the rural environment, where everyone is like in an unclosed bottle and everyone is so afraid to come out of that bottle. So they think about the things that they might face out there, but I was brave enough to go to the Varsity and I think I am adjusted. That’s why I’m one of the parts of this programme, so that I sort of help those who are still in the bottle who want to come out...” (Focus group discussion, 25 March)

So, the structural constraints at play are not determinants in shaping agential actions. There is no simple causal link between the structural constraints of the condition of rurality and what is eventually experienced by co-researchers. In Archer’s social realism, the agency of co-researchers is not deterministically conditioned by structures and cultures around them. This realisation is important if we are to avoid the fallacy of conflation. After engaging with the concept of rurality, it was then necessary to consider practices that shape the learning habits of co-researchers, hence the following question.

*What practices shape the learning habits of second year science students from rural backgrounds at a South African University?*

Drawing on the stated home locations, it was found that co-researchers all came from Bantustans, the previously designated “homeland” areas during the apartheid period of South

Africa. Most of these are what can be referred to as tribal areas, and are therefore amongst the most remote and disadvantaged parts of the country (Mamdani, 2018). In this study, practices are understood to be enabling or constraining of human agency. Practices are not just sustained actions, they are culturally mediated in different material and bodily ways, and are historically produced. In this study, an argument is made that the historical construction of practices is particularly important in exploring student experiences, particularly in South Africa. The understanding of practices could allow interrogation of the historical, cultural, relational, material and embodied meanings which are made and negotiated within and across lived spaces when students move from rural contexts to universities. Thus we may understand how these enabled or constrained negotiation of the university space and epistemic access.

It is for the above-mentioned reasons that in this study, I wanted to establish how home practices shape students' learning habits, as well as the sense that they make of learning at home and learning at university. To further engage with the notion of practices and places that influenced co-researchers' learning, PLA activity was engaged in, whereby co-researchers depicted "Mapping my rural learning world". Co-researchers engaged in an activity where they had to set out the different places of learning and places that influenced their learning, showing these places in relation to each other.

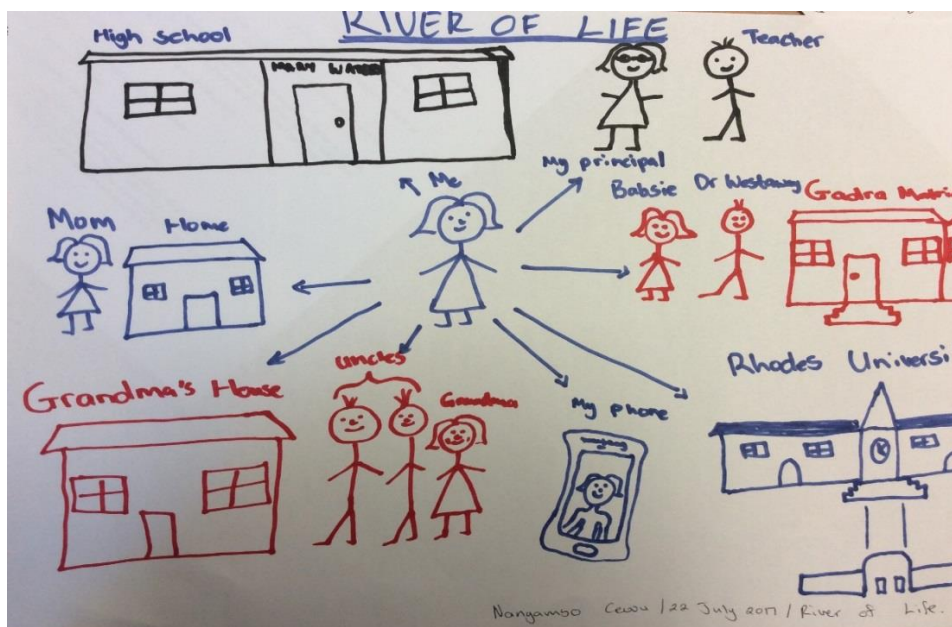
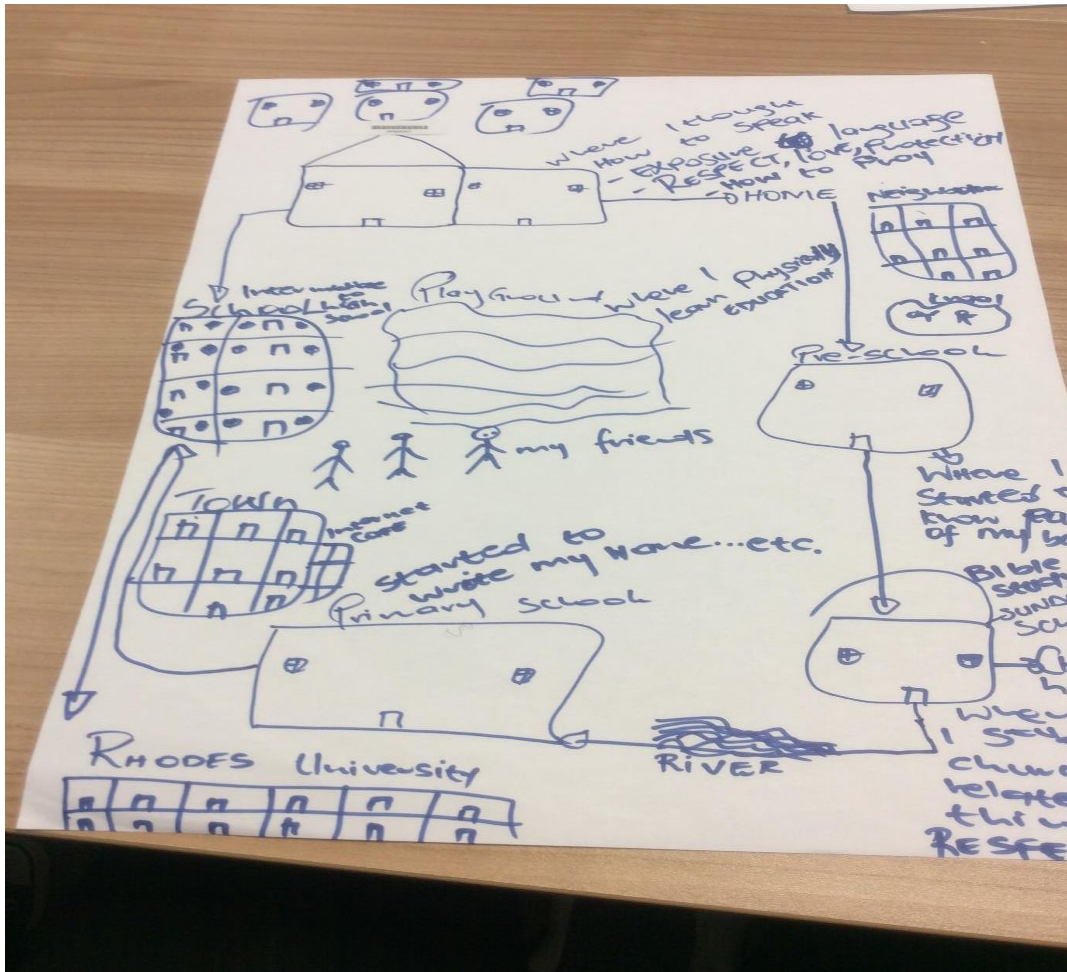


Figure 6: Map 1 depicting a rural community.

This shows social impoverishment in terms of material resources: no hospitals or clinics, no shops, no schools, no restaurants, recreational facilities, no water or sanitation, etc.



**Figure 7:** Rural community Map 2: Depicts similar conditions to those in Figure 1.

The community maps above show how the PLA tools allowed co-researchers to consider their position in relation to the availability of resources in their home rural environments. This technique gave them the opportunity to interrogate their everyday geographical structural circumstances with their peers. It is clear from the mind maps that co-researchers' home environments lack resources due to colonial and apartheid legacies, which led to continued geographical separation (Bozalek, 2011; Leibowitz *et al.*, 2019). These community maps enabled co-researchers to consciously realise the lack of resources in their communities, basic facilities like electricity, housing, toilets and water, all because of a continuing apartheid legacy, as the findings regarding rurality have also shown.

Crucially, the community mapping exercise allowed co-researchers to examine their own positions of inequality, which continued to affect them even in the post-apartheid context. This demonstrates how co-researchers are positioned in relation to their own resources and trajectories. Through the relation research exercise, co-researchers were able to share their

drawings and stories and thereby acquire a richer understanding of power relations on both an experiential and conceptual level. The PLA exercises enabled students to gain access to knowledge that had previously been concealed due to apartheid geography and its subsequent effects, having moved from rural homes to university and met people from various backgrounds. This exercise thus enabled some degree of participatory parity (Fraser, 2008) in the classroom, in that co-researchers appeared to have come to respect their own abilities as learners and co-creators of knowledge.

Nonetheless, the maps above show that the first literacies were learned from home, including extended families. Even though there is a lack of infrastructure or development, there is learning taking place. Before students went to church or school, they first learned at home, as the home is put on top of the map Leibowitz *et al.*, 2019). In addition. The roles that are played by teachers and how these condition co-researchers dispositions was crucial in this study.

#### **6.4 Role played by teachers in shaping students' dispositions**

The schooling system in SA during the discrimination against black South Africans ensured poor access to material resources and access to inferior education. These are events which had an impact that we are still witnessing today, and this could be seen to account for the literacy setbacks that currently confront universities (Mgqwashu, 2009). I have mentioned in Chapter 5 that when these students enrol in universities, especially in white liberal universities, they are perceived as “underprepared” for higher education (Boughey & Niven, 2012). Writing about his experience of learning under the system of discrimination, Mgqwashu (2009) points out that:

Because my teacher's priority was to finish the syllabus, she never considered our general or individual difficulties. Often when we wanted to ask questions, her facial appearance would deter us. We would remain, as a consequence, with unresolved questions about texts we were reading. When it came to tests and examinations on such texts, we would simply look for passages with words or phrases that appeared on the questions, and rewrite either the whole paragraph or sentence from the set works. The most troubling factor was that we would pass such assessment exercises, knowing very well that we were copying, and not coping (p. 296).

Evidently, the teacher in the quotation above did not promote confidence in students. Similar sentiments were echoed by co-researchers in the findings below as teachers were perceived to be promoting low self-esteem:

I don't remember... any session where, where they were promoting confidence, like, low self-esteem, like, it's what they promote. Like... the things they are saying to you... the things they do because they

know we don't know [our] rights. Like, even if you know your rights at community, you can't add on community because the community will be against you. (Focus group discussion, 1 April 2017)

There should be talks at schools in rural areas about basic rights. Children are unaware of their rights and the law. Children assume they are always wrong and the adult/teacher is always right – actually... I was abused... We didn't know. We didn't have knowledge... (Focus group discussion, 1 April 2017).

If you ask something from your teacher, or you question them, say, 'Mam, I don't think it's done like this, it's done like this', they will say 'Phuthuma, you are in Grade 12 and I've been in varsity. I know more than you, so no questioning'. They'll make you feel like you are inferior. (Focus group discussion, 12 August 2017)

...back where I came from, you find that the teachers work in hand with the parents because if you ask questions, they will go to school and say that you are asking too much, like you find that kind of relationship that teachers tell parents, so you are kind of scared to ask the teacher, and also at home you know that there is that relationship that they will tell your father, they will tell the teacher, so you get stuck in between. (Focus group discussion, 12 August 2017)

From the above findings, it is possible to see the persistent cultural constraints informed by teachers' ideas about how to relate with students. Mgqwashu's experiences, for example, are reported from a 2009 study and he reports on the experiences when he was at a secondary school during the mid-1980s, a period which was informed by the apartheid system. Based on the findings above, it could be argued that self-confidence is not promoted in most rural schools, which is one of the features that a university student must possess, especially in the field of science, given that students are sometimes expected to present their findings in front of an audience. Confidence is not just innate, but it can be developed and encouraged (Heath, 1983; Mgqwashu, 2019b; Rose, 2006). From these findings, it is possible to observe the interplay between schooling events in the domain of the "Actual" and experiences of students in the "Empirical" domain, which are experienced as lack of confidence, and these play out in a university context as the findings below show:

Learning in varsity is different from learning for varsity, in a sense that back in high school, we only depended on what the textbook and the teacher said. We could not question or challenge what the teacher said, because we had no power. We had little or no wings. When you question or challenge something, you have to give a reason why... now in university... I can tell you 'No Prof., I think that's wrong. (Focus group discussion, 12 August 2017)

Crucially, the role that schooling events in these areas might have played in constraining the agency of students from rural areas could be observed in the university space, intellectually and ideologically, to function as legitimate knowers in institutional cultures, as they potentially face

contradictory cultural conditions (Archer, 1996; Luckett, 2016; Maton, 2014). These events could be observed when agents' ability to work with the given culture (institutional culture) and structure (education system, curriculum) to pursue their own personal projects (Archer 1995, 2000) is constrained. The problem is not the students themselves, but the social interactions they have been exposed to. The above-mentioned constraints in terms of how teachers related to students could be traced through the process of educating (training) teachers who were to teach in schools located in black, rural areas. Teachers in rural contexts were themselves prepared to teach, and their own teachers too, all the way to the education (training) of teachers in "Bantu schools" under apartheid (Mgqwashu, 2009). These social interactions are shown below, as is the impact they might have on the development of students' agency:

...if we are going to write a test, if it changes what's happening, we are given the reasons why it had to change. You got to be informed, you are getting the email from the lecturers, and back at school we never got the chance to communicate with your teacher. You always see him or her at school and that's it, even if you don't understand the questions, you don't get the chance to ask ... (Focus group discussion, 12 August 2017)

...the special steps [was] to try and change the mentality, [now at university]. The mentality we [had then was that] we can't ask questions, [now at university] we had to go down and find the answers [by] yourself. I remember I had the challenge of losing [marks] because I didn't know my practical and I made the mistake of deleting the whole thing and I couldn't ask the teachers what to do because I had that fear that others are finishing... so I couldn't ask questions because I'm writing a test, but it would be like I was copying, so I ended up losing marks and when I told the lecturer that, the lecturer said I should have asked. (Focus group discussion group, 12 August 2017)

The findings above demonstrate that as far as the lecturer is concerned, the student is to blame for not having asked in the first place and so, the learning and teaching environment, from the perspective of the lecturer, is understood as "neutral". Because one is at the university, they should know how things are done here, except, not everybody does. The proximity between primary socialisation and secondary socialisation plays out in these circumstances, and that was not acknowledged in the findings above. This proximity is highlighted by the co-researcher in the findings below, in terms of how much parents from rural areas know about education and how this plays out when students come from these backgrounds,

...parents most of them ... they trust teachers. To us they just say, here is the child, teach him ... the parents will be like, how is he doing, they'll be like, he's giving me problems ... they think corporal punishment is taking care of the child and that's the problem. They do it not knowing. They trust the teachers, not knowing that they should be asking questions, like going to school, wanting to see marks. As long as next year you went to the grade above the one you were doing, that's fine. Whether you have

done the exam and passed, they don't care, you see, so I kind of don't blame them because most of them, they are not educated and didn't go that mile of asking what did you do today at school, do you have any homework, did you pass the test, what are you writing next week... (Focus group discussion, 30 September 2017)

Based on these findings it is possible to see that children from “uneducated” backgrounds are not usually groomed for participation in settings involving formal literacy and so, it is not surprising that parents for these children, at most, do not know how to get involved in their children's education. This is contrary to the homes of middle-class educated families where parents, through modelling (Heath, 1983), prepare their children for formal education by, for example, reading bed-time stories (Rose, 2006) and asking questions to which they already know the answer (Boughey, 2017), an event most prevalent in formal schooling. Researching children from literate backgrounds Rose (2006), for example, notes that these children learn about 1000 words before enrolling into formal education and so, when they enrol they bring with them understandings or literacies that have been developed from home and schooling. University education becomes a continuation of literacies they already have (Mgqwashu, 2019b). Crucially, the fact that most parents are not educated in rural areas, this cannot just be assumed to be a natural phenomenon but it is a structural disadvantage thanks to the legacy of apartheid, which has conditioned the quality of life for South Africans on the basis of race and class. The current event of being “uneducated” could thus be understood as emerging from structural or geographical disadvantage, the consequence of which is experienced by co-researchers as parents' inability to participate in their education and assisting them with their school work. There is vast research that shows the impact of home background on students' success in formal education (Boughey, 2019; Gee, 2008, 2012; Mgqwashu, 2019b). In contexts where parents are not educated there is little or no preparation for formal education and teachers are assumed to take full responsibility for the education of the students as the findings show below:

Parents look up to the teachers as people who are responsible for their children, and the teachers are also parents too, they also have a responsibility to teach their own children manners, so the parents take the teachers as responsible for most of the grooming for their children ... I think it's important that the parents are given education as to how to train their kids also at home, and they should assist their children with homework, so at my home if I brought homework no one would be able to help with it ... because I would be asked, what is the teacher's job if they have to help me with my homework. (Focus group discussion, 30 September 2017)

As a university, to what extent do we appreciate or acknowledge the above-mentioned events and experiences, their impact on how students engage with the education required of them when we interact? That is the concern for this study. While the above findings indicate constraining events and experiences in the structural and cultural domain for co-researchers, the findings below seemed to have brought about positive practices and values from rural areas which could be useful for university education, including science education, experienced as critical thinking events.

## **6.5 Religious practices: critical thinking**

Although, the findings below demonstrate some level of tension between co-researchers' religious practices and their rituals, the conflict that is noted indicates that they are critical of issues, which is a useful skill to have in the sciences:

I think it's still a problem now, because when you come to university you get to choose which spiritual belief you should follow because maybe you'll be saved. Maybe at home they do rituals and stuff, and now you start to choose that, ok you start to realise that, ok this is the path that I should follow, then when you get back home it's still a problem, because if you go there and you are different person, like you don't belong, because you have taken your belief away from the family, because they follow they do rituals, and then you will look like you are arrogant and better... (Focus group discussion, 30 September 2017)

While there are tensions highlighted from the above findings, co-researchers demonstrate awareness of these tensions and so, have to choose between the two competing views between culture and religion. As a critical thinker these are the issues you are most confronted with and have to take decisions. This is highlighted as co-researchers are able to see, understand and present different sides of a situation. This does not mean that critical thinkers do not have feelings about the topic they are thinking about or discussing, as does scientists. It simply means that critical thinkers are able to "distance" themselves and be more objective in their thinking. This allows building up an argument (in academic settings, with good evidence from the literature) which is clear and logical rather than emotional. These elements are indicated in the findings above and are also shown in the findings below:

It's true we do have conflict with parents because when you get here to school, you go to another different church, and when you get home it's another different church, not that you are disrespecting them, but you have found your spiritual belonging in the new church, and also when you get home there are clothes that you don't wear, but you wear them here at university and it all creates conflict and confusion. (Focus group discussion, 30 September 2017)

So, when we were answering the question of what is valuable to you now, I think that is subjective because we are all different and we can't value the same, but... we talked about mostly religion, of which we didn't see it the same way, but we managed to draw a conclusion around it, as some of us oppose and others are for it. (Focus group discussion group, 30 September 2017)

The critical element of building an argument, for example, is highlighted from the findings above when co-researchers point out that, “we are different so we cannot value the same thing”. While the word critical means different things between everyday English, that is, “pick apart” or to criticise something, and academic usage, that is, thinking clearly in a logical way, not influenced by our personal passions and preferences, these findings show some elements of critical thinking practice in an academic sense. Crucially, this is an important aspect in science when drawing conclusions from discussions – you make an argument for the conclusions drawn and give reasons. I am, however, in no way suggesting a simplistic view or relation between the practices highlighted above and the ways of knowing in science but these practices could be useful means to an end, that is access to the ways of knowing in science, including critical thinking and building of arguments. It is through language that the ways of knowing in science are realised and so, language as a structure could either enable or constrain access, not only to “what to know” but most importantly to “how to know” as findings show below.

## **6.6 Language embedded in D/discourses**

In this study, Discourses are conceptualised as socially accepted association among ways of using language and other symbolic expressions, of thinking, feeling, believing, valuing and acting... to identify oneself as a member of a socially meaningful group (Gee, 2012, p. 158). This understanding implies the role that one plays in society in a meaningful way. So, Discourse allow us to do certain things and not others, which impacts on the emergence of agency in constraining or enabling ways. Such issues are highlighted in the findings below, even though this study is necessarily concerned with science, the findings below are crucial in understanding the role that language plays in one's identity, which is important to one's academic trajectory:

You know there is this thing I've been observing and it's happening, I don't know, it's amongst the educated like black side of our community and I don't like it. If you've been in a shop and then you see a lady dressed nicely and with her toddler, you hear the toddler saying 'mommy I don't want this. (Focus group discussion group, 2 May 2017)

I was at the barber shop, this woman is Xhosa and she greeted in Xhosa and as she sits, the baby says 'Mommy I want that haircut. When are we going? Are we going to go to Debonairs after this? I want to.' Hey, my blood guys, was boiling and I've been and this thing it's like, it's a trend now, cause even

at church there's this pastor during Good Friday, we spoke Zulu with them, and the baby comes speaking English, 'Mommy I don't want to play with. (Focus group discussion group, 2 May 2017)

We are not saying he must not speak English, but the child must know the vernacular language, at least one vernacular language, because we are slowly but surely losing our sense of being African... we are going to push that our kids will not even know and understand what it means to be an African. (Focus group discussion group, May 2017)

That is why people are using American accents ... (Focus group discussion group, 2 May 2017)

Because now you feel like it will make me a better person, speaking nice English, rolling your tongue. (Focus group discussion group, 2 May 2017)

These findings show the dominance of English in all spheres of life, which could be viewed as the perpetuation of a structural constraint. Language is not neutral, but is socially and culturally embedded or value-laden. It could be seen from the findings above that the cultural milieu that is purported by the use of English above is white. Language is a vehicle through which as people we understand who we are and the world we occupy and so, language, culture and identity could be said to be different sides of the same coin. The co-researchers realise this connection when they indicate that "we are slowly losing our sense of being" because of the dominant use of English, which could result in people losing their cultural identity. In the domain of culture, (English) and "American accent" is perceived as a resource that could make one "a better person". It is through a layered ontology that we begin to understand and explain how race and class, as a structure, leads to events experienced as "appropriate" ways of communication using language leading to contradictions. It seems inappropriate to use home language and this could be seen as a contradiction between the language of the parents and the language they use with their children. Language is seen as important in one's being but there is a sense of displacement because of the dominance of English:

Language is one of the things that I value the most, the reason why is that I can act, like I'm able to explain myself fully in my mother tongue first of all, and then secondly like I can do anything. I can go anywhere with my mother tongue, you see, so I feel like back home you find that yes we do speak isiXhosa of course, but if there is someone who speaks English very well, that person is more valued than the others you see, because they speak a better language, so now here we come here in university... the societies are available to help us with things like, you should like, you should value yourself or you should value the language as it is... (Focus group discussion, 30 September 2017)

There is little or no interaction between the lecturers in university because of the language of communication. Sometimes you don't get the terminology, but when things are expressed in your language, that's when you understand better. I personally struggle with understanding academic papers

we have to study. This causes poor performance because you did not get the science, not that you don't know, but it would have been better if it was your language. (Evernote, 12 August 2017, [name removed])

I addressed the fact that language is a huge barrier. I was actually impressed when Nxakanxaka released their first Ph.D. to be written in IsiXhosa. (Evernote, 20 July 2017, [name removed])

Based on these findings we can see that language has the potential to lead to the experience of seeing university education as a continuation of literacies that these students already have, or a clash of literacies, and these emerge from the “Real”. In this case, language is presented by the university as something that the students need to engage with. While this is true, one needs more than English to engage with concepts. Students need to be familiarised with the Discourse of the science discipline, for example. The co-researcher points out that she lost the science not because she does not know, but that it would have been easier if it was her mother tongue because it would draw on experiences that she already knows. This is because language and one's culture and being are understood to be intertwined. As academic teachers, I argue, there is a potential to clarify concepts using home language of students, for example, Xhosa, since this is a dominant vernacular language at the research site. This approach has a potential to embrace other ways of knowing in the construction of knowledge. At the University of KwaZulu-Natal (UKZN), in the province of KwaZulu-Natal in South Africa, for example, they have developed a programme where Zulu, a dominant vernacular language has been made part of the academic discourse up to PhD level (Mgqwashu, 2019b).

What follows is the analysis of the knowledge resources that students from rural areas bring with them into HE in the T<sub>1</sub> period, in order to answer sub-question 2. of this study. This analysis will allow an establishment of the proximity and potential interactions between primary Discourse and secondary academic Discourse in the field of science in the period T<sub>2</sub>-T<sub>3</sub>, by identifying the key conditions that emerged in the analysis as either constraining or enabling the agency of students as legitimate knowers. The study findings show that some factors from rural home environments have the potential to constrain the agency of students as legitimate knowers in the period T<sub>2</sub>-T<sub>3</sub>. Factors include losing their indigenous knowledge because what they already know is not always valued in mainstream interactions, yet such knowledge is valued in their local areas and could have a positive effect on epistemic access and becoming. For example:

There's a lot of things that are done culturally that have meaning. But then slowly and surely we are... letting go of all the knowledge, because... sometimes we don't even engage to ask our parents 'Why do

you slaughter the cow the way you do? Why is it that this piece would go to that family? Why is it that we must follow this certain procedure when doing things?’ So we are not interested enough and... by the time our parents die and our grandfathers die, it might end up in the next 20 years to come we would have lost all that indigenous knowledge we have acquired, because now we are so influenced by the Western way of doing things, urbanisation... we are letting go of the critical things that makes us African, the things that groom us, that gives us our identity in our communities... rurality has such deep knowledge... (Focus group discussion, 2 May 2017)

Co-researchers seem to face a contradiction between what is valued at university that is, asking the “why” question because there seems to be no room for engagement with parents. A valuable skill which is valued in science, a skill to explain is lost and these students would not be able to explain, in later years, to their children why things are done the way they are done. An inability to ask questions could be seen as a disadvantage for these students, particularly when they enrol at university. Westernisation is also seen as playing part in losing “African” ways of doing things such as slaughtering a cow, which has significant cultural meaning. While the findings above indicate tensions between university values and home values, the findings that follow show the potential value of indigenous knowledge in formal education and the interactions that could be established thereof:

When you are herding cows, you’ll find that a young boy who has not learned to count yet will learn to associate the patterns of the cows... So it’s those critical elements and... cows have a way of behaving... but then we did not understand why the cows were migrating, only to find out that there was gonna be a flood later on... if we were still in touch with our indigenous knowledge, we would have known that, we would have been able to read the signs, but because we are so focused on the Western way of doing things and we’re not paying deep attention to the knowledge that makes rurality the core of such things, like, I feel like it’s if we can just like, acknowledge and try to be you know, in with the whole knowledge. (Focus group discussion, 2 May 2017)

The elders know the seasons, when they need to start planting maize and peanuts – it’s in their blood. The younger generation don’t have this knowledge. Our culture can ground us and groom us into becoming better people... there is a thing that you will never learn at school, but then once you go to the mountain, or there will be a traditional ceremony that will be performed for a girl, it will only be for a short time but those effects can change a person’s life completely...” (Focus group discussion, 2 May 2017)

...there is rich knowledge but it is not recorded. All this is important but ja, in all our stories it is not written somewhere... It’s hard to write a book like that, because as Xhosas you know that we are... very different. (Focus group discussion, 2 May 2017)

...we have this rich knowledge where we come from, which is ezilalini (village). So basically, I'm looking forward to using that knowledge to... make that knowledge be accommodated here because... we can learn a lot from what we had... (Focus group discussion, 25 March 2017)

What can be observed from the findings above is that co-researchers are aware of the value of their indigenous knowledge and that it is getting lost simply because they cannot ask their parents or grandparents about it. One gets a sense that the practices in rural homes are not congruent with those valued in HE, where students are expected to ask questions. In middle-class home families, for example, children are groomed to ask questions for which parents already know the answers (Heath, 1983). When these children enter HE, they would have been prepared for school by as early as two years of age (Rose, 2006). By the time they enter secondary education and university, they have the potential to succeed (Mgqwashu, 2019b). For students who come from rural areas, such home practises could potentially constrain the agency of a student to participate fully, not only in science classrooms, but in other social encounters.

There are other practices which are valued in rural areas which could have a bearing on science classrooms, if they were valued. For example, findings show that “rurality has such deep knowledge... when you are herding cows, you'll find that a young boy who has not learned to count yet will learn to associate the patterns of the cows”. These patterns of cows could be linked to careful observations, which are valued in science. As such, there are other practices originating from rural areas which have scientific underpinnings:

Some students use traditional medicines and herbs to clean the blood, imbiza, cleanse the stomach, remove pimples, and girls were given traditional medicine in the community to relieve period pain. They feel judged as ‘others’ by people in urban areas for using traditional remedies. What astonishes me is that we are using the same medicine, but it's just the packaging and the process was modernised and it's more expensive, and we took it raw because you know that traditionally, when we use it in a certain way, boil it and drink it, then it's fine, so now we see that certain things we don't understand. (Focus group discussion, 2 May 2017)

Even at res [university residence], I was looking for a traditional medicine, because I didn't want to go to the doctor, you know, this thing of cleaning blood, the imbiza (natural medicine), the look she gave me, the look she gave me and she will tell others that I'm a witch.” (Focus group discussion, 2 May 2017)

I just know that every two months or three months, I cleanse my stomach and I'm fine and healthy. (Focus group discussion, 2 May 2017)

You know, even with pimples you will be fresh if you drink the natural medicine. Because of this, I asked where in [name of the local place removed] I can find someone who will mix the natural medicine. The look she gave me, and I know that they will speak about me at res, that she's coming from Mpumalanga, coming here at Cape Town with her things.” (Focus group discussion, 2 May 2017)

“The thing is, we tell ourselves that we are not good enough, we are too dumb and all that... we don't love ourselves, we are not proud of who we are, hence we want to adopt into other people's things. (Focus group discussion, 2 May 2017)

From the above quotes, we can observe that when students from rural areas use traditional medicines, they are judged in a negative sense such that they might end up being ashamed to consume them. Yet it has been established, even in the scientific community, that some traditional medicines could have healing properties (Brendler and van-Wyk, 2003). When it comes to traditional medicine, the scientific community has found that *Flacourtia indica*'s (Madagascar plum, batoka plum, flacourtia, governor's plum, Indian plum or Mauritius plum) leaves contain several pharmacological attributes, including antimalarial, antioxidant, antimicrobial and anti-asthmatic properties (Kota, Kannan & Rajaseker, 2012). This medicine has been used over many years in rural areas in Africa. Since the abstract nature of scientific knowledge might be the cause for the difficulty that students face in accessing scientific concepts, students from rural areas can draw on everyday knowledge (which Bernstein (2000) refers to as horizontal knowledge) to access university principled knowledge (referred to as vertical knowledge by Bernstein (2000)). However, findings will show, in subsequent sections, that knowledge originating from rural areas is not always valued or rewarded in HE. It could be the case that when the practice and knowledge of using traditional medicine is used as a reference, among others, and thus valued in science, could encourage participation in science classrooms or lecture halls. Students could then investigate the chemical properties in these medicines as well as appropriate measurements for consuming them. Their outcome could be the positive negotiation of the university spaces, intellectually and ideologically.

## **6.7 Adapting and negotiating university space: coloniality**

It was important to understand what sense co-researchers made of their learning and of their transition from home to school and university. These experiences were captured in the findings below, where co-researchers had to indicate, among other things, why they chose to study at the research site. These findings are not necessarily about science, but were seen as important because students have accessed an HWU, and their interpretation of this space was crucial:

I'm upholding my brother's opinion when he told me to come to [name of institution removed]. He said 'It's a very white university, it's going to get you places.' So, he associated it with white people and so it was automatically better. I guess in his mind, it is better. I guess it's historically better... (Focus group discussion, 22 July 2017)

Why did I come to [name of institution removed]? I came to [name of the institution removed] because growing up, I knew about [name of the institution removed]. I think when I was in grade 11, you know how they always come for career exhibitions and all, so that's when I knew. So I was like, ok maybe I should go to the school because apparently it has white people. I want to interact with the white people, because I didn't know anything because I was growing up in a black community, so I thought white people were better. I'm not being racist, but that's how we grew up, thinking that they are better than us, so, and also parents I think, our parents also play a huge role in making us think that white people are better, what ok. (Focus group discussion, 22 July 2017)

Why did I choose [name of institution removed]? I don't know, it has reputation. It has reputation, ja like I said, it has reputation. People like it and like, let's just say it guys, it's a white school, so it's better. Like, let's just be honest. (Focus group discussion, 22 July 2017)

What emerges from the findings above is the construct of a university as a cultural, historical, political and social entity. What this means is that there are structural and cultural conditions which shaped co-researchers' experiences and perceptions about the university before joining it. This means that when they joined the university, they entered an environment which pre-existed them at T<sub>1</sub>. What could then be observed from these findings is a historical, asymmetrical, social structure largely based on race and increasingly on class (Ndlovu-Gatsheni, 2013; Sidanius & Pratto, 2001). In this context, the privileged are seen to be favoured by the unequal social relations. In the domain of culture based on ideas and beliefs that co-researchers have about the research site (which have emerged from co-researchers' geographical location, given the uneven socio-political relations between different racial groups in South Africa), co-researchers see the research site as historically and automatically better because it is associated with white people, so race as a structure becomes an organising principle. When co-researchers comment that the research site is predominantly a white people school and because of that it is better and will provide better and quality education - all speak to the point of the historical and political construction of whiteness.

In relation to the points raised above, Ndlovu-Gatsheni (2013) notes that persistent coloniality must be unmasked as it "...continue(s) to exist in the minds, lives, languages, dreams, imaginations, and epistemologies of modern subjects in Africa and the entire global South" (p. 11). It is then possible to see from the findings that the teaching and learning environment in

South Africa was informed by segregated institutions designated for certain groups of people in terms of race, a structural enablement for some but a structural constraint for others, at least prior to 1994 and perhaps during the early 2000s.

From the findings above, it is also possible to observe the limitations of understanding university education in general, and learning in particular as an individual cognitive activity. What is evident is an understanding that learning is socially and culturally embedded. This observation points to a realisation that “some students, by virtue of their previous experiences, typically, but not always in the homes of educated middle-class caregivers, take on some of the values and practices similar to those associated with the ways of being privileged within the university from a young age” (Boughey, 2019, pp. 1-2). For these students, the values and practices that they bring with them from home would allow them to gain ease of epistemic access, which would eventually allow them to succeed, while the opposite will be true for others, especially those who come from marginalised backgrounds, including rural areas.

In Chapter 4 of this dissertation, I mentioned that this segregation was a result of the racist history of SA under the apartheid regime. During these periods, some institutions were predominantly white and privileged (Boughey, 2018) and the research site was no exception to this. These institutions were assumed to provide quality education as these findings show:

Why did I choose [name of institution removed]? [Name of institution removed] replied first of all the universities I applied to, so with them replying so soon I was like, ok, it's far from home, number 1, so I'll be independent and actually learn how to take care of myself without having to go to my mom and cry for everything. So, it was far from home which I thought would teach me independence at that time, and then I wanted to get also since [name of institution removed] is said to be internationally recognised and all of that, so I wanted to get quality education and interactive white people. So ja, since I'm never interacting with white people. (Focus group discussion, 22 July 2017)

It is interesting to note that when the study was conducted, the student cohort had changed significantly at the research site, and there are a considerable number of students who come from marginalised backgrounds and are cut off from mainstream discourses.

The sentiments expressed from the findings above are also captured in the following findings, wherein co-researchers show that they have to adapt to fit in at the university, and in the process the university is seemingly absolved from critiquing its structures and cultures to enable epistemic access for all, irrespective of home background (see for example, findings from

academic teachers in the field of science and senior leaders in chapter 7). Apparently, students from rural areas are cut off from mainstream discourses:

...the first time we came to [name of institution removed], it seemed like all of us here, it was the adaptation, it was very difficult for us to adapt in this situation because... our background is very different... because we are from rural areas so we don't know most of the things that are trending outside, so... it was really hard for us to adapt... (Focus group discussions, 22 July 2017)

An important point is raised here regarding the alien space of the university, particularly when one comes from backgrounds that are cut off from mainstream discourses. In relation to this point Mgqwashu (2019b) historicize the conceptualisation and formation of universities and situates these to Western civilisation. Mgqwashu (201b) argues that universities were historically not conceptualised and formed to cater for students from lower-class backgrounds but for middle-class, rich children, often white and privileged and have access to material resources such as access to books from home, libraries in their communities and so on. The question he is posing is: to what extent, as universities in the post-colonial and post-apartheid era, have we acknowledged that we now have a different cohort of students from the traditional students, or the extent to which we promote the “othering” of non-traditional students and thereby, mainly expect these students to assimilate or adapt to university structures and cultures without necessarily knowing who they are. These are important questions to consider for equal representation (Fraser, 2008) of students in our university space.

While co-researchers often find university space alienating, they also note that within the alien space of the university they find ways of coping from other peers who have more university experience than them:

Adapting to university, there were people who were like, who have experience, so they were sharing their experiences with us. Ja, that's how we managed to adapt at some point. (Focus group discussion, 22 July 2017)

I think it's just the person, the character you see, because at times like, attitude is very important. The way you present yourself like, to be able to adapt easily if you can talk to people, if you can, ja. (Focus group discussion, 22 July 2017)

I'm open... to the situations we are raised. Where we develop UBUNTU, we are not raised to competition, we are raised to love each other, so it makes it easier for us to adapt [to] other people... we are resilient enough to be able to understand other people's behaviour... you have to meet them halfway... (Focus group discussion, 22 July 2017)

Another thing that made us to be possible to adapt is the fact that we are resilient enough to be able to understand other people's behaviour in such a way that if, and though you don't understand, but you have to like, be in a point that where you have to meet them halfway, in such a way that where we come from, like, you are just used to the same people who are speaking Xhosa, for example, then you came here, there are different people, different languages... (Focus group discussion, 22 July 2017)

The findings above are indicative of how co-researchers are willing to adapt to university cultures and structures. The observation that could be made from the findings is that, on the one hand, co-researchers are aware of the identities that they bring with them to university, which were engendered in the rural worlds, such as “resilient”, while on the other, they are aware that these identities are not rigid. An argument could then be made that the identities and practices that these students bring with them into university space cannot be left intact. Writing about education for public good and using a decolonial gaze, Mgqwashu (2019b) shares similar sentiments:

...my definition of a decolonial education system foregrounds African identities and worldviews. However, this does not exempt knowledge generated in this context from critique, nor does it suggest abandoning the problematisation of what knowledge is and the processes involved in generating it. Such critique can be ensured by opening a dialogue between African knowledge and knowledge from the Greek, Arab and European worlds. In other words, African knowledge cannot be considered the be all and end all. In the context of education for public good and its inherent exclusion of non-mainstream members of society, this is not negotiable. Educators, researchers and educational institutions should value many types of learning and knowledge, inspired by a post/decolonial orientation to education. However, it is still important for marginalised populations to have access to the knowledges and skills that are valued by the current mainstream society as they fight for liberation (p. 69).

Such sentiments from Mgqwashu are captured in the findings when co-researchers realise they have to adapt to university cultures and structures. My duty as a researcher is to establish the extent to which structures and cultures enable or constrain the negotiating of university space, intellectually, ideologically and physically, for ease of epistemic access in the field of science. Identifying the role of structures and cultures could be said to have been influenced by the realisation that we do not know much about rural students in higher education (Leibowitz, 2017a; Mgqwashu, 2016) and the following findings focus on this aspect.

The following findings point to a knowledge gap. To this effect, Mgqwashu (2016) argues that, despite being one of the most marginalised groups, there is relatively little research on students from rural areas. The need for universities, especially white liberal universities, to widen participation is notable, and has been a major and ongoing concern in South Africa subsequent

to the 1994 democratisation. However, just ensuring access in numerical terms cannot enable epistemic access (Badat 2014; Leibowitz & Bozalek 2014, Cooper 2015). This is coupled with a lack of academic achievement by students from non-traditional backgrounds (Scott, Yeld & Hendry 2007; CHE 2016). Not recognising prior knowledge and experience that students from rural areas bring with them might be one of the reasons for an assumption by the university of the “under-preparedness” of students to engage with HE, which of course does not question the preparedness of the university and its structures to meet the needs of these students, as the following findings show. Students from rural areas, for example, note that they are automatically put into foundation level regardless of grades because of the assumption that they would not be able to cope with mainstream study:

I have a friend, she was studying, she came to university, and she had level 7s and level 6s. They put her in foundation because she's from a rural background. She works so hard but they said, 'No you won't be able to cope with all of this.' The thing is how do [they] know she won't be able to cope with all of this? She has very good marks... and then there are [non-rural students from Model C schools] with level 4s and level 3s [that] were put on mainstream. What is that? (Focus group discussion, 22 July 2017)

She mentioned something about being put in foundation level and I would say at that point, you are not appreciated, because we have so much, you have planned so many things to get the marks you have, but because you are coming from the rural areas, just the status of coming from the rural areas, you are put through, they give you an extra year on top of the work that you already did, so at that point it's not appreciated and at some point it is appreciated, whereby you have to stay late and have to cook for yourself and there are other students who are gonna learn from you. As some come through they say, 'How do you do this?' So, it is appreciated because... even here at res, you will see that some people (Focus group discussion, 22 July 2017)

From the findings it is possible to observe an understanding of the student as having “the problem” which needed fixing, because they were perceived as “underprepared” for higher education, which might have been true, but this understanding could potentially allow teaching and curriculum matters to continue largely un-critiqued. The structure of the curriculum was thus complementary to an institutional culture that saw the student “under-preparedness” problem as inherent in the student body, or students from constrained backgrounds. This situational logic led to what Archer (1995; 1996) calls “protection”, whereby the culture and structure enable the protection of the status quo, where students from middle-class, Model C schools are likely to go straight to mainstream.

The protection of the status quo has also been challenged from another angle by students by contesting the appropriateness of disciplinary knowledge traditions and underpinning values.

In line with this contestation, Vorster and Quinn explain (2017): “For black students, curricula and pedagogic processes are often not aligned with who they are as people and it is not possible to divorce themselves – their being – from what is taught and how it is taught” (p. 39). Archer’s (1996, 1998) MM framework is useful in analysing the continuing structural inequalities discussed above. These students argue that they do not see themselves in university structures like curriculum and institutional cultures. Post-colonial universities are, for example, prone to perpetuating the norms and standards that favour selected groups of students to the exclusion of the majority that is beginning to enter HE (Reay, Crozier & Clayton, 2010; Mgqwashu, 2018, 2019a). According to Fraser (2008), these students are *mis-recognised* and *mis-represented* by these structural as well as cultural conditionings, and this tends to adversely affect participation in knowledge construction.

## **6.8 Curriculum: interaction between primary and secondary discourse**

The following findings engage with home literacies with scientific underpinnings in terms of how these could be harnessed to facilitate access to formal, disciplinary science knowledge. The findings below indicate that the learning of scientific concepts and procedures and ways of knowing in science could be contextualised so that they encompass students’ prior learning or home environments, provided we come to understand how to use those experiences to provide them with access to the ways of knowing and being in science. This focus could help re-think teaching and learning in the sciences so that attention is not just on accessing the powerful knowledge of the disciplines (Maton 2014; Wheelahan 2010; Zipin *et al.*, 2018) in decontextualized ways (Boughey & McKenna, 2016), but also on how students have learned to see the world (Heath 1983) and then, on the ways in which these understandings could be used to access powerful knowledge.

In Chapter 4, using abductive reasoning, it was abstracted that apartheid policy played a role in shaping curriculum events in SA, and using Archer’s concept of situational logic, it is possible to see that curriculum could be described as having “culturally emergent properties” wherein structural and cultural conditioning have already been set up before students joined the university as they interact with other agents, structures and cultures of the academy (Lockett, 2016). The following findings are concerned with how students interacted with the science curriculum, and the contradictions the curriculum set up for these students. For example, co-researchers note that rural/indigenous knowledge is not considered in knowledge construction, and that curriculum continues to favour the already privileged:

You have to change and the curriculum just stays the same.” (Focus group discussion, 2 May 2017)

“The education system here purposely or otherwise favours those who grew up in such privileged lifestyles, and that is of great disadvantage to rural students because we are treated as if we all come from the same backgrounds and live the same life... We are treated as if we are from the same privileged schools that prepare their students well for tertiary education... I see this as a reason why many students from rural disadvantaged backgrounds have difficulties in completing their tertiary education... (Focus group discussion, 12 August 2017)

This is a significant finding in the sense that the dominant discourse in higher education, which rather simplistically equates hard work with success, serves to privilege the already privileged, with their background in particular forms of knowledge and learning (Boughey & McKenna, in press). We want to believe that higher education is a meritocracy wherein hard work and bright minds result in success, but the reality is that around the world, middle-class students get rewarded for their privilege. When students enrol in universities, they do so to access powerful knowledge. However, accessing powerful knowledge is sometimes conflated with accessing the knowledge of the powerful (Zipin *et al.*, 2018) with the result that the success of students from marginalized backgrounds, including those from rural areas, is likely to be compromised. As a consequence, these students are unlikely to draw on knowledge resources that they bring with them to university, since they find them unrecognized and unrewarded. The findings below demonstrate that knowledge outside of the academy, for example, in rural homes, could be used as a pathway to access powerful knowledge. They make a case for the recognition and rewarding of forms of rural-originated knowledge currently ignored in higher education:

There is a similarity because indigenous knowledge, like our grandmothers knowing how to diagnose cows when they are sick from grazing, when you get here, for instance we went to a dam... we went there, they know back home how to detect climate changes that are affecting water, where you were not sure when you were growing up, you were not sure whether it's true or not, but when you experience it you are like, oh, actually I've heard about this. (Focus group discussion, August 2017)

It just upgrades [the existing knowledge] but to add on that there was this other time, Natural Science assessment... we had to assess the soil... but I was familiar with that thing because, before at home, you know when it's planting season, before we plant, we crop rotating... assesses the soil if it is good to plant spinach... actually, our professor, he was impressed. Like, he loved it. (Focus group discussion, 12 August 2017)

Sometimes, before the professor planted, I felt like it [indigenous knowledge] wasn't acknowledged. I felt like they would say... you see how science flows with experience. They want facts, they want to prove if you say this happened doing this and this, they will say prove it. That's science. If I say my

father does [this in this way]... they say, how so, it's not acknowledged [even though the procedures are similar]. (Focus group discussion, 12 August 2017)

Three things are noticeable from the co-researchers' findings above. First is that "our grandmothers know how to diagnose cows when they are sick from grazing". The implication for this is that grandparents used observations for such diagnosis. They looked at the behaviour of the cow and could tell that something was wrong with it. They might not have had an accurate or precise diagnosis, but they could tell from observing that the cow was not well. Furthermore, "back at home, they know how to detect climate changes". Again, this implies observing natural phenomena. When the method of observation was presented in the classroom and/or in the field, students realized that they knew this from home, but when it was presented, it was not contextualized through their home lived experiences. Lastly, co-researchers mentioned that before planting could take place, they had to first assess the soil. Again, observations took place here. While it is careful observation that informs science procedures, observations do take place in students' rural environments. The fact that the professor loved what the student did, that is, assessing the soil before planting, suggests that the student used knowledge from home to execute an experiment. However, there is a suggestion in the data that the professor did not in the first instance use what students already had as a starting point in his teaching. The professor's design of the curriculum and thus his enactment thereof did not consider the students' prior learning experiences, particularly those who come from rural areas. More discussion on this aspect is in Chapter 7, when analysing data from academic teachers, and this is hoped to provide a balanced analysis.

The co-researcher also points out that, due to lack of evidence, she could not relate what she learned from her father, who is "uneducated", to the process of growing plants in which the professor was involved. However, the co-researcher became aware of the similarities in procedures of selecting the right soil, where the method of observation was used. The undertone from the findings above is that the co-researcher felt out of place in the above-mentioned experiment, and in academia in general. These are events which students perceive as marginalisation associated with the continuing elitist and exclusive nature of the institutions in which they have enrolled.

Given that our knowledge of the world is relative, but the nature of the world itself is real, through critical realism I was able to weigh various accounts of the mechanisms from which events (what students did) and experiences emerged. I was able to judge (judgemental rationality) in order to provide the most likely explanation of the workings of mechanisms, in

this case, the professor's beliefs or limited knowledge about the resources that students from rural areas bring with them, which might have led to the professor not drawing on these resources or contextualising his teaching to the lived experiences of these students. The event that emerged was that the students drew on the Discourse learned from home and this Discourse was helpful to the student in executing a science experiment.

In the domain of culture, it could thus be argued that the dominant discourses constructing learning and teaching in the discipline of science were playing a big role. These discourses construct learning and teaching as asocial, apolitical and ahistorical. These aspects in the domain of culture in the MM model highlight morphostasis, or the state of non-change, in the teaching and learning environment, although the cohort of the student body now comes from different backgrounds culturally, geographically and linguistically.

Another home practice which has scientific underpinnings is captured in the findings below:

“Before student could count, is able to memorize cow by their colours and the position and types of horns. Learned how to recognize the herd in this way. Learning how to count as a child has duties, like taking cows to graze and fetching the cows by that time. You don't even know how to count, but you know that all cows are there when you look at them. You memorise them with their colours, you also memorise the position or type of horns they have, so you recognize the cows according to their horns, their colours, and you never go wrong. You know when you look at a whole lot of them if one cow is short and which cow according to the horns is not there, even though you don't know how to count. (Focus group discussion, 12 August 2017)

Here is an important aspect of science procedures, that is, careful observation. The co-researcher is able to recognise when one cow is missing by just looking at them. This was possible by observing certain features that the cow possesses. The point that I am making here is not to suggest that science is simplistic in that it could just be associated with observing the colour of the cows or their horns. But the skill that the student has gained from home could be a useful skill in science classrooms when the professor is teaching about the method of careful observation. If the professor knew about this experience, then it would have been possible to use it as a starting point in teaching about observations in science. The pertinent argument here is that there is a need to effect change or elaboration at the level of pedagogy that will portray experiences and identities other than the dominant perspective of scientific procedures taking place in controlled environments. This pedagogy should also account for the social aspect of learning given, that there are always knowers in the construction of knowledge (Ellery, 2016; Maton, 2014). What I mean is a pedagogic practice that will reflect students' experiences,

including for those who come from rural areas. Such curriculum events, I argue, have a potential to shift these students' views about science – that science is in fact not divorced from what they already know. This shift could potentially enable participation in science knowledge construction.

Drawing on Bernstein's notion of three fields, discussed in Chapter 5 of this dissertation, and the “epistemic-pedagogic device” which shows the relationship between these fields, it is possible to see that within each discipline, there are “rules” or principles that affect what can “count” as knowledge (McKenna, 2019). However, these look different in:

1. The field of production: This is the field where the knowledge is initially discovered or constructed; the form is usually in laboratories and fieldwork, and disseminated in conference papers and journal articles.
2. The field of recontextualisation: This is the field where pieces of knowledge from the field of production get selected and adapted and turned into an educational format or curriculum. This might take the form of course guides and textbooks and lesson plans and so on, also policies about what needs to be taught. It is in this field that academic teachers have an option to shape the curriculum through course guides, for example, such that it reflects the experiences of the heterogeneous cohort of students in their lecture halls.
3. The field of reproduction: This is the field where the knowledge gets reproduced through teaching and learning and assessment. Again, academic teachers could choose to do the same in this field as in the field of recontextualisation.

Nonetheless, it should be noted that the process is not linear; there are ideological clashes within and between these fields, and there is movement in both directions. Sometimes, the main actors in the first field are completely different to those in the second field. Often in the school system, teachers are expected to teach a prescribed curriculum and may not themselves be knowledge producers. This is different from universities, where academics are producers of knowledge, and so they have agential emergent properties or powers and can exercise these as they interact in different contexts, in this case, in the three fields discussed above (Archer, 1995). Agents (academic teachers) could exercise their agency (powers) to achieve their goals, to design a more living and inclusive curriculum.

Crucially, given the ideological clashes manifested in these fields, it is possible to observe that textbooks, for example, in the field of recontextualisation, can serve to hide or reformat

knowledge. In this case, science textbooks normally give a scientific perspective or experiments from the point of view of Western modern science (Mbembe 2016, 2015; Medupe, 2017; Khene, 2017). What needs to happen is that we ask questions about the ideological clashes playing out within and between each of the three fields and challenge whose interests are being served. We also need to question the extent to which students are given access to texts from the field of production in order to allow them to engage with knowledge in its original form, not only provide them with textbooks and lecture notes for their entire undergraduate experience (Mckenna, 2019). In other words, it seems necessary to undertake our work across all fields in a more just manner, which may mean disrupting some of our assumptions about how curricula happen (Mathews, 2019). That is, curriculum is not “just the topics covered in a course. It encompasses attitudes, the values, dispositions, worldviews, that get learned, un-learned, re-learned, re-formed, de-constructed, and re-constructed, as a result of the tuition our students are exposed to through their degrees” (Mgqwashu, 2017).

The transformation talks focused on decolonising the science curriculum which were held at the research site in 2017 resonate with the ideas presented above. Professor Thebe Medupe, an Astrophysicist and lecturer at the North-West University (South Africa), concentrated his talk on the practicalities of decolonising the curriculum through examples of astronomy. He argued that, “Science is not colonised because everyone is exposed to the laws of science and physics through nature, rather it is how it is presented” that makes it colonised. He further asserted that, “The African continent has a long history in stars, unlike what has been accepted in the academic world.” Furthermore, he asserted that the science curriculum could be decolonised by moving the African child from the western concept to the centre of where the individual is, through educating them about the history of science in Africa. Medupe also indicated that decolonisation could materialise through celebrating high-achieving scientists in Africa.

Dr Samson Khene, an independent researcher who is also part of the African Leadership Programme and a senior lecturer in the department of Chemistry at the research site, presented a different view of decolonisation. He argued that the decolonisation of the science curriculum should be viewed as, “preparing budding scientists to be able to solve local and global problems”. Khene’s key argument was on how the breakthrough of decolonisation could be found through innovative students. He maintained that the main problem of the current situation is that students take the theories they learn as unchangeable facts, as the truth about the world and not what the human mind thinks about the world. This is how science is normally presented from textbooks, an objective world out there. Critical realists allow for this understanding but

they further argue for a social world, which is necessary to understand when dealing with people. What normally happens under this situation, as Khene argued, is that, “We end up producing scientists who are just users of knowledge, users of theories but never producers of theories”. Khene believes that decolonisation can only happen when African students become generators of African knowledge through thinking about new theories that will surpass the current ones. Based on these deliberations, it is possible to see why the findings from the co-researcher below indicate the difficulty in bringing what they already know from home into an academic space. This is what one co-researcher had to say about planting in the community:

When like, listening to plough and plant stuff, the soil, you know, we know which soil is good to actually make your garden on and which soil carries too much water, and which soil is not good for planting, because maybe the seed will get washed away... and when you really come to university, even though they don't talk about ploughing, but you get to learn about the different types of soil and then you put a name to that soil... (Focus group discussion, 12 August 2017)

It is true that scientists concentrate on getting accurate data in order to validate scientific claims. It is also true that the evidence that is obtained based on accurate data is obtained through observations and measurements (procedures). What we can do as academic teachers would be to contextualise these to students' lived experiences to enable ease of access to disciplinary knowledge, which is often abstract and therefore difficult to access:

Some of the things we learned from the community are just the way you phrase them, so since I remember having some argument with my father talking about animals that ok... these stomachs, some have one, some have two, ok, he mentioned something about when you eat during the night. He said you have machine that digests your food and after 12:00 he doesn't work, and now I realised that, oh ok, the digestive system, it works like that. They know that it works different, but the way they phrase it, it's different. (Focus group discussion, 12 August 2017)

So basically, most of the things that you find in formal education are things that we already have access and knowledge, it's just that they are named differently. (Focus group discussion, 12 August 2017)

Like, the purification of water, like at home, with boiled water you purify it, whereas here you get that thing, ok, you can purify water by boiling it, but there are some other ways, so we get some sort of advanced knowledge about what you already know. (Focus group discussion, 12 August 2017)

What the findings above effectively show is that, at the research site, the home practices with scientific underpinnings that students from rural areas bring with them are not clearly understood and therefore, are often marginalized in university teaching and learning (Zinyeka, 2013). An argument could thus be made that the research site does not adequately cater for prior

learning or cultural capital (Bourdieu, 1973) of students from marginalized communities, with the result that the curriculum, which is understood as a structure that regulates access to knowing and knowledge, tends to favour certain world views and ways of being and, as a result, does not treat all fairly (Boughey & McKenna in press; Lockett & Lockett 2009). Students from marginalised groups thus come to feel ignored by the curriculum and the teaching and learning processes that it encompasses (Mgqwashu, 2016). Focusing on students' being and local ways of knowing with scientific underpinnings could be used to gain genuine understandings of what it means to enable epistemological access to higher education in the field of science. A key point here is that there are ways of being and ways of knowing in rural areas which are valid, but are simply not recognized or rewarded. Local knowledge is subjective and produced by local people on the basis of their beliefs and reasons for doing what they do (Zinyeka 2013). To some degree, this is similar to formal scientific knowledge, which itself does not start from neutral observations in order to arrive at explanations about the natural world, but rather from the subjective experiences of scientists (Chalmers, 1982).

Effectively, the structure of curriculum in the field of recontextualisation and the field of reproduction could be seen as constraining the development of the agency of students, both as individuals and as a group, over a specific time period termed  $T_2$ - $T_3$ . Through the tenets of critical realism, it was possible for me in analysing data to realise the context of teaching and learning in the field of science (Case, 2013) in order to excavate the way structure conditions agency of students in contrast to the way the agency of teachers, who may come from very different backgrounds, plays itself out.

## **6.9 Curriculum: Clashes between primary and secondary discourse**

While the previous section has shown interaction between primary Discourse and secondary academic Discourse, this section shows tensions between these Discourses. There is thus a perception from co-researchers that primary Discourse or literacies socialised from home pose a challenge and confusion for them once they are at university, and universities seem to be absolved from acknowledging these differences and are thus left without critique. From the findings below, it is possible to observe the potential impact of this on the agency of students in accessing the secondary academic Discourse in general, and the Discourse of science in particular.

### **6.9.1 Clash of discourses: explanations in science**

The following findings present constraining practices from rural homes of co-researchers. Explanations, for example, are valued in science. When students are presenting laboratory results, for example, they need to explain why they have obtained their results and support their reasons with literature. This skill becomes easier to practice if a student has been exposed or has been groomed from home to be critical of the environment around them and is provided opportunities to do so. In some instances, this seems not to be case for these students, as the findings show:

At rural areas at home, we are taught... why you are asking, you are like, ok, this is how it goes, then you come to school and they challenge you. Maybe you say something or you are trying to say a point that you understand, and they ask you about it like, ok tell me about this, what's going to happen if this happens. You are like, no it's that I don't know, if you get what I mean. You see, it kind of has a conflict, it kind of affects us from the rural areas when we come to such spaces, where things have to be questioned and we have to explain. (Focus group discussion, 30 September 2017)

By question, I mean you know, I'm sure you know, I'm definitely sure you know when there is a cultural ceremony and things are done a certain way, you are like, what's going to happen if I close the pot? They are like, no you don't close that pot, you let it boil like that. If you ask, they will tell you that you know too much, why are you asking, then they label you as that. Then you end up not asking questions because you are afraid that that person is older than you and what she/he says goes, and you have that in the back of your mind, so when you are out of that space, you act like that, like it's subconsciously there. You act like that when you learn about something. Like, most of the time we tend to cram, and we are asked ok, why does the heart function like this? You are like, that's how it functions, because you can't explain and you can't say to that person that that's how it functions and you should take that; that will be like your own explanation. Like, that's how it functions, that's it; you can't explain it to the next person, because you were not taught to explain things... (Focus group discussion, 30 September 2017).

Young people don't have access to elders' knowledge. The elders don't explain what they are doing, they only issue orders without providing explanations. (Focus group discussion, 30 September 2017)

The situation presented above is likely to be transferred to other environments wherein a person has to get an explanation for something, but they end up not asking because they are not used to doing so, which could be a disadvantage in academia. In this situation it could be difficult for these students to identify themselves as members of a scientific community and so, would be unable to participate fully in science Discourse (Gee, 2012). In other words these students could potentially be unable to act and use language resources and act in ways recognisable in the science community. Gee (2012) argues that acquiring the ways of acting, such as asking

questions and giving explanations, could be eased by the proximity between primary socialisation (Discourse) and secondary academic Discourse. If the social context from which people are born is congruent to the context to which individuals gain access, for example, in the case under study, a university, the likelihood is to experience the secondary context as a continuation of literacies learned from home. To this effect, Boughey (2019) notes that the mainstream ways of knowing exist in school-oriented families. In these families, often middle-class educated families, parents prepare their children for participation in settings involving literacy like schools and universities (Boughey, 2019; Heath, 1983).

Clearly, the concerns expressed by co-researchers above could be detrimental for epistemic access and success at university. The identity of students is thus affected in more constraining than enabling ways under these conditions. In the context of this study and what the findings reveal, we can ask the question: to what extent as a university are we prepared and have recontextualised our curriculum structure and pedagogic practices to teach students whose home backgrounds are not school-oriented? Given the current demographics of students, in this study, the argument is made that this is a pertinent question to engage with as we design our curriculum.

### **6.9.2 Clash between home values and university values**

These findings present tensions between what is valued at university and in the field of science in particular, and the values from the homes of co-researchers in rural areas.

Clash of interest, even now I'm from, and Prof is my warden there. At the beginning of the year, he said no guys, I'm not standing here as a father or someone who is, but I'm standing as [name removed], so you can call me [name removed]. So Prof, he is very older than me, like, I can't call him [name removed], but now I'm used to call him Prof, as he told us to call him [name removed], so we couldn't call him [name removed]. Like, we are referring to him as Prof. Prof better to us than calling him straight [name removed]. (Focus group discussion, 12 August 2017)

Calling an elder by name is considered an act of disrespect from in most African cultures but an acceptable way of doing things in academia. In some instances, academic teachers insist on being referred by their first names but not by their titles. If we do not know who the students are that we teach, their cultures and identities, we might be alienating them, in most cases, unwittingly. Under the above-mentioned circumstance, the likelihood is that the student would end up not going to their professor because there is a clash between primary socialisation and secondary Discourse. At university, in order to know, a student must ask by consulting. This act is likely to be a challenge for this student, yet to what extent do we acknowledge this, as the

university is at issue? While I realise the quantity of content that needs to be covered in science courses, I propose that before we teach, particularly in the post-colonial and post-apartheid university, it is necessary to engage in some kind of diagnostic assessment where we ask students who they are in order to identify the gaps that they bring with them (Mgqwashu, 2019b). The idea is to enable learning and I argue, for that to happen we need to know who is in our lecture halls:

At home, you are taught that if you are speaking to an adult, do not look them in the eye, so if they are talking to you and you look them straight in the eye, it's a form of disrespect or something, and then when you get here it's just... to the lecturers, when you don't look them in the eye, it's like you are not listening to them, or you just to them it's disrespectful when not looking them in the eye when they are talking... and when you get home, and then your uncle is talking, and then you look them straight in the eye... 'You think you are clever now. (Focus group discussion, 12 August 2017)

Again, the tension between primary Discourse and secondary Discourse can be observed here. You end up not knowing what is correct to do and this is likely to impact on how the student acts, which will then condition the relationship he or she has with academic teachers:

...we respected teachers to the point that we feared, so it was hard to ask questions even if you didn't understand. Maybe you didn't understand in class, so you can't go to the teacher and say hey, I didn't understand this and that, so we had that thing that no, I'm scared of this teacher so whatever, you don't understand, you leave it, because you are scared to go ask this ... so here in university, at least we had that relationship with our lecturers. They are ok with us asking questions, they want us to ask questions, they want us to engage with them... (Focus group discussion, 12 August 2017)

...I have to respect elders. Like when I came to university I was, the lecturer introduced himself and said, call me with a name, which is very difficult for me to call an adult with a name... it doesn't sit well, so if I have to approach the teacher, I have to use the name, and later he responded and said, no, call me with a name, and then I said I can't call you with the name, you are an adult to me. (Focus group discussion, 12 August 2017)

...we understood respect, like we both know that we confuse respect with fear, that's what happened, so when they said respect and that, we thought that you must not fear, understand that fear and respect are two different things. (Focus group discussion, 12 August 2017)

Ja it affected the relationship and you couldn't be comfortable with the people you were respecting, only to find out that you were fearing and when you be like, when you see your brother, you are like, why do I have to respect you? You come with that mentality. (Focus group discussion, 12 August 2017)

Respect is seen by co-researchers as a disadvantage at university, because they end up not doing what they are supposed to do – ask questions to gain understanding, because their home

environment has confused respect with fear. The students cannot ask if they want to. This is very disadvantageous at university:

If your dad says this is it, and you kind of don't agree with him... you get to a point where you just have to say ok, you are right, not that you agree with your parents, but it's just you respect them and you don't agree with them... but now I feel like the parents at some stage, they have the mentality that the teacher is always right, everything that the teacher says is right, because now when you go home, now I think it's not only me who notice that they trust me more about things because I'm at varsity, to a point that even if they want to write an obituary they will consult you, 'Can you please write?' You have been doing this, and you ask me to write, like, what happened? (Focus group discussion, August 2017)

This finding links to the point made above that the home environment seems not to provide an opportunity to engage with issues. This extends to a university space when these students are challenged by their lectures because that's what University education is all about. You need to ask, make an argument and provide evidence. Under the above-mentioned circumstances, that could be daunting. The work of Gee (2008, 2012) could be helpful here to understand the role of primary Discourse as it clashes with secondary academic Discourse. As an academic teacher, knowing the role of Discourses could be significant in shaping pedagogic practices to enable epistemic access for all.

These home values have the potential to be translated into university space, and would thus impact on students' agency, as the findings below show:

In the rural areas, they teach you the values and you don't question. It's yes and amen and no questioning, but at varsity, you taught the opposite. Now how does that impact on you if I was told not to criticise them? I am here and then I'm told to criticise, it is a conflict... (Focus group discussion, September 2017)

I mean, how do you find that, it's confusing to my head...think of a student who has lived with parents who are always encouraging that critique and questioning, and you've been taught never to question, and you are in the same class with this student who knows how to critique... (Focus group discussion, April 2017)

Both the domain of culture in terms of beliefs regarding expected child behaviour, and structural domain in terms of geographical location of co-researchers, were perceived to be responsible for the constrained agential development of students in ways valued in the academy and in the field of science in particular, that is, a learner who is independent, objective, critical and values other claims based on sound argument (Ellery, 2016). How prepared are we as a university and the Faculty of Science to enable epistemic access by these students by acknowledging who they

are, what they bring with them, where are the gaps from what they bring with them. I am arguing that just going into a lecture hall and deliver a lecture and come back the next day do the same thing, without giving students the tools to access the content you are teaching and provide opportunities to establish the extent to which students have been socialised to act, think, and value the ways of accessing the content could be another reason for perceived lack of participation for these students in science classrooms or lecture halls, as findings in Chapter 7 will demonstrate.

Another resource for data generation was documentaries that co-researchers produced. These also demonstrated the frustrations that students from rural areas usually face at the research site, mostly because they come from backgrounds where parents do not know much about the education of their children and so, do not really know how to be part of it thereof. It should, however, be noted that these parents did not choose not to know about the education of their children. Geographically, these students come from the most impoverished areas in South Africa which then condition access to material resources, including education as chapter 4 has demonstrated. So it is possible to understand why, because of the inability to access material resources, parents are not so much involved in the education of their children, unlike parents from the middle-class educated communities.

## **6.10 Primary socialisation and agency development**

Co-researchers shared their frustrations due to the home environments that are conducive for learning in HE. Such an environment could have consequences for success or failure at university as the findings show:

I think we also need to change the society, because in rural areas we don't have self-confidence. You see, we might have resources, but parents don't care about their children, like, passing a lot they don't know the reports. They don't even take the reports, like, you tell your parents that they have to go to a meeting today, they don't go, they don't care, and they don't care about education. They won't say what education can do for people, so if maybe a child says I want to drop out, they don't care, they will let a child drop out, I'm saying that we must build like, self-confidence as society as black people that ja, we can believe in ourselves that education can change us. (Digital documentaries, 28 October 2017)

From the findings above there seems to be an idea expressed by co-researchers that their parents are not responsible for their education and there is a sense of frustration because of the distance parents have towards the education of their children. This inability of parents to be involved in the education of their children could be understood as emerging from structures like their geographical location which is characterised by a constrained access to material resources such

as education. And so, it could be understood why these parents are not involved because they themselves had not have access to education, not because of their choice but because of structural disadvantaged constituted by the apartheid legacy. Not being involved in the education of their children could be understood as emerging from a deeper “Real” domain which leads to the emergence of events (what parents do or not do – ‘they do not even take our reports’, to check if and how their children have progressed to the next level), in the “Actual” domain, and how co-researchers experience these events in the “Empirical” domain (frustration that their parents do not care about their education and/or, even if they drop out from school, parents do not care. From these findings, it is possible to see the role that is played by home background in the education of children and how this could translate to the events that are likely to be experienced later, either in secondary or higher HE, what Gee (2012) refer to as the proximity between primary Discourse and secondary academic Discourse. Understood in this way, education could be seen as political – who is involved and not involved in the education process, social, cultural and historical. What we can do as academic teachers is to accept this and this acceptance could give us an opportunity to investigate and know, who are the students that we teach, so that we can enable learning for all in our lecture hall as well as the development of agency. If learning is not enabled for all, the likelihood is the sentiment expressed below,

Ja, you have to go back. You see, even here, the fact that you get certain education you see, most of the people getting excluded are children from black people in rural areas, like, you see, they can’t cope with this education, you see, so you have to go to the foundation phase. (Digital documentaries, 28 October 2017)

### **6.11 Rural students not wanting to go back after university**

Based on Mamdani’s analysis of the formation of the colonial state in South Africa, as well as the post-colonial developmental state, the urban elite continue to enjoy the civil rights granted to “citizens of civil society” (in the Western idea of a nation state), while the majority remain “subjects of political society” (Luckett, 2016). From this analysis, it is possible to see that the operation of ex-colonial universities, as they are part of communities from which they have emerged, could serve to sustain or reinforce civil society and as a result, function to replicate the elite citizenry (Castells, 2001; Garuba, 2012; Nyamjoh, 2012; 2016):

You just want to go out of there. You grew up there, you are like, yes I appreciate this place, it got me, but then I want something better for my family and my kid and their kids, so I’m moving from the rural areas so they don’t experience what I’ve been through, and then that changes the whole system then, because it’s like, you put, you are giving them that advantage, yes, but then you are forgetting actually everyone else that helped you in like, becoming who you are, even if they just gave you like, words of

encouragement on the streets when you were feeling down, they actually forgetting them. And you are like, no, if I help my family and my kids, my kids will grow up to be better people and hopefully they will remember that no, my grandmother used to be from a rural area, and that's like, the chances of that are very slim, and then they'll want to give back to that rural area, ja. (Digital documentaries, 28 October 2017)

The sentiments raised in the findings above could be associated with a concern that Mgqwashu (2016) raises when he argues that education fails South Africa's rural millions. According to Mgqwashu, education tends to favour outcomes that are relevant only for urban contexts. He further notes that South Africa's rural population is more than 19 million. Nonetheless, the degrees that students are enrolled for in universities may not be easily applied in their home towns (Mgqwashu, 2016). Writing about the public good, Mgqwashu (2016) asks the questions: For which "public" are universities educating the younger generation? For whose "good" are they receiving this education? Which "public" receives "the good" out of students' education? (p. 4). It is then possible to see why co-researchers find it difficult to go back home once they are educated. The findings below also echo the points raised above:

...institutions here in South Africa at large are biased, and taking from what I've learned from class about urban bias... in urban schools for example, you'll find that. Let me make an example about my school, my high school and the high school in (Name of the place removed). You would find that if there's new technology to be introduced in the school, a certain, you'd find out that improvement is done mostly in the urban schools and then rural schools are usually marginalised. There is that mentality; it's called futility. There is that mentality that like, they are on the rurals, so what change would bring in technology in that rural places? So let us further improve the schools that have been improved already, like, they say it efficient in material because... has enough material already. Maybe they bring it computers, they will say... already has electricity, but at my previous school, they will say ok, we need to bring them computers. They won't work, because we have to start by installing cables and all that, like, there is more to be done, so let's rather focus on the ones that will make us achieve this thing at less cost. (Digital documentaries, 28 October 2017)

What could be observed from these findings is that different environmental contexts shaped the emergence of the experiences of the South African population based on their geographical location and access to material resources. It is then possible to see an ideology of separate development which was promulgated by apartheid policies. Crucially, in the social world, people occupy different positions (through birth or through voluntary or involuntary placement) which imbue them with certain powers (*ibid*, p. 177-185). These positions structure life chances for people. Thus, people are born into contexts of advantage or disadvantage, given their geographical location, especially in South Africa. Attached to positions are certain material

resources and therefore vested interests. People occupying the positions may wish to maintain their positions and interests, or may wish to improve their situation in life. Social groups and the positions that people occupy could thus be interpreted as a structure that leads to the events of not wanting to go back to rural areas once a degree is obtained, and an experience of not liking rural areas. Based on this understanding, it is possible to see how apartheid policy had structured life chances in either enabling or constraining ways for different groups of people in SA.

The uneven access to material resources between rural and urban populations conditioned unequal privileged positions. The effects of apartheid are still felt even today, and this is especially experienced by students from rural areas, which is why they struggle most in universities. It is not their choice, but they have been born into environments not of their making. The question is, what are we doing as universities to support these students? At the research site, for example, there is a mentoring programme which supports these students, but the issues of the epistemologies valued in academia, the agents receiving and giving these epistemologies and their philosophical and ontological orientations, are not given much attention.

Critically, based on these findings, the life chances that are conditioned by access to material resources, including the positions that people occupy in society, have a potential impact on who gets access to the academy and who succeeds. Rural areas are generally characterised by poorly resourced schools, located in isolated areas, with high levels of poverty, disease and unemployment (HSRC, 2005), as well as disadvantage and lack of economic and educational opportunities (Trends in International Mathematics and Science Study, 2015). The concept of rurality is typically concerned with deprivation and deficiency, including, among others, isolation, poverty, disease, neglect, backwardness and depopulation (Nkambule *et al.*, 2011). However, this perception does not accurately reflect heterogeneous experiences of rurality and the multiple ruralities that exist (Brown & Danaher, 2012) as well the funds of knowledge found in these areas (Zipin *et al.*, 2015). Several dimensions of rurality have been discussed in Chapter 1.

## **6.12 Conclusion**

This chapter has presented findings that relate to co-researchers' home literacies and community environments, whether these could function as enablers or constraints in accessing disciplinary knowledge in the T<sub>2</sub>–T<sub>3</sub> period. Although some of the co-researchers' home

literacies might be said to have scientific underpinnings, these could be said to be constrained in their potential for accessing the abstract science discipline, due to the fact that, as the university, we do not know much about students from rural areas. This knowledge gap shaped how curriculum was structured, which further shaped how it was enacted, an enactment which left most students from rural areas alienated, because the curriculum drew very little, if at all, from literacies already known from home or communities.

What has emerged from the analysis is that the contexts within which science teaching takes place tend to favour certain world views to the exclusion of others. As evident from co-researchers' findings, persistent apartheid legacy and coloniality continue to reproduce constraining structures and cultures, which continue to shape teaching and learning in the field of science. Thus, departmental structural systems in the form of curriculum and institutional cultural systems created a constraining synergy in the parts as they complemented each other, thus constraining the agency of rural students.

Through Archer's (1995; 1996) theory, this phenomenon was explained and could be seen to have resulted in situational logics of contradiction for some students and complementarity for others, and thus the protection of the status quo that favoured students from middle-class educated families. This was observed from co-researchers' findings when they indicated that "we have to change, but curriculum stays the same". The constraining nature of the "parts" seemed to reinforce each other, and thus constrained human agency in accessing science disciplinary knowledge.

The findings also showed that there are home practices which pose tension between home values and university values, which could be another reason why students experience a form of contradiction when they join university. When students are at home, they are told to respect and not look an adult in the eye, but at university this is perceived to be disrespectful, or a mark of being a dishonest person. In Chapter 5, I have explained that one of the characteristics that is valued in a scientist's identity is honesty, especially when conducting scientific experiments. If a person is perceived as being dishonest, this might negatively affect interactions between teachers and students.

This chapter thus leads to the analysis of data from academic teachers, in order to get a holistic analysis that will provide a bigger picture of what we know about rural students in higher education, including the support we give them, especially in the field of science, as well as teachers' understanding of "rurality". Chapter 7 presents these findings.



# CHAPTER 7: T<sub>2</sub>-T<sub>3</sub> PERIOD: A CONSTRAINED OR ENABLED TEACHING AND LEARNING ENVIRONMENT: ACADEMIC TEACHERS

## 7.1 Introduction

Chapter 6 analysed findings from co-researchers from period T<sub>1</sub> to period T<sub>2</sub>-T<sub>3</sub>. The findings showed how students' historic and current practices shaped by their primary Discourse have either enabled and/or constrained access to secondary academic Discourse in the field of science. Students' own accounts and discussions as co-researchers demonstrated how family and community, including religious groups, influenced their experiences of education in general, and in the field of science in higher education (HE) in particular. What stood out in Chapter 6, therefore, was the emergence of events or practices that shape approaches to the learning of students from rural areas in universities, and the challenges they face in higher education curricula, which remain imbued with coloniality and apartheid legacy. Also, the potential contribution and challenges of digital technologies and social media, both in rural communities and when entering HE from rural backgrounds, came to the fore.

Chapter 6 also showed that the geographical location of co-researchers acted as a structure which constrained the agency of these students, as they are cut off from the mainstream and are thus subjected to limited amenities, which then conditioned access to material resources. However, because there is no direct cause and effect between structure and the emergent events and experiences, these students were able to modify their circumstances (Porpora, 2013) by going to university, an event which is difficult for students coming from the most remote and disadvantaged areas of the country (Mgqwashu, 2016).

Chapter 7 analyses findings from the senior leaders at management level and Faculty levels of the university. These are corporate agents. This chapter also analyses findings from academic teachers (primary agents) who teach these students. This chapter thus continues to look at the T<sub>2</sub>-T<sub>3</sub> period, but with a closer emphasis on how the institution manages access, support for non-traditional or under-represented students, as well as issues around rurality, so that a deeper understanding of its different dimensions can be conceptualised in relation to HE. Chapter 7 thus engages with issues of support for students from rural areas, inclusivity and diversity within the curriculum, and pedagogic practices. It is important to note that period T<sub>2</sub>-T<sub>3</sub>, drawing from Archers' SR theory, emerges out of period T<sub>1</sub>. Period T<sub>1</sub> conditioned the teaching and learning environment in ways that shape the emergence of events and experiences in the current period T<sub>2</sub>-T<sub>3</sub>. In other words, the structural and cultural emergent properties operative

at T<sub>1</sub> shaped the events and experiences of agents in T<sub>2</sub>-T<sub>3</sub>, as they pursue their responsibilities using their reflexive powers (Archer, 1995, 1996). Consequently, this chapter locates the complementarities and/or contradictions at play, and how students from rural areas experience these. As a consequence, a discussion is necessitated of how academic teachers and senior leaders perceive a more inclusive and living curriculum that might be developed to build on the experiences of all students, including those from rural contexts.

The first part of this chapter thus presents and analyses findings from the corporate agents in terms of support for students from rural areas, inclusivity and diversity within the curriculum, as well as pedagogic practices, contradictions and tensions. The second part presents and analyses findings from the primary agents. The findings demonstrate the extent to which lecturers who teach students from rural areas, among others, appreciate the knowledge resources that these students bring into their classrooms, their conceptualisation of the teaching and learning environment, and the kind of relationship they have with students in general and those from rural areas in particular. An attempt at establishing the extent to which academic teachers know of the knowledge resources that these students bring with them from home to university was crucial, especially in answering the third research sub-question: *How do academics who teach second year science students understand the knowledge resources that students from rural areas bring to their classrooms?* Working with data in this way allowed an explanation of how home environments and the HE environment in the field of science led to the emergence of students' experiences and academic teachers' observations thereof, as well as the impact of these events on educational outcomes. I now turn to the analysis of findings from corporate agents.

## **7.2 Corporate agent in management: an enabling environment**

The findings below indicate an acknowledgement from the senior leader that the student body has changed at least since 2000, and that the representation of black students in the South African student body is noticeable. It should, however, be noted that at least in 2004, the student body in the research site for this study was predominantly white and privileged, which meant that the teaching and learning environment at the research site was congruent with literacies from middle-class, often white educated homes (Boughey, 2018; Heath, 1983). When data for this study were generated in 2017, the majority of students in the research site were black, and a large number came from working-class and, possibly, rural backgrounds (Boughey, 2018). Because of the change in student demographics, there seems to be an implication from the findings that an increase in the number of black students in academia, especially in Historically

White Universities (HWUs), has affected how teaching and learning should be conceptualised, including institutional change at various levels, as the following findings show:

So, regarding the fact [of] involving the students, I have a number of students [on] campus that have changed with the increase in modern black students. They have representatives in the South African student body. They have done a level in a whole of things, and stuff like that. We have a lot of modern students... So, in 2000, a lot of student bodies have changed academically. (Interview, senior leader in management, 13 April 2018)

So, when I came here, my approach was looking at the academic development... It's about institutional change, it's about development gap... and to get into an institution in the interim, as for you to get a post-graduate diploma. There is a gap in teaching, and people that are in teaching are not that very knowledgeable... [In] 2012, we got for the first time development plan in history to develop teaching earmarked [grant], since then it comes in a form of subsidy, and it was enrolment on whether or not you are eligible for teaching enrolment... (Interview, senior leader in management, 13 April 2018)

So, we got a small amount of money in 2012, so we had to have a big account, so we continue to meet demands. We have got the best system, even though our student body has changed, we managed to hold the fund although the student body had changed... (Interview senior leader in management, 13 April 2018)

The findings show a shift and a refocusing of the interventions onto teaching and learning. These interventions are informed by a realisation and an acknowledgement that a university teacher must have some kind of teaching qualification, in the form of a Postgraduate Diploma, and that there are funds put aside just for that intervention. It could be deduced from the findings that it is one thing to be a Chemistry graduate or to have a Doctorate in Chemistry, for example, and it is another to teach Chemistry. It is possible to understand this academic development move, especially in the context of a student cohort from diverse backgrounds.

It seems from the findings that this was seen as more pertinent now, given the changes that have taken place in the South African Higher Education sector (SAHE), including the change in student cohort. The move to encourage, from the academic development point of view, the development of teachers could be seen as an enablement in implementing curriculum that is informed by the scholarship of teaching and learning. These initiatives are mainly provided by academic development/teaching and learning units in universities. These units are responsible for leading curriculum development and renewal in the institution by providing advice, training, planning, research, and other related areas (Moyo, 2018). We can then observe the corporate agency supportive of the professionalization of teaching and learning. In other words, the presence of this unit at the research site could be observed as a strong institutional structure

driving teaching development or institutional policy to support teaching development. Thus, in addition to the structural enablements discussed above, the findings above also showed evidence of cultural enablements, given a strong history of teaching and learning development work as articulated by corporate agents. It should, however, be noted that the Commission on Higher Education (CHE, 2017) has reported a conceptual shift from “professional development” to “professional learning”, which could be understood as a key input to the discourse of teaching and learning such that “in the context of the decolonization debate, [this shift] has the potential to offer a more flexible continuum in which to position different learning opportunities” (p. 10). There is thus an opportunity for academic teachers to acknowledge “the importance of group and individual agency and the importance of informal contexts in learning to teach” (p. 10) and this acknowledgement is important in this study.

It would be interesting to find how academic teachers conceptualise teaching and learning in the context of academic development discourse, as the findings from academic teachers will show later in this chapter. Nonetheless, the change that is envisaged by the senior leader in management is not only focused on the development of academic teachers to be professional teachers because the student body has changed, but is also on institutional change and on development.

...So, a lot of it [change] is that you don't focus your attention on the students. You have to look at how to bring change in the institutions. So, if the institution were to change in engaging a new student body, in a way, that institution is to change, it would have to start looking in curriculum development, so how to work with those you have to make sure that the university or the institution needs to change or transform... (Interview, senior leader in management, 13 April 2018)

This finding relates to the previous findings wherein the senior leader mentioned that when she came to this university, her approach was to look at academic development. So, the employment of the senior leader into this position could be seen as the university's recognition of the need for teaching development work. This could be understood as a deliberate attempt by the university to institute an enabling structure to promote the professionalization of teaching and learning among academic teachers. And so, it could be argued that this in itself was an enabling structure that shaped the emergence of the decision (cultural enablement) by the corporate agent (senior leader in management). The senior leader's focus on academic development could be seen to have shaped the decisions and practices at the research site towards instituting teaching and learning structures, like the Postgraduate Diploma in Higher Education (PGDPiHE). PGDPiHE was seen as a mechanism that would enable academic teachers to better teach in

ways that draw on teaching and learning theories in order to structure and enact the curriculum in ways that are inclusive of all students' experiences in the classroom. The situating of the academic development project in the hands of a senior person ensured that the person had the corporate agency to implement initiatives like the PGDPiHE.

It is through robust leadership that the cultures of professionalism could be improved. According to Leibowitz *et al.* (2014), such conducive teaching and learning environments are tendential to such cultures, and thus likely to condition the actions and approaches of academics towards their teaching work. While the leadership of the senior leader might be showing enabling cultures, these are tendential to the agency of academic teachers and other senior members like the deans for their pronouncement, especially at curriculum level, as the findings indicated. The senior leader in management, for example, notes, "How to work with those you have to make sure that the university or the institution need to change or transform". Therefore, from the findings, the change must also be at curriculum level, given that the university now has a new student or different student body, and this could be realised through initiatives like academic development. The corporate agent seems to be aware that the university and its structures, like curriculum, cannot be left without critique for genuine inclusivity.

Apart from the change at institutional and curriculum level that is observed from the findings above, there seems to be a realisation from the senior leader in the following findings that under-represented groups' experience of HE is challenging at various levels, including financial challenges. This challenge is likely to constrain full participation at classroom/lecture hall level and in the university at large. Most students from rural areas go the classroom hungry and this is likely to negatively affect participation as the findings show:

It's about a whole person and we would try to put black students [to]... get the financial aid package and they would let them in a lot longer and get financial aid, so for them, they would get full package, which would give them tuition fees, and they go around and live with their sisters. (Interview, senior leader in management, 13 April 2018)

While the students might be getting financial assistance, sometimes they spend the money buying food and staying with their relatives who might be experiencing the same difficulties as them, who might had luck to get financial aid. As a result, tuition money, sometimes ends up being used for something else, such as buying food instead of paying the tuition, a situation which is difficult for someone enrolled at the university and the senior leader seems to be aware

of these challenges that students are mostly confronted with, including ones identity as a student from rural areas:

They know their challenges, they have similar challenges... the food option, the monetary option. So, I think the biggest difficulty is the monetary and the literacy shift, and the shift of their being is what brought the PhD student... the science student who is from a rural background, and yet there was also the social stigma. (Interview, senior leader in management, 13 April 2018)

Drawing on Fraser's (2000, 2003) multi-dimensional framework of justice that affects "parity of participation", where economic dimension is one of these factors that could affect participation, we can see the relevance of the initiative mentioned by the senior leader. Fraser (2000, 2003) argues that for "parity of participation" to take place, a particular social arrangement is required that will enable "...all to participate as peers in social life" (73), for example, in the case under study in HE. The implication for this is that, whether a student comes from a middle-class educated family or a lower-class uneducated family, the fact that s/he has gained access to HE means that they should all have equal chances of success. In other words, the fact that some students come from middle-class backgrounds should not be a determinant for success at university. The economic dimension thus maintains that access to material resources like wealth or income would enable or constrain individuals' abilities to engage on equal footing in social interactions. Economic deprivation would result in what is termed distributive injustice. In this way, because of lack of economic resources, some students may find it challenging to negotiate university space at various levels, including access to the goods of the university.

The senior manager is a corporate agent by the mere occupation of her office, and is thus in a position to direct or shape the environments and systems within which students experience HE. Corporate agents "promote re-organisation and re-articulation of goals in the course of strategic action for their promotion or defence" (Archer, 1995, p. 191). Senior managers, through the articulation of their "project", exercise corporate agency. In a context where there is a complementary culture, the situational logic allows for opportunism, or the possibility of morphogenesis in the direction of the project (Moyo, 2018). The institutional and curriculum change espoused in the previous findings could thus be seen as complementary to situational logics that allow for opportunism or elaboration of structures and cultures regarding teaching and learning at the research site.

However, the situational logic that allows for opportunism would most likely be shaped by the uptake of teaching and learning development work by academic teachers relating to their interpretation of science, in terms of whose world view is used to explain abstract concepts. For example, the field of production, the field of recontextualisation and the field of production, as these would impact on students' engagement with the Discourse of science. The implication from the findings that follow is that cultures within the Faculty of Science, and the driving of the projects by corporate agents (including senior leader in the Faculty of Science) either enabled or constrained how students from rural areas experienced the curriculum, as data will show in the following sections. The next section analyses findings from the senior leader in the Faculty of Science, another corporate agent.

### **7.3 Corporate agent in Science: A constrained and/or enabled environment**

The senior leader in the Faculty of Science addressed an important aspect related to HE, that is, the issue of equity:

I get really upset when people are hypocrites, there has to be, ja, all decisions must be substantially fair, slight socialist in that respect, and I'd like to spread things around given, not necessarily equal opportunities. I've discovered that to deal with equity issues, you have to at the end [be not] equal sometimes, like if you have multiple children, you don't treat them the same because they have different needs and different stages of development that you have to be, [you] are getting to know who your faculty are, is to treat them in such a way, such as thinking they all can achieve to be best and so I'd like to think that I treat people equally, but I don't. I try to, in a way, such that it is fair at the end of the day. I'm treating them fairly, and giving them, and empowering them. (Interview, senior leader in the Faculty of Science, 13 April 2018)

There is a vast amount of literature on equity of access in HE (see for example, Boughey, 2012; Boughey & McKenna, 2016; Fraser 2000, 2003, 2008; Hlatshwayo & Fomunyam, 2019). According to Fraser (2000, 2003, 2008), equity of access and equity of educational outcomes could be achieved through *parity of participation*, which involves particular social arrangements, where those who are involved in social interactions, for example, students, participate as peers or legitimate knowers (Leibowitz, 2017b). Fraser further argues that if social arrangements are such that *parity of participation* cannot be realised, this could amount to distributive injustice. In this way, maintains Fraser (2000, 2003), students could be constrained from gaining access to powerful knowledge of the discipline.

Access to powerful, principled or abstract knowledge could be realised through access to the ways of being of the discipline, thinking and what is valued in the discipline. This is what Morrow (2009) construes as epistemological access. However, what is not brought forth from the finding above, and in epistemological literature, is the question of whose epistemology we are enabling access into. That is the question that this study is asking and contributing toward.

The senior leader in the Science Faculty says he empowers students, and that is good, but there is a sudden sense of an asymmetrical relationship (Ndlovu-Gatsheni, 2013) in that the senior leader asserts himself as operating in the “Zone of Being”, while students from rural areas functioning in the “Zone of non-Being”. In social relations and interactions of this nature, there are questions that emerge: who decides what is needed in the process, and whose world is used as the mediating world in the process of empowering (do Santos, 2014; Maldonado-Torres, 2011; Ndlovu-Gatsheni, 2013; Oyedemi, 2018)?

If the above questions are not considered when dealing with issues of epistemological access, the likelihood is that there could be obstacles embedded in curriculum that might constrain said access (Boughey, 2012; Fraser, 2000, 2003; Hlatshwayo & Fomunyan, 2019). Such obstacles might be deeply entrenched in institutional cultures, embodied in disciplinary knowledge, learning and teaching methods, methods of assessment, use of technologies, studying methods and resources. These structures and cultures tend to determine covertly who gets epistemological access based on their home backgrounds, as the proximity between primary Discourse and secondary academic Discourse may ease the process for some students, but not for others (Boughey, 2018; Gee, 2008, 2012).

The corporate agency of the senior leader seems to be constraining engagement with curriculum issues in addressing equity. As much as he demonstrated awareness of the importance of equity discourse and empowerment, his awareness seems to be related to individual students who need to be “fixed”, as there is no mention of the structure like curriculum. Throughout this dissertation, curriculum has been presented as a structure that regulates access to material resources like knowing and knowledge (Boughey & McKenna, in press). The senior leader in management has mentioned that institutional change must also involve curriculum change, and curriculum change does not necessarily mean change in science content, as curriculum is broader than this limited understanding. And so, the findings from the senior leader in science were perceived as not congruent with literature on equity of access, or the broader conceptualisation of curriculum.

Taking a closer analysis of the findings below, it is possible to see that the senior leader's focus seems to be on an individual student who needs "fixing" "for quality outcomes" as "some people need different development to get there", and the implication is that institutional structures like curriculum are left without critique:

I'd like to see that quality of outcome, and some people need different development to get there...  
(Interview, senior leader in the Faculty of Science, 13 April 2018).

These findings show a hugely problematic and outdated sense, very much stuck at Students Academic Support tradition. The dominant discourse from these findings is the intervention to support students in their studies and thus correct their "deficiencies" of "under-preparedness" for HE (Boughey & Niven, 2012). While students from rural areas could be "underprepared" for HE because of their home and school backgrounds, because of the legacy of apartheid, accessing the Discourse of the discipline means more than just developing students. These students are perceived as having gaps that require fixing outside of mainstream academia (Volbrecht & Boughey, 2004; Boughey & McKenna, 2016). The corporate agency of the senior leader seems to locate the capacity to learn and succeed in HE in an individual's ability and motivation for development. Thus, learning and teaching are construed as apolitical, asocial, ahistorical and acultural. In this way, the discourse of learning and teaching is seen as neutral and acontextual, such that the capacity of the students to construct knowledge and meaning rests within themselves, as does the responsibility for success, while the institution is absolved of students' failure (Boughey, 2012; Quinn, 2012). And so, the role of cultures and structures are excluded in the learning process. The interplay of mechanisms like institutional and broader social contexts in shaping students' success or failure was not observed from these findings, and this is the critique that this study is attempting to address.

Research has shown that the rules that affect what can count as knowledge in the disciplines, even in science, is subjected to ideological clashes (Bernstein, 2000; Mbembe, 2016; Medupe, 2016). If this is the case, we need to ask questions about the ideological clashes playing out in instances of epistemological access, in order to engage with issues of whose interests are being served. Not considering these issues could lead to a situation wherein curriculum is covertly limiting, silencing, constraining participation and thus exclusionary for some. We might then need to disrupt some of our assumptions about how curricula happen (Mathews, 2019), that is, curriculum is not "just the topics covered in a course. It encompasses attitudes, the values, dispositions, worldviews, that get learned, un-learned, re-learned, re-formed, de-constructed, and re-constructed, as a result of the tuition our students are exposed to through their degrees"

(Mgqwashu, 2017, p. 1) Engaging with curriculum in the ways mentioned above is possible if we consider Connell's critique of the accepted understanding of a fixed curriculum. Connell (1992) argues that "the selection of knowledge for a curriculum is not done in heaven by a committee of epistemological angels" (p. 137). In other words, curricula do not fall from the sky; they are developed by people in contexts and for particular purposes, often ideological ones. The idea is not to change science, but how we understand and interpret it, and how this could affect its structure, enactment and learning.

In compiling the curriculum review document which was passed by Senate in 2016, the senior leader in management, conceptualised the curriculum as a structure which distributes access to knowledge and knowing (Proposal for a Curriculum Review at Nxakanxaka University, 2016). The senior leader in management further notes that in enabling access to knowledge and knowing in the disciplines, curriculum legitimizes, among other things:

What gets taught through the selection of content and through the pedagogical approach; Who learns through the teaching approaches it uses; Who succeeds through the assessment approaches it employs; Who teaches in the sense that curriculum content privileges some 'voices' over others; Which parts of the world are privileged not only by the knowledge it draws on but also the examples it uses and the learning materials (textbooks etc.) it selects; How teaching takes place through the use of lectures/tutorials/online learning/service learning and so on; The purposes or goals of education through the choices made in respect of content, pedagogy, outcomes and so on; The options available to teachers and learners in respect of pathways through the curriculum, the rate at which teaching and learning proceed, the timing of assessment etc. (Proposal for a Curriculum Review at Nxakanxaka University, 2016, pp. 1-2)

Based on the above, the senior leader in management maintains that conceptualising the curriculum as a legitimising tool means that it must be acknowledged as profoundly cultural, social and political (Boughey & McKenna, 2016, 2015; Proposal for a Curriculum Review at Nxakanxaka University, 2016). She further notes that this acknowledgement, especially in a country such as South Africa, means that considerations of the curriculum from this perspective are imperative if we are to strive to make access to and success in higher education more equitable. There is also an acknowledgement from the senior leader in management that in many disciplinary areas, there is a body of knowledge that simply has to be mastered. She further acknowledges that if this body of knowledge is not mastered or only partially mastered, then, as several scholars have pointed out, students are disadvantaged. In such disciplines, like science, since it is hierarchical, it could be the case that the curriculum review focuses not so much on content but rather on teaching approaches and assessment, which are often culturally

laden (Proposal for a Curriculum Review at Nxakanxaka University, 2016). Conceptualising curriculum as value-laden is crucial in this study, and the contribution which it is making. So far, findings from co-researchers and corporate agents display this issue clearly, giving it tangibility. Crucially, addressing equity issues in a country like South Africa without a focus on curriculum in its broadest sense might not yield equity of access and educational outcomes. Chapter 1 has provided statistics on the performance of black students in the field of science at the research, a cohort which includes students from rural areas. It could be the case that the issue is that the world that is used to mediate access to disciplinary knowledge is distant from the world views of these students.

Still, focusing on students from rural areas, the findings below show that there is a likelihood of fragmented identities of academic teachers, and different priorities between teaching and research in terms of whether the university has a strategy of inviting students from rural areas to enrol in the university:

The [name of the university removed] is trying now to target quintile 1 – 4 schools, and that's from the registrar's division and I think it's the completely wrong strategy... What's going to happen is that we are going to have to take the time we spend what we do in terms of research time we spend on other things, and turn it into, turn the university into a comprehensive, a teaching post rural university, because we will be spending so much time on remedial issues that we won't be able to just, ja, so ja, this is being driven by a new registrar and as [specific rank of the senior leader removed] we are saying no, so if we went to probably 10 or 15 of our largest schools, rural schools, we will probably get more enrolments from one model, one quintile 5 school in the Eastern Cape and all of those other 10 schools, it's problematic. (Interview, senior leader in the Faculty of Science)

Again, the outdated Academic Support tradition emerges from these findings. The remedial focus highlighted in the findings is characterised by interventions such as add-on, generic, practical, life and language courses, and they focus on students as having gaps that must be fixed in order for them to succeed. This view does not question the construct of the “underprepared” institutions (Boughey, 2007, 2010, 2012; CHE Report, 2013). While esteeming research over teaching could be seen as very good and having a place, this could be seen as contradictory to the discourse of the professionalization of teaching through the academic development project that was espoused by the senior leader in management in the previous findings. The likelihood is that more attention on research might perpetuate cultures that marginalise teaching and learning, an important aspect, given the different cohort of students (McKenna & Boughey, 2014). However, it is possible to understand why research is chosen over teaching, especially in the sciences, given the individual and institutional rewards

that accompany research skills and efforts (Boughey, 2012b; Moyo, 2018). Crucially, the findings from the senior university leader in the Faculty of Science seem to show views of anti-transformation and so, an exclusionary attitude. The problem seems to be the non-traditional students entering the university. In relation to this point, Tema and Vilakazi (1985) raised a point more than three decades ago, but one which seems to be relevant today, given the findings above. These authors argue that:

...the assumption held by the average academic and administrator of a white university in this country is that the increasing admission of blacks into their student body gives rise to a problem. This is correct. However, we insist that the diagnosis of the problem widely accepted in white universities is largely incorrect. Our greatest, most fundamental error, is the assumption held, stated or unstated, that the problem is first and foremost with the black student, or with most black students (p. 19)

In relation to the quotation above, it is possible to observe “common sense” discourse that the problem is a student from quintile 1-4. This seems to be the dominant way of thinking and being of corporate agency, and is anti-transformation and exclusionary, making this “common sense” attitude hegemonic, and thus never questioned (Gramsci, 1971). This study argues that critical examination and interrogation of the schooling and education systems (“structures” in society) is necessary to see how they serve to disadvantage some and privilege others in ways which are not always overt (Boughey, 2010).

Based on these findings, there is a potential conflict of interest between teaching and research. As such, the relationship between academic teachers having better discipline qualifications and research and being better equipped to teach students from various cultural and linguistic backgrounds is not highlighted. The likely implication under these circumstances is that academics, like the senior leader in the Faculty of Science, might see their teaching and research roles as entirely separate and could therefore struggle to integrate the two. In such cases, the benefits of academic development that intends to promote teaching and learning, as has been pointed out by the senior leader in management may be constrained as academics would most likely have a challenge in balancing teaching and research (McKenna, 2012).

The challenge that academic teachers might face when teaching students that are “other” to those from middle-class educated families is likely to be exacerbated by not only the fragmented identities mentioned above, but also by the interplay between language as a structure and teachers’ perceptions of it as culture, which have been shaped by the legacy of apartheid in terms of access to disciplinary Discourse.

The Language of Learning and Teaching (LoLT), English, could be seen as a factor that is playing out in equity discourse. Language is a key cultural resource for the emergence and development of human agency (Luckett, 2016). The findings below, again, show the “common sense” understanding of the role of English. The unquestioned hegemony of the English language as the LoLT potentially poses a cultural constraint for those who are positioned as not proficient in the language, as they are likely to experience it as a “cultural system and curriculum that devalues and negates their home languages, cultures, histories and identities – thus positioning them as culturally deficient” (Luckett, 2016, p. 421)1:

Ja, [language is] an issue, our students are pushing, there is a small band of quite vocal side students which are pushing the need for us to become sort of multilingual and or operational teaching, or to translanguage. The problem that a lot of students have, it's got nothing to do with Rhodes or other English medium institutions, it's just that the students have been taught with their mother language and their mother tongue, so they haven't developed cognitive strength in a language which for them they can understand... imagine if your teacher can barely speak English, you parents can't speak English and you are now expected to have some sort of mastery of really fundamental cognitive concepts... they are severely compromised by the time you get to university, and we had to pick up the slack. So all the problems that happened at school, so yes there is the language issue, you are not going to get by. We don't have a grade 4 Mathematics textbook in Isizulu and IsiXhosa, how are we going to have a university level textbook? Because government has taken the stand that English, it will be from when you are in primary school. (Interview, senior leader in the Faculty of Science, 13 April 2018)

There seems to be a suggestion that English is a condition for students' lack of engagement. English language seems to be associated with mastering the forms of language or the language skills in “neutral” ways, to the extent that mastering these skills, or understanding English, would lead to cognitive reasoning or meaning making. However, language is embedded in social contexts, with an understanding of using language to engage with meaning in academic contexts (Boughey & McKenna 2016).

Constructing meaning in academia and in science classrooms in particular using language seems to favour certain world views, and this has the potential to adversely affect participation of other students in the construction of science knowledge. For example, the idea that mastering “neutral” English language skills would enable access to disciplinary knowledge has long been challenged in literature (Boughey, 2012; Boughey & McKenna, 2016; Street, 1984). Language issues should thus concern themselves with both what is taught as well as how it is taught and learned. The findings in Chapter 6, for example, expressed some of the challenges student co-researchers face as a result of the domination of English as a medium of instruction.

The point is that language and culture are like two sides of the same coin and so, while the point is not to change English as a language of learning and teaching, how we teach and the examples that we use in our teaching are likely to compromise students' engagement and participation if language is not understood as emerging from social contexts, as was shown in Chapters 4 and 6 of this dissertation.

A “decolonial gaze”, for example, allows an exploration of structural and cultural constraints that might be faced by students, at least those whose mother tongue is not English, and the challenges that they might encounter in terms of what these could place on pedagogic relations (Bernstein, 2000) in a post-colonial university (Luckett, 2016). Luckett (2016) has, for example, noted that these students frequently experience a contradiction between the equity policy that admits them (a structural enablement) and the cultural and linguistic demands of the institution (a cultural constraint), leading to their correction or elimination (academic exclusion).

Clearly, language has the potential to be developed. But crucially, in the context of these findings, the experience of the dominant LoLT should also speak to issues of belonging and one's identity. Language signifies the university's institutional culture, being and identity, and could be significant in demarcating who belongs in the university space and who does not, and so the insecurities displayed by working-class students from rural areas points to this demarcation, and in the process, limits the possibilities for epistemic access (Hlatshwayo & Fomunyam, 2019). Hlatshwayo and Fomunyam (2019) recommend that corporate agents might want to consider the extent to which a bilingual pedagogic approach (where both dominant vernacular language and English are used in teaching and learning spaces) could be beneficial for black students in HWUs, to ease accessing the curriculum and engage effectively and efficiently with the disciplinary material. This is in line with the call by other students for “multilingualism” or “translanguage”, as the findings from the senior leader in the Faculty of Science above show. But the senior leader seems to view students as having individual problems, as they are not proficient in English.

When the agency of these students is constrained as a result of language, participation in classrooms or lecture halls is also constrained, as the findings below show.

I can say, some students will struggle to put their hand up and ask the question, mainly because of the insecurity part, but their command of English, or also they don't want to question, they are hoping someone else is going to ask the question, yes, it is an issue, but it's nothing I don't think that we can't

honestly address, because the problem is fundamental from the age of about eight. (Interview, senior leader in the Faculty of Science, 13 April 2018)

An important issue is highlighted from these findings, that is, the insecurity that most students from rural areas feel in lecture halls. In relation to this point, Vorster and Quinn (2017) have noted that the cultural milieu (in terms of symbols, ceremonies and rituals) in HWUs continues to privilege the traditions of the colonial Western universities from which South African Universities emerged. As such, these authors postulate that these students are likely to be alienated in these environments, as their cultural identities are likely to be invisible in university structures, and the senior leader's view is blinded to this privileging tradition. It is possible that the values underpinning disciplinary curricula play a role in the insecurity of these students in lecture halls, as Vorster and Quinn (2017) point out, "For black students, curricula and pedagogic processes are often not aligned with who they are as people and it is not possible to divorce themselves – their being – from what is taught and how it is taught" (p. 39).

It is possible to see that these students entered the teaching and learning space that pre-existed them (Archer, 1995, 1996). The impact of the cultural milieu, ideologically and intellectually, that existed at  $T_1$  influenced the direction of action of agents at  $T_2$ - $T_3$ , as these students find it daunting to have confidence to participate in lecture halls. The insecurity of these students could be attributed to positions that people occupy in the social world (through birth or through voluntary or involuntary placement), which imbue them with certain powers (*ibid.*, p. 177-185). Social groups and the positions that people occupy could thus be interpreted as a structure that leads to events, observations and experiences.

This insecurity is likely to constrain access to the secondary academic Discourse of science. The alienation of these students could further be explicated through Boughey and McKenna's (2016) discourse of the decontextualized learner, which attributes the ability to succeed to factors inherent in the individual, such as intelligence, motivation and aptitude. So, the blame for failure is allocated to the student while the university and its staff are absolved of all responsibility. From the findings above, the senior leader has observed that students are afraid to participate in class and do not ask questions with the hope that someone else might. This is a disadvantage and a constraint in pursuing their goals. From these findings, I could argue that the university, including its structures and cultures, is not prepared to teach in an inclusive way that will accommodate different world views in the construction of knowledge.

The senior leader acknowledged that there is something that could be done to assist these students, but it seems the university is assumed to be an ahistorical, apolitical, asocial, and acultural space (Boughey & McKenna, 2016; Street, 1984). As a result, the environment of the university that pre-existed students is left without critique. Curriculum, teaching approaches and assessment strategies could draw on home practices with scientific underpinnings so that students could see that what they already know is valued in knowledge construction, and this could potentially ease access to disciplinary knowledge and practices (Boughey, 2018).

Black and white students from middle-class, educated backgrounds have been raised in environments complementing university practices (Boughey, 2018; Heath, 1983) and might therefore be motivated to participate in lecture halls. The big question for me then is how do we, as academic teachers in the field of science, work with students who might be coming from a background wherein there are practices with scientific underpinnings, but are unable to express these because they are not proficient in English and are therefore struggling to untangle “cultural codes” that are constituted of material cultural objects, for example, writing, acting and being in the field of science (Hlatshwayo & Fomunyam, 2019; Ellery, 2017)? These are significant social justice issues, as what they already know, that is, home literacies (Street, 1984) is likely to be *mis-recognised* (Fraser, 2003, 2008).

The discourse of widening physical access in South African Higher Education (SAHE), given our historical inequalities, resulted in a situation wherein the numbers of students from disadvantaged backgrounds, including rural areas, increased proportionately high, especially in HWUs. These events at T<sub>1</sub> had implications for the kinds of teaching required for universities at T<sub>2</sub>-T<sub>3</sub> to respond to new challenges, and so the roles of corporate agents and primary agents to respond to issues of equity and success were tendential to academic development initiatives. It is the field of academic development that was crucial in shaping teaching and development in the SAHE sector, and the attention of this field has not only been on developing academic teachers as professional teachers, but also on student development through various initiatives involving, but not limited to, extended studies programmes. The corporate agency of the university was crucial in ensuring the development of these initiatives – The senior leader in management. It has, however, been pointed out in this analysis that the corporate agency of the senior leader in the Faculty of Science has conceptualised the “under-preparedness” of students as located within students themselves. Even though the findings below indicate students’ enrolment in academic development initiatives, an element of “underprepared” students is

brought forth without necessarily engaging with the construct of the “underprepared” university and its structures and cultures:

Of the 250 odd enrolments that come through, you know, in the Bachelor of Science, you know which is our main degree, 50 of them we’ve taken away and put them into the foundational course, and so that’s the thing, where they would have been the first child to go into a university and the first person to go to university in the family, and you have a look at the essays and you can see that they need the systems, they are not stupid, they just have not been prepared, and maybe prepared to parent work and regurgitate work, they haven’t to think they haven’t come out of... a laboratory... (Interview, senior leader in the Faculty of Science, 13 April 2018)

The challenges that black students from working/lower-class backgrounds face in HE and in the field of science are, again, located in individual students and the point is not to say that students do not struggle, but how the challenge they face is conceptualised. The challenge is conceptualised in terms of students themselves as having the problem, not the university or the faculty of the Department. This view is problematic, because it fails to account for how these students navigate the university, intellectually and ideologically. For example, the contestation over material resources within the university, that is, cultural and social resources (Fataar, 2018; Fraser, 2008; Hlatshwayo & Fomunyan, 2019) as these are crucial in negotiating the intellectual and ideological space of the academy. According to Hlatshwayo and Fomunyan (2019), the above-mentioned resources are important to negotiate university space, intellectually and ideologically, but most importantly it is about the type of resources that are significant in ensuring success in the field (Maton, 2014). For this study, drawing on knowledge resources or cultural resources that students bring with them could be useful in harnessing these for epistemic access. So, while the senior leader indicates that there are programmes like academic/student development, his approach is more one of seeing students as having “lacks” in what may be understood as the “right kind of capital to access the curriculum” (Hlatshwayo & Fomunyan, 2019, p. 11). Indeed, students might need extra tuition, as it has the potential to help students negotiate their transition from school to university, but it is the kind of tuition that is of concern:

The foundation course, so this is a slightly slow stream, it’s a catch-up year. They do the degree over four years instead of three, which actually, most obviously, students are doing four years anyway, and what it does is that they take mathematics, which they would have taken in high school, and we stretch it over a year, so it’s a one-semester course normally, in a side for normal BScs, we just extend it. They do computer literacy and sort of computer problem solving. We stretch it over a year and then we have a real sort of foundational course called introduction to Scientific concepts and methods, where they get

exposed to the stuff we tackle around it, and the stuff we tackle around it, is how do we measure something? We teach them to be specific, we teach them to pay attention to detail, stuff that you think that a science student would just have, and it's all the unseen issues and how to write the academic, how to construct a paragraph, which is the first thing, and then start putting these paragraphs together, and including evidence, start moving towards evidence-based approach. (Interview, senior leader in the Faculty of Science, 13 April 2018)

The initiatives that are mentioned above were designed to equip students who were seen as not ready for HE because of their “poor” schooling background. They are indeed commendable and I have had the opportunity to teach in one of the programmes mentioned above, that is, Introduction to Science Concept and Methods (ISCM). This is part of academic development/student development initiatives. In ISCM, we teach the knowledge (concepts encountered in the field of science as well as the Discourse of science). At the end of the programme, students would have been equipped with science knowledge and how this knowledge is constructed using language in particular ways, and so another aspect of the course is Language and Literacies in the sciences, which I teach and the other colleague teaches science concepts.

In her study, my colleague has found that students struggle to access disciplinary knowledge in the sciences because knowledge is more valued in science while dispositions and ways of being in the world, acting, and thinking are back-grounded, and so students struggle (Ellery, 2016). This is because some aspects of the Discourse of science are not taught in the science classroom; if they are, they are taught tacitly, and so one of the objectives of the ISCM is to teach these other ways explicitly:

It does, it helps a lot, but it only helps one fifth, then what we do is we have what we call an extended study... yes, we have a four-year what we call flexible curriculum as well, so we have the foundation, which are stopping with every year around the country, and we are stopping it, but we retain the subjects. (Interview, senior leader in the Faculty of Science, 13 April 2018)

While these programmes are commendable, what is not is the extent to which the world that is used to mediate access to disciplinary knowledge plays out to ease access or constrain it. This is linked to Heath's (1983) point that children's environment plays a role in how they construct the reality of the world around them and so, if the world that students from rural areas have constructed is suddenly replaced by the new world of academia without drawing on their previous world, constructing knowledge in that space could be daunting. This is what Gee (2008, 2012) refers to as the proximity between primary Discourse and the secondary academic

Discourse, but this does not suggest that the world that students bring with them from rural areas should be left intact. We need to interrogate what it is that they bring with them that we could tap into to clarify abstract concepts, and this is reflected in the findings below:

If you are the first person that got to university, you are missing a lot of social capital. It's not an easy place, it's not supposed to be, you are supposed to be questioning everything and anything. If you come from a rural environment where you question nothing, because that is in certain cultures, you don't question. (Interview, senior leader in the Faculty of Science, 13 April 2018)

The findings above is just four lines, but is so significant in understanding the tensions between home environments and the university, and how these play out at T<sub>2</sub>-T<sub>3</sub> to access the Discourse of science. The co-researchers' T<sub>1</sub> context at home has been shown to be characterised by an environment, in most situations, which is instilled with values that are contrary to university values. In Chapter 6, for example, students from rural areas pointed out that “in the rural areas, they teach you the values and you don't question. It's yes and amen and no questioning, but at varsity, you taught the opposite, now how does that impact on you if I was told not to criticise them? I am here and then I'm told to criticise. It is a conflict...” (Focus group discussion, September 2017).

In the context of this study, it could be argued that, in some instances, these students perceive their primary socialisation (Discourse) into home literacies as disadvantaging and a source of confusion once at university, which requires one to be sceptical and ask questions, as the senior leader in the Faculty of Science has pointed out above. Universities, however, seem not to appreciate this difference sufficiently. This was also highlighted by co-researchers in Chapter 6, when one co-researcher noted, “I mean how do you find that, it's confusing to my head...” (Focus group discussion, April 2017). In this way, we can see the role that is played by the proximity between primary Discourse and secondary academic Discourse (Boughey, 2018; Gee, 2008, 2012).

So, a university could thus be understood as an environment that is cultural, historical, political and social. Understood in this way, we can begin to view literacy practices (Boughey, 2018; Boughey & McKenna, 2016; Heath, 1983; Street, 1984) of the academy as profoundly underpinned by values and attitudes regarding what can count as knowledge and how that knowledge can be known (Boughey, 2013). In the field of science, this would mean, among other things, not just focusing on knowledge that is to be transmitted, but also on the identities of the students that our curriculum will shape, that is, how we enable the acquisition of the

norms, values and practices of academic Discourse. In this way, the students that we teach would not only be required to know, but they would also be required to act and behave in ways that are appropriate for the context, and thus take on new identities (Gee, 2012, 2008; McKenna, 2004). The difficulty of taking on a new identity complementary to literacies of the academy is captured by Boughey (2017) when she notes that:

Developing these socially embedded ways of engaging with and relating to texts often impacts on the very 'being' of individuals who are discomforted as they do not understand the purpose of what is being required of them because the practices themselves are rooted in values and attitudes about what can count as knowledge and how it can be known which themselves are alien... (p. 1)

However, the senior leader in the Faculty of Science has observed that students from rural areas find it daunting to act in ways appropriate to the context of science academic Discourse.

It is possible to observe the enduring “cultural emergent properties” acting as a mechanism constraining the agency of students from rural areas in accessing the Discourse of science. So, the event of questioning in class or lecture halls is unlikely to be pursued, and this is likely to lead to instances that create self-doubt and low self-esteem, both of which can lead to learning difficulties. More data in Chapter 6 and in this chapter have shown that issues of self-esteem are often affected by home and school as well.

The findings below are an acknowledgement from the corporate agent that the challenges that students encounter in accessing the Discourse of science are not only faced by first-year students, given that there are initiatives geared to supporting these students, like extended studies programmes, but these challenges are also faced by second-year students:

I think we need to have more support in our second level. We've been putting a lot into first year only and sort of saying, “ok guys swim”... One professor, who was it, I'm just trying to think, there's a story, a professor in my department, a head of chemistry, highly rated science... when he started, it was sink or swim. That was years ago, and after a while, there had to be some sort of life boat that was given to the students, and after a while it got so bad that the academics had to jump into the water with them, like, so there has been big change, there has been a big change. (Interview, senior leader in the Faculty of Science, 13 April 2018)

The issues that are raised above could be captured by the dominant discourses related to teaching and learning and the beliefs and practices underpinning those practices, which become “normalised” and “naturalised”. The senior leader noted, in the previous findings, that “we teach them to pay attention to detail, stuff that you think that a science student would just have”. In Chapter 5, a discussion was made that the nature of the field has such an effect on how we

teach and assess that if one is a scientist, for example, and has been inducted into the field, literacy practices become common sense (Boughey, 2012, 2013), not just the writing practices but all the practices, the way we act, talk, think and the way that we form knowledge, which seems obvious. So, the key form of legitimation for a scientist is knowledge, but not the way of being and the gaze in the world. However, as an academic teacher, one is not just a scientist in the laboratory, but also an academic, and also teaching. While knowledge is foregrounded in the field of science, pertinent questions must be asked: Who is a curriculum for? What should be taught and how; by whom and to whom? (Luckett, n.d.). So, questions about the fitness of purpose of inherited curricula are crucial in terms of responding to the current demographics of students.

It was also pointed out in Chapter 5 that, the nature of the field effectively means that the ways of knowing, doing and being that have been so successful and have allowed a scientist to be a legitimate knower in the field translates into the classroom but are so implicit. What this means is that she or he assumes, not consciously in most situations, that her or his job as a teacher is to get through the knowledge and principles in her or his teaching. However, as she or he focuses on knowledge and not so much on the ways of knowing, doing and being, there is likely potential of alienating students because there is no explicit conversation or induction into “how to know” in the discipline. Making sense of the nature of the field could thus allow us to understand why students were left to “swim or sink”. It is interesting to note from the findings that “the academics had to jump into the water with them”, presumably, providing support for students in order to cope with the demands of the science curriculum. The kind of support that is provided to students, particularly 1<sup>st</sup> year students, is highlighted below. It is necessary for this study to understand this support so as to realise how this feed into 2<sup>nd</sup> year science classes, if at all. But it was clear from the findings above that 2<sup>nd</sup> year classes had been receiving no support. Although they are said to be receiving some kind of support from academic teachers now, it is not clear from the findings what the form of this support is, or the “kind of capital” that is provided by academic teachers.

The other kind of support that was mentioned by the senior leader was access to information technology, like computers. Clearly, such access is useful for students’ success and the work that is required of them in the university, and this could be seen as an enabling factor. It could be argued that this is one of the advantages of studying in HWUs, because they have “the state-of-the-art library”, for example, with access to Wi-Fi as students “can work anywhere”:

Students have access to computers. We've got 1,000 Wi-Fi hotspots in campus. You can work anywhere and your phone or tablet or anything will be always connected to Wi-Fi. We have a state-of-the-art library... We've got... laboratory has 150 PCs and which are they are new PCs, 150 in a laboratory, all the residences are wired up, we are trying to make spaces in dining halls where we can have like a satellite laboratory for some students who don't have laboratory facilities, so they don't have to walk down the campus... Not that it's a bad thing either, I used to do data computer science, I had to work in laboratories all night, and ja, you just unfortunately had to walk and it's horrifying... and it's a kilometre to walk, no it's not even, it's 300, 400 metres... we have security patrol routes where you can walk down and there will be people, so it's well-lit, the students will happily walk from there down to the car park. (Interview, senior leader in the Faculty of Science, 13 April 2018)

...we also couple that with technology. Before they touch a microscope, they will have a look at the five-minute video in a variety of languages... like YouTube, so they can watch it a couple of times. You come in and you know what's expected of you, you know that the button's turned on, it's at the back of your head, you know that you are going to be focusing with this knob, you know this is how you are going to be holding a slide. It's difficult when they tell you, put the slide onto the, what do they call it, onto the stage... and you are in a class where you've got someone with like, a headlight on, and you are swarming around... but if you watch it beforehand, it takes all that magic out of it and now you get straight into it. And then what we've done is, I've now bought 30 large whiteboards... and we put them into a big open space ... something to push against the walls and we've stolen with our eyes what they do at UCT, and this is for our Mathematics and Physics classes, is that the students, they pair up, and they solve problems together, standing up on a whiteboard with roaming tutors, and the tutors give them a problem and until they've solved a problem, they get a next one, and just they are now active. It's no longer sitting by yourself on a chair or on a desk, and getting stuck. We problem solve, and now we take away that passive and made it an active experience... And they love it and the marks are going up... (Interview, senior leader in the Faculty of Science, 13 April 2018)

So these are little curriculum changes which we are trying to, I mean, I've introduced whiteboards more as a technical way. (Interview, senior leader in the Faculty of Science, 13 April 2018)

The above remarks from the corporate agent were seen as factors that enable the agency of students to engage in ways of learning valued in the academy and in the field of science, for example, working in groups, working actively, preparing before the lecture and so on. Drawing from the findings from the co-researchers in Chapter 6 in terms of why they chose to study at [name of institution removed], co-researchers associated [name of institution removed] with prestige, power and advantage, as there are more white people studying there. In discourses about resource differentiation in South African universities (Moyo, 2018), it is possible to see why [name of institution removed] could be said to be a well-resourced institution, and this is a historical phenomenon. While this study is not about resource differentiation among South African universities, the findings above indicate this factor, and literature on resource

differentiation supports it (Moyo, 2018; Oyedemi, 2018). Writing about black universities, Oyedemi (2018) posits that:

The establishment of Black universities was to provide separate university education to Black students, often in substandard educational environment with basic infrastructure. Historical Black universities are colonial–apartheid creations; as a result, a critical step in decolonizing South African academia is to address the historical nature of the quality of education and infrastructure at historical Black universities. The challenges facing Black universities are largely historical, based on the past racist educational system and the current lack of bold actions to remake Black universities. Black universities are confronted with infrastructural challenges ranging from scant availability of technologies for teaching in classrooms to connection to stable Internet that allows faculty and students to access all forms of digital content. There are also challenges with the structural resources, such as buildings – from lecture theatres to student accommodation. In fact, the limited infrastructural resources in Black universities today still reflect a differential experience for students in historical White institutions and Black universities. (p. 9)

The quotation above reflects on an important observation as far as the experiences of students in South African universities on racial grounds. Access to technology at HWUs enables, in some ways, access to curriculum, as the findings below show:

It changes the dynamic, it changes the curriculum completely. What I'm wanting is to make the curriculum accessible, so we don't need to have a change in curriculum. We could make it accessible... Make them understand why they are doing it, so it's things as well. They can get that little eureka moment, and kind of work out how to solve problems, with this problem, ah, here we go, and you realise oh, it's a quadratic... solve a quadratic formula, or if I do a substitution, or... square and they can have those little moments together. (Interview, senior leader in the Faculty of Science, 13 April 2018)

From the above findings, based on access to information technology, there was an observation that, at structural level, the agential development of students is supported in order to access curriculum in ways valued in science. But the broader understanding of curriculum as having ‘emergent cultural properties’ which then influence what is taught and how it is taught seems to be ignored from the findings.

In Chapter 6, co-researchers highlighted the difficulties they face at university, because they had not been exposed to computers from their home environments, and so they take longer to complete tasks than students who were. While access to technology for all students at the research site is commendable, there is no indication, from the findings, that “the process of knowledge construction involved in academic learning might be alien to many students” (Boughey & McKenna, 2015), because they did not have the previous experience valued at

university, for example. Here I am not saying that students from rural areas should be treated differently from other students, the point is that these students come from environments where, even if there were computers from their previous secondary schools, there was usually a lack of teaching staff qualified to teach computers. At ideational level therefore, that is, in the domain of culture, there seems to be an understanding that once students have access to technology, they will have access to curriculum. Based on the broader conceptualization of curriculum adopted in this study and argued for in literature, (Boughey, n.d.; Boughey & McKenna, 2016, 2015; Luckett, 2011; Moyo, 2018; Shay *et al.*, 2016), there seems to be a neglecting of how curriculum itself could enhance teaching and learning (Boughey, 2018).

The neglect highlighted above was captured in these findings, “What I’m wanting is to make the curriculum accessible. We don’t need to have a change in curriculum, we could make it accessible” (Interview, senior leader in the Faculty of Science, 13 April 2018). Making curriculum accessible is necessary and important, but not acknowledging that curriculum, including content, ways of knowing, acting and being, might be alien for other students is likely to lead to a situation wherein the curriculum is left intact and the cultural domain (agents’ beliefs about curriculum) would focus on change that will be directed to or on students. “Make them understand why they are doing it” (Interview, senior leader in the Faculty of Science, 13 April 2018). This situation is likely to lead to a situational logic of protection, where the status quo of the inherited curriculum is maintained Archer (1995, 1996).

I acknowledge that science curriculum is influenced by “different structures of curricular informed by particular visions for purpose of higher education as well as the ways in which the disciplines and professions have been institutionalized in higher education” (Luckett, n.d., p. 4). These issues could involve, for example, “the intrinsic value of the forms of curriculum knowledge themselves” (Luckett, n.d., p. 4) such as the hierarchical nature of science, that is, science builds its knowledge by linking and subsuming previous knowledge into more general prepositions and theories. However, I argue that, the ways of knowing, acting and being, which are necessary for epistemic access, are not “neutral” and so, in our teaching, given the cohort of students we currently have in our disciplines, it cannot be business as usual. What emerges from data is that “despite contemporary challenges” (Luckett, n.d., p. 5) for example, racially skewed educational outcomes in favour of middle-class educated students, “the higher education curriculum is peculiarly stable” (Luckett, n.d., p. 5).

The learning and teaching environment presented in the findings constructs teaching as providing a learning environment in which students can exercise their agency to learn (Boughey & McKenna, 2016). “They can get that little Eureka moment...” (Interview, senior leader in the Faculty of Science, 13 April 2018). Working in groups as way of acting in science was captured in the findings above, but the process of knowledge construction, *which* might favour other world views but not others was not considered. There is a sense from the findings that students can experience the education that is required of them in similar ways.

In line with decolonial thought, based on the findings in this study, there is little that is said about how curriculum could be seen to be inclusive by also drawing on the experiences of students from rural areas, except that some academic teachers draw on home practices generally, not necessarily on home practices originating from rural areas. In Chapter 6, for example, co-researchers raised concerns that they have to change but the curriculum stays the same, and this was confirmed by the corporate agent in the findings above. These findings, in Chapter 6 for example, have demonstrated that there are ways of knowing originating in rural areas which are congruent with the ways of knowing in science. In the domain of culture, the corporate agent posits:

Not specifically to rural students, we are re-looking at all our curricula in all our subjects, so each department has been tasked with addressing the curriculum for at least a semester, and trying to benchmark it on international standards, make it more accessible to our student body, such as maybe not as intimidating, maybe it's not foreign when we teach ecology, let's not use no heirs and links and learning, let's use African examples. (Interview, senior leader in the Faculty of Science, 13 April 2018)

The corporate agent acknowledges the need to link teaching in the sciences to African contexts, though not necessarily rural contexts. This is a good move, but it does not acknowledge the extent to which the teaching and learning environment might be complementary for some but contradictory for others, which then affects participation in knowledge construction and the development of agency for students. An attempt to link teaching to home experiences is shown in the findings below:

One of our deputy dean, she teaches chemistry and she first produces physical chemistry and then makes it sort of the more, they call it biological building blocks, which is organic instruments. She brings stuff from her kitchen and they as a class go through the ingredients and they have a look, so by the time they get to sort of bleaches and bicarbonate of soda, which is sodium bicarbonate, it sort of seems chlorine to what's in a bread or what's in a cookie. I mean, there's sugars. I mean, we know what sugar is, but what happens when you add sugar and heat it and add, and we know that these forms will associate and we'll make something else, so she can take simple stuff from the kitchen to try and make it more accessible,

and that's clever teaching, choosing, and also we don't need a laboratory, we can go to a supermarket and we can do high school, all high school samples of physics and chemistry experiments can be done from... you can, it's just being clever... Just make it more accessible, use a more familiar example, change your examples, jumble them up... (Interview, senior leader in the Faculty of Science, 13 April 2018)

The above findings demonstrate a good way of linking home knowledge resources with teaching, but again, there is silence on practices originating from rural areas, which might have scientific underpinnings. Nonetheless, this is an indication that there is room for pedagogical approaches that could be recontextualized to draw on home practices, including practices originating from rural areas. It is not only at the curriculum level that access could be approached, but also at pedagogic level, as the senior leader indicates, "Just make it more accessible, use a more familiar example, change your examples, and jumble them up". Pedagogic work is vital, more so because of the student cohort universities currently have. So, how we teach and the kinds of examples we use to clarify concepts should speak to diversity issues in our lecture halls. The work of Bernstein (2000), for example, classification and framing, could be useful in explaining the choices that academic teachers have through his pedagogic device. This could take place, for example, where the evaluative rules cover the actual pedagogy and evaluative criteria, which indicates what knowledge and attributes are used to determine success within the discipline, and who defines and controls these criteria (Lockett, 2011).

If we agree that the production of curricula in HE involves, among other factors, the transformation of knowledge (Bernstein, 2000), for example, as it moves from knowledge as research to knowledge as curriculum to knowledge as student learning (how does curriculum relate to students' identities, cultures and ways of understanding (Ashwin *et al.*, 2012; Ashwin 2014; Ellery, 2016), then it is possible to see that curriculum should, in some way, be responsive to students and so, we should acknowledge that the current cohort is more than likely shape the curriculum in a number of ways to be relevant to the new kinds of students. In this way, curriculum involves, as Lockett (n.d.) asserts:

The selection of particular kinds of knowledge and practices to be included in particular curricula based on considerations of both what society values and thinks is important for students to know, do and become; and also on explicit theories of learning or common-sense notions of how we as teachers believe we can best get students to learn and understand what we want them to know (p. 8).

In relation to the above quotation, Maton (2014) observes that these processes of knowledge transformation are crucial in an academic field, because they structure both the kinds of knowledge and practices with which students are invited to engage, and also determine who a particular curriculum legitimates as the “right kind of student”.

There are, however, instances in the ideational (cultural) realm, from findings, in which students from rural areas are conceptualized as individual beings with characteristics inherent in them that provide a greater or lesser chance of success. These characteristics include motivation, “students not willing to ask questions in lecture halls, hoping that someone might ask for them” (Interview, senior leader in the Faculty of Science, 13 April 2018), intelligence, “stuff that you think that a science student would just have” (Interview, senior leader in the Faculty of Science, 13 April 2018), language skills and other “neutral” learning skills such as time management (McKenna & Boughey, 2014; Boughey & McKenna, 2016). There is a sense in which students are not understood to be social beings bringing sets of practices with them that are more or less aligned to those expected in the university, “if you are the first person that got to university you are missing a lot of social capital, it’s not an easy place” (Interview, senior leader in the Faculty of Science, 13 April 2018), and the university is not understood as a social context comprising structures and cultures that are historical and political in nature (Moyo, 2018).

So, while the interventions that were identified by the senior leader in the Faculty of Science are worth noting and commenting on for agential development of students, the seeming understandings of students and the university as “neutral” could lead to clashes between structures put in place to support students and the dominant cultures that corporate agents and primary agents (academic teachers) draw from in conceptualizing teaching and learning, especially in the context of inclusive and living curricula. This does not, in any way, suggest that there have not been attempts in addressing these issues. There have been, for example, curriculum reviews that have taken place at the research site. At most, curriculum review documents in the field of science at the research site are, however, silent in terms of how reviews consider issues facing students from rural areas.

Drawing on the discourses dominant in the sections of the curriculum review documents, understood as “systematically organized sets of statements which give expression to meaning and values” (Kress, 1989, p. 7), an ontological position was considered in engaging with these discourses. This meant a realization that discourses have power to enable and constrain events and experiences from emerging (Boughey, 2018; Moyo, 2018; Sayer, 2002). It has been argued

in this dissertation that there are multiple mechanisms at play in the structural and cultural domain, and these would have exerted power over how curriculum reviews took place and were experienced and observed, but my focus was on discursive mechanisms so as to conceptualise how academic teachers experienced the reviews and how these shaped the emergence of their agency in developing inclusive and living curricula. Through a position adopted to engage with these reviews, it was possible to observe the tensions in the reviews about how and what to include in the curriculum, and this tension constrained the ability of agents to work with the given culture and structure and so, the transformation moves of curriculum highlighted in the above seem not to be part of the discourse emerging from curriculum review documents, and as such, there is silence on issues relating to students from rural areas:

Chemistry 202: Statistics show that our students perform significantly worse in Chem 202 than 201, and also worse in 302 than 301. The aim of curriculum transformation here is partly to understand this trend and to find ways to mitigate it. (Curriculum review Summary for the Department of Chemistry, 2018, p. 1)

Research is important in trying to find answers to the challenges that students face in terms of positive educational outcomes, especially non-traditional students from rural backgrounds. The aim of curriculum transformation that the Chemistry curriculum review process is directed towards was seen as having potential for change in the structural domain and the cultural domain, since both primary agents and corporate agents seem to agree that curriculum events which constrain the agency of students to achieve better educational outcomes must be investigated, identified and transformed. The relatively low number of students in Chemistry, which has implications for postgraduate degrees, most probably due to poor educational outcomes, was also captured below:

A second component involves finding ways to attract students into chemistry. Our second and third-year numbers are too low to sustain the developments in Honours and postgrad. Thirdly, to increasingly show students how chemistry is relevant to South African industry allows them to understand the practical application of chemistry. As with our first-year discussions, there was much disagreement about the content, with some expressing reluctance to really change the course material substantially, while others are much more willing to look at both content and pedagogy. Overall there is a commitment to reinforcing basic concepts, since it was felt that this equips students to grapple with complex ideas later on. Some felt that sticking mostly to fundamentals is important BUT we need to make the connections to real events and complex ideas, and a particularly important idea was that we needed to start to find ways to do this together WITH the students (modelling critical thinking). The exam assessment came up for discussion on several occasions, with most staff feeling that the students are able to “spot” some sections and leave out other sections completely, and also that they mostly fail to INTEGRATE

knowledge across the curriculum. (Curriculum review Summary for the Department of Chemistry, 2018, p. 2)

Curriculum transformation, based on the above curriculum discourses, involves a tension between putting more emphasis on conceptual knowledge or on pedagogic practices or some kind of a balance between the two. While the focus on knowledge is a mechanism of legitimation in science such that students should be able to demonstrate knowledge, I argue that pedagogic practices that focus only on knowledge without enabling learning, that is, learning to know how knowledge is constructed in the discipline, are likely to exclude students from participation, particularly students whose home backgrounds are not characteristic of the formal ways of learning (Heath 1983, Mgqwashu, 2019b). Evidently, the agency of academic teachers will play out in either enabling or constraining ways in relation to the agency of students who come from environments different from formal schooling and so, need explicit induction into Discourse specific literacies (Mgqwashu, 2012). The idea of curriculum transformation from the review are important and necessary; however, as research has shown, there are benefits for curriculum transformation if it is conceptualized as involving a move from knowledge as research to knowledge as curriculum, to knowledge as student learning (Bernstein, 2000; Luckett, n.d.; Shay, 2012).

It is possible to see that agential action, or lack thereof, was seen to be largely shaped by the prevailing institutional configurations. The review above thus shows that in some instances, there was a dearth of corporate agency (senior leaders) and primary agency (academic teachers) in overtly dealing with and addressing issues pertaining to rural students, even though there was an acknowledgement, at least from curriculum review documents, that there is a need for curriculum transformation, an issue which was raised by the senior leader in management in the earlier findings. Similar analysis was established from the Physics and Electronics curriculum review document:

Traditionally, the physics department prides itself on its good teaching, but some of us recognise the danger of resting on this tradition without recognising that the student body is changing. It is vital that if our teaching is to remain effective we continually re-evaluate ourselves and acknowledge that we also need to change to accommodate the changing student body. (Curriculum Review 2018 – Physics and Electronics, 2018, p.4)

The dominant discourse that emerged in the findings related to the construct of “underprepared institutions”, especially white liberal institutions, unable to teach non-traditional black students who were beginning to enter HE. These students were perceived as “underprepared” for

university education, which is true, given the history of inferior education. Crucially, there was a realization that the blame for under-preparedness could no longer be located in students, but there was now a necessity that academic teachers accept that they also need development (Boughey, 2007, 2010; 2012). While there is acknowledgement that there is a need for institutional change in terms of curriculum, these initiatives are tendential to structures external to university, which could constrain the change that might be sought. However, as the findings below show, university practitioners have some degree of autonomy to shape pedagogic practices through the construct of pedagogic device, from the field of production, to the field of recontextualization, and the field of production (Bernstein, 2000), as well as their beliefs about teaching and learning, whether they view these as individual, autonomous acts or as social, ideological act or a combination of both. These views of teaching and learning are crucial when considering issues of social inclusion and exclusion (Boughey, 2012) or *mis-recognition* and *mis-representation* (Fraser, 2009) prevalent in HE, particularly for non-traditional students:

The Physics department regularly undergoes internal curriculum reviews to varying depths. The last detailed one was held at the end of 2016. In addition, we periodically re-visit perceived problem areas in between large-scale curriculum reviews. We do not have a large amount of freedom over the content that is taught at undergraduate level due to the international expectations of the requirements of a degree at that level and the desire for our degrees to be transferrable, both nationally and internationally. During 2010 the South African Institute of Physics (in consultation with the physics departments nationally) drew up a Benchmark Statement outlining these minimum requirements. This Benchmark Statement is not as binding as the requirements of professional bodies in other fields and there is a certain amount of leeway for individual departments to emphasise their own strengths in order to prepare students for postgraduate research. For example, at [Name of institution removed], we cover more electronics at undergraduate level than other physics departments. This makes transferring from another university to [Name of institution removed] for an Honours degree in Electronics difficult and consequently, transfer students at honours level tend to choose mostly Physics options. (Curriculum Review 2018 – Physics and Electronics, 2018, p. 1)

While there is more focus on postgraduate degrees in the findings above, the findings below seem to place emphasis on the social aspect of learning, espoused in this study.

In 2017, an Honours student did a project on “Why is Physics Hard?”. She explored reasons covering Physics, mathematical knowledge, study methods, emotional and social reasons among others. We were surprised to find that while the lecturers thought that the low level of mathematical knowledge would be a large reason why students find Physics hard, the students themselves identified emotional and social reasons as more important factors. This research needs to be written up in publishable form. (Curriculum Review 2018 – Physics and Electronics, 2018, p. 4)

Another key discourse that emerged from the curriculum review document of the Department of Physics suggests that affective and social aspects contributed to student poor performance, wellbeing and agential development. From the document, the central discourse that emerged seemed to relate to the social nature of learning. This is crucial as formal learning is normally considered to be an autonomous, individual act, decontextualized from context (Boughey & McKenna, 2016; Jacobs, 2019; Street, 2018). While knowledge is foregrounded and is a mechanism of legitimation in science, other aspects such as students' dispositions and gaze in the world are equally important and this is the area that this study is attempting to contribute towards.

Implicit in the review document was the emergence of a discourse of the act of academic learning and teaching as being a social practice – where “social” is the acknowledgement that the norms of academic Discourse are political, historical, cultural and so on, and that being a legitimate “knower” in academia is not an inherent trait but rather one can develop over time. Being a legitimate knower is largely conditioned by the proximity between primary Discourse and secondary academic Discourse (Gee, 2008, 2012).

It was evident from the findings in the previous sections that learning and teaching, including science, should not just provide spaces to knowledge, skill and practices valued in science, but that learning of science is also a social act and so, issues of sociality should be responded to as students and academics engage in social relations of teaching and learning. To this effect, we should, as academic teachers, disrupt our own thinking and develop politically clear educational philosophies (Bartolome, 1994) so that we can begin to explore what are the needs of the students that we teach (Jacobs, 2019). Acknowledging the sociality of learning and teaching is closely tied to the emergence of agency (Achadu, *et al.*, in press). Importantly, from the review document, there is a suggestion of working outside of the deficit model so prevalent in the academy, whereby students are understood to be removed from their histories, norms and values (Boughey & McKenna, 2016). In a country like South Africa where certain experiences have been silenced, the social aspect of learning and teaching has a pivotal space in HE, particularly in the field of science.

The findings below show the relationship that academic teachers have developed with students over the years, which is good, but developing such a relationship might not be enough if it is decontextualized (Boughey, 2012; Boughey & McKenna, 2016; Jacobs, 2019) and seldom

draws on some teaching and learning philosophical foundations. While interesting issues were raised from curriculum review documents, the conceptualization of curriculum from the following findings seem to have left an unaddressed teaching and learning gap, most of which have been highlighted above.

#### **7.4 Primary and corporate agents, constraints and enablements**

The findings below show academic teachers sharing their background about teaching and learning, as well as the relationship that they have developed with students in and outside the classroom or lecture halls. These findings are important, because through them we can begin to understand why academic teachers do what they do in the context of teaching in the sciences:

I taught at high school for seven years of my time. My 14 years, I was also a resident warden, so I lived with students, had 85 girls under my care, and so I got to interact with them on many levels and some of them were my students and most of them were not, but it's out of that I really feel like some of the key values that are foundation for the work that I do is to. I'm definitely a development person, so to take someone from where they are and show them where they could be and help them get there, so even if their aims are not my aims, to help them understand how to use what we can give them to get them where they want to go, and to have respect for people who are not like me, so I love learning. (Focus group, Science, 16 April 2018)

These findings show that the academic teacher not only had a relationship with students in the classroom, but also outside the classroom, in the residence system of the university. While the academic teacher lived with female students in the residence of the university, there is something that can be learned from her experiences of staying with students. The teacher values developing a person to their full potential, which is good, but such development cannot be assumed to be a “neutral” act, for example, by moving a person from one point to the next in a developmental ladder, as the findings above seem to suggest. Teaching is not generic but is particular to the extent that, through our teaching, we are likely to make particular aspects of knowledge accessible to particular groups of students but not others, given primary Discourse and secondary academic Discourse (Jacobs, 2019; Gee, 2008, 2012) and so, this aspect of teaching should be acknowledged and interrogated for living and inclusive curriculum.

Living with students happened in the past 14 years, and these data were generated in 2018. So, this experience must have started around 2004 and during this period, the research site was predominantly white. It was interesting to note that the teacher has been at the university for almost two decades and as such, she has experienced the change of the student cohort. But the extent to which institutional support, including assistance from corporate agents, assisted in this

regard is not acknowledged. As such, the issues of social justice to do with academic development seemed not to be visibly highlighted. The academic teacher further expresses her experiences of teaching in the sciences in the findings below:

...and I came to varsity to learn, but not all students do, and many students come to get a piece of paper. And it's very frustrating for those of us who love knowledge to pour our knowledge into someone who just wants the piece of paper that comes at the end, and to somehow bring them on the journey of loving learning, of beginning to understand that the process is as important to us as the paper at the end, but at the same time respecting that the paper at the end means a lot to them and helping them get there. So, it's that give and take. So I think that sense of community, mutual respect, and that love for learning, I think those really underpin what I do. And I do love teaching. There's nothing quite like being in a room full of young minds and engaging and drawing them out and helping them discover that love for learning. And of course, I don't win every time. (Focus group, Science, 16 April 2018)

The findings above show the tension between what the academic teacher's value, that is, knowledge, and what students value, that is a piece of paper. It is not easy to teach someone who does not value knowledge and the processes involved in acquiring that knowledge. The teacher seems to suggest that to get a paper, one must be a particular kind of a person (knower/learner); his or her identity must shift so that they realise that some things must happen – the process – before acquiring a degree (a paper). The inconsistency between the knower and knowledge was seen as unsustainable for success or epistemic access by the teacher. Such inconsistencies were also captured in the findings below, as they show that students come to university space not prepared for university education, when the Geology academic teacher provided students with broad-based practical knowledge in Geology. The academic teacher is originally from Germany, a developed country:

...when I came to South Africa, I actually came from an environment in Germany where Geology is a bit of a blue sky research and kind of hobby field... so if I really want to encapsulate it in one sentence, I think people who do a Bsc here, and they come with a very poor previous academic preparation, where rote learning is usually the only tool of learning, the only, they never have heard about any other way of learning and very often they don't know what the difference is having learned something and understanding something, or being able to describe something or explain something, all these things are not in place and I try to now develop these kinds of things rather than thinking about what does a mineral Geologist have to know in the many jobs that are available to them. (Focus group, Science, 16 April 2018)

It cannot be denied that our schooling system leaves many students unpleasantly underprepared for higher education study (Morrow, 2009; CHE, 2016), and this was apparent in the findings as a number of interventions were pointed out. The academic teacher was aware that students

come “underprepared” for HE, but findings from co-researchers have also demonstrated that there may be connections between home ways of learning and academic ways, even though this is not always the case, and so I am not suggesting in this study that there is a one-to-one correspondence between these ways, but home ways can be used as leverage to access explanations and descriptions in science.

Meaning making involves knowledge and knowers – the undertone from the findings is that knowledge is foregrounded, but equipping students with values that would enable them to access this knowledge is back-grounded. These findings are contrary to literature on epistemological access (Morrow, 2009) in that what is known is tremendously shaped by the way it is known (Mgqwashu, 2019b). Teaching the knowledge about mineral geology should also involve how disciplinary knowledge is produced in the subject area of geology, what count as knowledge and what are the key principles on which disciplinary knowledge is built, including, but not limited to, explanations and descriptions (Jacobs, 2019). In other words, making the “rules of game” explicit (Maton, 2014) should be part of our teaching, otherwise our teaching is half- job done (Mgqwashu, 2019b). From the findings there is a suggestion that making the rules of the game explicit is not part of the role of the academic teacher but the student should have come to the university space already knowing these rules as such the problem is likely to be located to the individual student. While I acknowledge the amount of content associated with science modules but just giving content without enabling access to that content by giving students tools to access it is problematic.

Also, there seems to be an assumption that the student is “the problem” which requires fixing, especially “underprepared” students, and the likely implication in this situation is that teaching and curriculum matters should continue largely un-critiqued, not just the content of the syllabus, but the broadest sense of curriculum: disciplinary knowledge content, modes of delivery and assessment approaches. Understood in this way, we can begin to ask questions about curriculum – what is knowledge, and who is understood to be a legitimate knower? (Vorster & Quinn, 2016). It seems from the findings above that the agency of the academic teacher is constrained in deliberating about curriculum in this broader sense, and this limited view of curriculum could be conceptualised as an instrumentalist approach to education fostered in the era of apartheid (Moyo, 2018). The agency of the academic teacher was thus conditioned by the situational logic that saw students’ “under-preparedness” as inherent in the student body, a situational logic of “protection”, whereby the structure and the culture absolved the curriculum and enables the protection of the status quo.

It is however, interesting to note that very few students make it to the postgraduate level given the “under-preparedness” of students. So, for this reason, the academic teacher realises that there is something more that they can do for those students who might not be eligible for postgraduate degrees:

There aren't many jobs, and those which are available are only available to those who have an honours degree, and out of our 180 first year students in the first semester, we take 10 or 12 into honours and that means the majority of our students who go through our various programs never become a Geologist anyway. And most of them never even get an honours degree, so they need to have something that they take away that they can apply in a large spectrum of other fields, and that is my colleagues often criticise me if I say that, that is what the humanities are doing all the time, that is, and we can learn from them in order to give our students something useful, and that useful is not necessarily from terminology. (Focus group, Science, 16 April 2018)

The findings above seem to show that the academic teacher is not only interested in knowledge creation in the sciences, but also in the development of a particular kind of knower related to a career, thus shifting the focus to other aspects of teaching and learning, rather than just knowledge. But the teacher acknowledges that developing this identity is not something that is valued by other colleagues in the Faculty of Science, that is, making sense of academic readings, writing argumentative essays, being a critical learner, and so on as these aspects are more foregrounded in the Humanities than in the sciences. These aspects are valued in the humanities. One of the arguments that has been raised in this study is that teaching and learning involves both knowledge and knowers, such that focusing either on knowledge or knowers could potentially alienate some students, especially those who have been cut off from mainstream discourses. When teachers were asked about their conception of rurality, it was clear that this is a complex concept to define, as rural areas are sometimes not distinct from urban areas, but it was also clear that rurality was defined in terms of disadvantage, lack of access to resources and in terms of quintile 1 and 2 schools:

So when I was living in the residence, one particular student that has come to mind during my conversation this morning, she came from a rural background in Limpopo province, which is far North, so a small village, a family very focused on the... rich, so even the family members live in the city, they are very focused on the village, their home, the centre of their extended family, and there's definitely for me that's one of the biggest differences between rural students and city students, still that strong connection to the land and that place, so even students who live in the city but still will have that strong connection. (Focus group, Science, 16 April 2018)

Even if you can take someone from rural areas to the city, you cannot take their rural background out of them. It is what and who they are:

I think of them as having a particular framework for thinking, and this young woman really struggled with coming to varsity, and she was not the smartest anymore, she was not respected and treated as important, she was just another one and people didn't have the same values here as they had at home, and she didn't have a wide experience of life that you would get in a city, she had quite a narrow experience, and so it was very difficult for her to understand and to see herself in the context of this new community she was in, and she really struggled and she struggled to find her new identity. So, for me, she was the epitome of a deeply rural student.” (Focus group, Science, 16 April 2018)

Rural students defined in deficit discourses – resources that they bring with them not really understood as the following findings show:

...but she's not the perfect example because there are many students who come from what I would think of as rural schools, so schools from a small town where the main industry is to do with land, whether it's farming or mining, but you know, the fairly limited exposure to arts and culture and science and all those things, and a lot of them are just so curious and so keen and culturally, socially, they struggle a bit. (Focus group, Science, 16 April 2018)

...but if they have the right attitude, there's nothing, they actually are more teachable because they don't have a jaded view of the world, and I was a rural student by that definition. I came from a small town where the main industry was forestry and I came from a succession of small towns, so I really relate to those students and their limited exposure, but also their curiosity and their freshness. There's I think they have an amazing opportunity, different pressures on them to city kids, but still you know they can learn. They have brains, they are curious. (Focus group, Science, 16 April 2018)

The findings above show that students from rural areas are associated with a limited view of the world outside rural areas, which might be true as per the legacy of apartheid, but these students are not themselves deficit – they are curious, teachable and so on.

From the findings below, it was also interesting to note that the narrow view about students from rural areas also applies to white students, even though white students might have attended better resourced schools. The distinction here is that a white person in rural areas might have been there attending a “private” boarding school or a better equipped school – race becomes an organising principle but because they come from rural areas they are also cut off from mainstream discourses n- a deficit view of rural areas:

Well I would say black and white students, but we don't see a lot of rural white students. We do see quite a few, especially from Zimbabwe, and kids who've grown up on farms, but a lot of them have gone to private schools where they have a much more cosmopolitan education and but yes, we do have white

students who also have had kind of a narrow view of the world, who have a limited exposure, and I would say they struggle with some of the things, but not, they don't connect that deeply entrenched connected to the land, and the communities that really struggle to make the transition to university are definitely kids from those very connected to the land. Those, they don't have much exposure to reading, to science, to experimentation, they do what the elders have done for the last ten generations and I think those are the students who struggle most, and perhaps that's what we really mean when we talk about rural students. (Focus group, Science, R.U., 16 April 2018)

The deficit view of rurality which is associated with rural areas could be deduced from the findings above in that students from rural areas do not have much exposure to reading, which is true, but not necessarily true that they also have no exposure to science or experiments. It seems, from the findings, that science and experiments can only take place in the classroom or in laboratories and this view, I argue, provides a limited view of science and would thus not lead to providing opportunities for other ways of coming to know in the sciences. The findings below attest to the idea that there are practice with scientific underpinnings in rural areas but academic teachers do not know much about these and are sometimes constrained by the amount of content to teach. I argue that the amount of content to teach should not be a hindrance in providing opportunities for other ways of knowing:

I don't think we always tap into that as lecturers, I don't think we always tap into their indigenous knowledge and also the stuff that they've learned as part of a farming community we really could get them thinking and Karen ... with the extended study students she really does get them thinking about what did your grandmother say makes plants grow, let's try it let's do an experiment and see if what your grandmother said works and so taking that indigenous knowledge and turning it into an experiment where they can turn start the hypothesis we need to do more of that but the classes are big so how do we tap into that at the same time. (Focus group, Science, R.U., 16 April 2018)

It has been demonstrated in chapter 6, for example, that in rural areas, there are practices underpinned by science, such as experimentation, observations, etc. There is thus an idea that little is known about the students we teach in general and rural students in particular which could lead to decontextualised teaching and learning:

Ja, the problem lies there, that we actually know very, very little about our students. I tried to find that out in a research project a few years back. Ja, it was during my PGDPiHE. It was actually evaluating the performance of first year students in the second semester. It is usually, you would expect many of them have found their feet in the first six months, also supported by the resident system that we have, and I try to find out about the background of these students and there is no data on it. Wardens probably know much more because they are interacting socially with the students in their residences. We as lecturers, we have no knowledge whatsoever. It comes usually through by the way students interact with us, I

believe, and again, I don't have good data because there's no way to check what I think. (Focus group, Science, 16 April 2018)

In her key note speech presented at the 2019 HELTASA conference, Jacobs (2019) notes that contextualised approaches to teaching should involve knowledge about the students that we teach, the context from which they come and their learning needs. If we do not know who are the students then we would not know what their learning needs are. Jacobs (2019) further notes that we also need to know who are the academics teaching, where they come from and their views of the world so that we could enable an understanding of the socially constructed nature of universities, and the practices within faculties and departments. Acknowledging these aspects of teaching and learning could allow a realisation of the context of knowledge in order to engage with issues of how disciplinary knowledge is constructed (and what norms, values and principles underpin such constructions; as well as knowledge for social change and transformation (Fataar, 2019) which underpins what and whose knowledge is being taught. Academic teacher's views of the world are important to consider in this realisation, particularly from social realist lens in order to tease out the way culture condition the agency of students in contrast to the way the agency of their academic teachers, who may come from very different backgrounds, plays itself out. The interplay between academic teachers' beliefs about rural students and knowledge resources that these students bring with them, whether these knowledge resources are seen as viable for knowledge construction or not, was captured in the findings below:

The soft skills, the organisational skills, the thinking skills that are entirely independent of education or formal education, these are just the people who have probably at an early stage perhaps had someone mentor her get to grips with problems they are facing, but what I hear always with this indigenous knowledge and we need to tap into that it always transports this aura as if there was this huge untapped potential that everybody has from these rural backgrounds and this is just not so, there are individual skill sets which we can tap into they have nothing to do with their upbringing, or they have to do with their upbringing and where they come from but this is not because of they come from a rural environment, yes they might know that that the grandfather and the grandmother were saying ok we need to fertilise our maizefield and we take the dung from the cows for that, ya but if it really ends with that then we are very quickly at the end of our indigenous knowledge, I don't believe that there is a kind of group knowledge, there is individual knowledge in all rooms and whether this is indigenous or not I don't really care because it's the ability of these people that you want to make flourish (Focus group, Science, 16 April 2018)

Some interesting points are raised from these findings. The idea that there may be practices in rural areas that may be relevant for science learning was observed as not significant for science

learning and teaching in HE. There is also an acknowledgement that we do not know much about practices with scientific underpinnings, originating from rural areas. The only practice mentioned above relates to cow dung or fertilisation, yet findings in chapter 6 have shown that there are more practices with scientific underpinnings in rural areas. It is for this very reason, of limited knowledge, that there is a research of this nature, to research these practices and make them available for academic teachers in the sciences. The idea of sociality of learning was seemingly downplayed from the findings, yet research has shown that, as much as there are individual skills, but individuals are part of society and so, society conditions, not deterministically, the events and experiences. It is this aspect of sociality that I argue, could ease access to disciplinary knowledge of science. The work of Archer (1995, 1996; Bernstein, 2000; Gee, 2008, 2012; Street, 1984) were useful for this realisation.

The PGDPiHE is a Postgraduate Diploma in Higher Education, which is a teaching development initiative made available to primary agents (academics) by corporate agents (academic management). The success of this initiative is, however, tendential to the agency of academic teachers, who may choose to partake in it or not. While the culture of the institution of the research site may be complementary to the endeavours of supporting teaching and learning by providing structural enablements such as the PGDPiHE, if we do not know about the students that we teach, such enablements may not be sufficient to ensure an institution-wide response to the need for teaching and development (Moyo, 2018):

I usually sense whether somebody comes from a background that is very remote from formal, say western kind of education, by their behaviour. Many of them, who I think come from such backgrounds, village backgrounds, farming community backgrounds, where parents might be illiterate or semi-literate. (Focus group, Science, 16 April 2018)

Coming from rural areas is associated with being illiterate in the Western sense of formal education, yet research shows that there are literacies and these are not neutral (Street, 1984; McKenna, 2004; Boughey 2012, Boughey & McKenna, 2016).

The following findings demonstrate the clash of values between rural home values and university values. Below is what one academic teacher had to say about these clashes:

They treat me more like a priest than like a lecturer or teacher. They look up at me as a kind of higher being, and I'm not sure whether this is because of my title, or my position, or my gender, or my race, or all of that, but for me it's always very difficult to break down these kinds of barriers, because I want to teach on a kind of a partnership level, and we are in this academic project pretty much together, and I cannot do it without them, and they would probably struggle to do it without me, so we need to co-

operate and we have different roles in this project, but we don't really have a different hierarchy. They are power graded. (Focus group, Science, 16 April 2018)

The value of respecting elders from rural areas clashes with university values in terms of asking questions, self-confidence, etc. it seems to me that as a university and a department faculty, there is a lot that we need to do to address the barriers mentioned above and some of the things we could do have been suggested by Jacobs (2007, 2019) above and others (see, for example, Boughey & McKenna, 2016; Mgqwashu, 2019b). Contrary to tensions between values from rural areas and university values, values of students from middle-class backgrounds seem to resonate with university values, as the findings below show:

But in my view, you know they shouldn't be any hierarchical radiant, and surely, I have to assess them, but still it's a kind of a role. It is not a power tool that I want to employ, and this works pretty well with all students that have had a good schooling, because I think many of the good-quality schools also have implemented this kind of interaction. So yes, they accept me as a kind of an authority figure, but they also are not shy to come and ask me for certain favours or that or that, and then I say yes or I say no, and I give them a reason and that's that. With students that I think come from these very traditional backgrounds, they have a very strong sense of hierarchy, which doesn't make it easier because they don't dare to ask questions. (Focus group, Science, 16 April 2018)

It is easier to relate with students from middle-class backgrounds, who are often white, and have attended quality schools because they have been prepared for HE, even from home, and this demonstrates the "under-preparedness" of the academic teachers to teach students from backgrounds which are "other" to middle-class educated families. This understanding is significant in order to realise how the agency of these students plays out in relation to the agency of their academic teachers:

In the undergraduate years, we have an increasing proportion of poorly prepared students that need to be, need help to develop basic learning skills, basic kind of rationalisation skills to become capable learners, and this is compromising the content development and that is what we do at... with small groups with a target group that then also goes into that professional life that we are developing, and I think it works. I think it leaves [Name of the institution removed] with an honours degree, at least in the sciences it's competitive, it's certainly competitive with BSc graduates from the developed world, I would think so, the problem of all those, not a problem, I would say one of the effects is that there are many who never make it up to honours. (Focus group, Science, 16 April 2018)

There are important points highlighted in the findings above. Most importantly is how the Discourse of science is constructed. There is vast research which shows that epistemological access should involve access to the Discourse of the discipline or discipline-specific literacies

or ways of coming to know in the discipline (Boughey, 2013; Dall'Alba & Barnacle, 2007; Ellery, 2011; 2016; Gee, 2008, 20012; Jacobs, 2007, 2019; McKenna, 2004; Mgqwashu, 2008, 2012; Morrow, 2009). Ways of coming to know, for example, “involves integrating ways of knowing, acting and being within a broad range of practices” (Dall'Alba & Barnacle, 2007, p. 683). Ellery (2016) also notes that meaning making in the discipline of science involves both knowledge and knowers, and that to access the discipline of science, a student must be a particular kind of learner in order to become a participant (who is independent, self-regulated and able to develop understanding on her own). She further notes that how knowledge is constructed in the field of science forms the basis for claims – a science knower must be objective, curious, critical, analytical, and tentative. These aspects, which are necessary or valuable to access science knowledge, are however, back-grounded, a discussion made in Chapter 5 of this dissertation, and so are not explicitly taught. Earlier in this analysis, the senior leader in the Faculty of Science pointed out that these aspects one would expect a student to already possess. Most crucially for this study is the question of whose epistemology we are accessing. Whose world view do we refer to when teaching the ways of being, thinking and acting in the sciences, and who is favoured by these?

From the above findings, the academic teacher raises these issues and indicates that they are important and necessary, but his pedagogy is structured towards content that is to be taught. Now they (academic teachers) have to teach “basic learning skills” and “rationalisation” ways of thinking and thus acting in the sciences, among other things, and this “compromises content”. While content is valuable and it is through content that the discipline of science is legitimated, how to access it should also form part of teaching, though this seems to be not valued in science. It has been argued in Chapter 5 that foregrounding knowledge and back-grounding ways of coming to know has implications for constraining access, and this is more experienced by students whose primary Discourse is further from the academic Discourse, and as a university we need to ask ourselves the extent to which we appreciate this.

It is then possible to see that findings demonstrate that established structures (teaching structures) have the potential to create constraining environments for the agentive powers of these students.

Engaging with or consulting academic teachers and tutors is also seen as a challenge for these students, as findings show below:

They actually need higher quality learning skills they did not develop, because they did not fail, so I think what we need to achieve is that in, from the first day at university, that they are prompted and perhaps half forced to engage with a new academic system, which means to engage with their lecturers, with their tutors, in order to get their learning abilities changed, the main problem that I see and again... is rote learning and that rote learning comes from a long tradition of hierarchical education. I tell you what you need to learn and I am telling you how to learn and then I check exactly that way, and that is so deeply ingrained in people with poor schooling, which I think overlaps largely with the group that you are looking at, the rural kids, that is where I think the bottom drops out for them, is it's learning abilities, it's not skill, it's not engagement, it's not that they wouldn't be industrious. (Focus group, Science, 16 April 2018)

It could be argued that, while students need to be equipped with basic learning skills, there seems to be an inclination by academic teachers (drawing on theoretical assumptions of the general dominance of “common sense” understandings of teaching in higher education) that learning can only take place in class. There really was no reference to the learning practices that these students bring with them which might be relevant in HE, such as critical thinking. In relation to the points highlighted above, this study is an attempt to share views on why students from rural, marginalised backgrounds find it difficult to engage in classrooms or lecture halls with their academic teachers and I think answers have been provided to that effect, for example, the world view that is presented when the curriculum is enacted, does not reflect these students experiences and how they have learned to see the world.

The Chemistry academic teacher commented on other challenges that students from rural areas face in lecture halls. What is raised by this academic teacher is congruent with what co-researchers raised about the relationship they had with their school teachers, the fear of making mistakes:

So one of the biggest challenges they have is the willingness to make a mistake, that you know as a scientist you have to experiment, you have to try stuff and if it fails, you have to get up and keep going, try again, do something different, imagine a world you know, and they want to do what they are told, they want to keep the rules and do what they are told and succeed, just succeed by doing what they are told, and when you need them to actually make mistakes, so how do we support that process of learning to experiment? (Focus group, Science, 16 April 2018)

This fear of making mistakes was understood as constraining agential development, which is true, and rural home environments contribute to this factor, but it is also true that the teaching and learning environment in HE is alien to some students, while it is favourable for others, given their home backgrounds. As an institution, we need to accept this factor and create ways

that could make this environment more inviting for all students, by for example, drawing on concepts they already know when making examples in our classrooms. Or when conducting experiments, let us initiate these by drawing on experiments from home and then contextualise these into our teaching.

The academic teacher further notes the kind of support available in Chemistry, which is commendable, but there are frustrations that are experienced by students from rural areas. The challenge might lie in the point that we do not know much about students from rural areas in higher education:

We get a lot of support in the theoretical work, so in chemistry we have a series of tutorials that go all week, every week, and they can just slot it when they want to. Certain students are required to attend this, they get signed off when they attend, but they can pick anyone, and there is a senior tutor, either [Name of the academic teacher removed] .... or we've hired [Name of the academic teacher removed] ... and their job revolves around supporting these students through the induction session, learning how to think in a way that is amenable to learning at university, but as far as the experiment, the curiosity, I don't think we do enough really helping them to embrace failure. I don't think we always recognise the most difficulty in, so we give them the recipe to follow, they follow the recipe and then they want to just get full marks, because they followed the instructions, but then you've got to teach them about, well, what about your observation? And so, one of the processes we are currently implementing in our department is re-inventing our experiments, our lab members, because we need to be able to promote that enquiry and I don't think we are quite getting there, they are still too afraid, by the time they get to PhD, they still just want to get the answer, ja. (Focus group, Science, 16 April 2018)

Important findings above and these are to do with inducting students to think and act in ways valued in science, a point that has been raised in this study. This is good and needs to be supported and ways of supporting it, for example, through research must be encouraged. However, this idea seems to be an individual idea or an idea from a particular module – Chemistry. In my view this should be a Faculty endeavour. Students cannot be assumed to already know the “rules of the game” when they enter a university space. These must be learned and developed over time – it should be part of our teaching and as we do so we need to ask ourselves – whom do we legitimise as the knower because their ontological being relate to the norms and values of the academy and so, they find our pedagogic practices not so detached from home literacies such as question and answer technique, prevalent in most middle-class educated families.

The following findings show some of the frustrations that rural students face as they engage with their tuition, but there is little that the findings show about the pedagogy in supporting these students:

And they feel failure intensely, because they feel that they are supposed to do everything right and when they don't know what's right and what's wrong, they are very insecure and they don't ask. (Focus group, Science, 16 April 2018)

And they don't ask and particularly what I think is, if they feel they are wrong or they get negative feedback or a bad mark, and are frustrated asking things, that is the better side of it, because then they might actually respond to that and say, why am I going wrong. (Focus group, Science, 16 April 2018)

They respond by dropping the course. They might respond by that, but they also might respond by talking to somebody else in their class and that person, they might say, well just go there and ask, and they need I think, only a limited number of interactions when they then sit there with their 15% test and shaking and hardly there to ask questions. (Focus group, Science, 16 April 2018)

The challenges that are highlighted in the findings above show that students from rural areas are likely to suffer isolation from various aspects of university life, which might not be conducive for success at university. The issues highlighted above make it difficult for these students to learn how to become successful participants in academic practice and discipline enquiry (Morrow, 2009). Clearly, we are not doing enough to support these students. The findings below clearly demonstrate the minimal support in terms of academic teachers' preparedness or not to transform their views about decolonising the science curriculum, for example:

decolonisation ... that is a term that has been used as a political fighting term to pinpoint or to point fingers at lecturers who are perceived to still have an ambition to run Oxford in Africa at [Name of university removed]. (Focus group, Science, 16 April 2018)

The issue that is raised from these findings is crucial in the sense that any attempt to claim the space of local knowledges and practices within academia, would be fruitless, if the real issues are not addressed – that is the absencing of other knowledges and/or ways of knowing. Just blaming people without addressing the real issues is problematic and I concur with these findings. However, it should be made clear that coloniality of being and coloniality of knowledge is not only in the books as the findings below show. But it is in the idea that anything that is not Euro-America or white is substandard and therefore cannot be viable for knowledge construction (Mgqwashu, 2019b; Ndlovu-Gatsheni, 2013). Coloniality is masked in books, norms, values, attitudes etc. so the idea that, from rural areas, you can only refer to things like

cow dung and fertilisation and end there could be seen as another aspect of coloniality. What we need to consider is our attitude and what we believe to be normal or abnormal in the construction of disciplinary knowledge. These issues should be unmasked, if we are true to the agenda of social justice and participation for all in HE:

there are, if any, very very few lecturers who have this kind of stance we are adapting, transformation is now, decolonisation. They think we are still using the textbook from the 60s from Europe, no I mean we have moved on and we are moving on at a continuous way, there is no such thing like decurriculum reform, we are reforming all the time because it's a normal adaptation to the changing environments and you see something your outcomes are not achieved, where there is a problem and you try to fix it, no, this curriculum reform and decolonisation is yes, ya please perhaps a shakespeare course is no longer really the thing to do in Linguistics or in Philosophy or wherever they teach that, but it doesn't really exist anymore they have moved on, you know, the content has changed, teaching methods have changed, and they are changing continuously (Focus group, Science, 16 April 2018)

The undertone from these findings seems to be the denial of the damaging effects that colonialism had on the subjugated groups which led to the eradication of their identity, cultures and knowledges. An education system or curriculum that cannot acknowledge these issues is seen as being objective. It cannot just be that students do not get the desired outcomes and then the next step is to change content, teaching methods and so on. The question will always be – what informs the change? Are we viewing students as having the problem and so, must be “fixed” or are looking at values and philosophies underpinning our teaching, including the proximity between primary Discourse and secondary academic Discourse, these are issues which have been raised in literature. So, our attention cannot just be on books we use when we teach. It is more than that:

I feel prosecuted when the people look. Have you decolonised your teaching? Well it was never colonised, I always try to teach to the student body that I have in such a way that it's effective, there is effective teaching or there is non effective teaching, and if you don't like the effects maybe the outcomes are not well pitched, but this has nothing to do, or very little to do with colonisation (Focus group, Science, 16 April 2018)

The idea about curriculum is that it is just about going into a lecture hall and teach the student body. It is not just about teaching in effective ways or not. But most importantly it is about accentuating social practices related to what is valued and legitimated as credible knowledge by society. Given the effects of colonialism and apartheid legacy on indigenous cultures, identities, languages etc., issues about whose knowledge and social practices are legitimated in the academy cannot be ignored. These are not neutral issues – they are political, historical,

cultural and so, in our teaching we cannot pretend that it is just the hard work and meritocracy that results to success. From Bernstein's (2000) we have learned that teaching is not simply the transmission of skills and knowledge but also of moral order and social order. As much as we have to objective as scientists, we cannot divorce the work we do from our political and philosophical orientations. We need to be cognisant of these issues and how they translate to hidden curriculum in either constraining or enabling ways for epistemic access.

## **7.5 Overall analysis**

The application of Archer's MM framework in the Chapters 6 and 7 analysis allowed an observation of the continuing immense structural inequalities brought about historically between "subjects" and "citizens" of colonial states. There is then a tendency for these inequalities to be reproduced by institutions of civil society in a post-colonial context (Lockett, 2016). The consequences of the structural conditioning mentioned above are then enduringly mediated, particularly when black students enrol in HWUs as subjects of redress policies, which construct these students as having "lacks" that need to be fixed (Boughey, 2012c; Mgqwashu, 2018; Ndlovu-Gatsheni, 2013) without necessarily considering if the universities are prepared to receive them (see, for example, 4.9 in Chapter 4).

While there is currently a possibility that students from black middle-class educated families might have access to material resources and thereby overcome the structural conditioning mentioned above, these students might still be experiencing contradictory institutional logics (Case, 2013; Lockett, 2016, 2012). It is possible to realize this constraint through Archer's (1995) morphogenetic cycle, because of its usefulness in understanding the impact of the broader social context of learning. We learn from this model that agency is conditioned in the first part of the cycle, termed  $T_1$ . We can then observe the way students use their agency, either individually or as groups, over a specific time period termed  $T_2$ - $T_3$ . From this period, we can observe whether there is reproduction or elaboration in structures like curriculum, in which case, students would either experience complimentary or contradictory influences when curriculum is enacted, as per Archer's distinction between structural systems and cultural systems. Findings in these chapters have shown that students face curriculum contradictions, as the knowledge resources that they bring with them are not effectively known in the construction of knowledge in science classrooms.

Deepening the analysis of Archer's "situational logics" discussed in Chapter 2 around complementarities and contradictions, it is possible to see that middle-class, often white

students from educated families can exercise their agency in more powerful ways because, there is complementarity in terms of the academic practices that are valued in universities (Boughey, 2017, 2019; Heath, 1983), even though, in this study, there is no data pertaining to white students from middle-class educated families per se. Although the student demographics are no longer socio-culturally homogeneous, inherited academic practices have largely endured continually. In this context, English continues to have an advantage as the Language of Learning and Teaching (LoLT) throughout educational levels in South Africa (CHE, 2016). According to De Kadt and Mathonsi (2003) and Lange (2016), universities, particularly HWUs, embrace a context wherein Western (and English) practices and (associated) identities are validated and maintained at the expense of other practices and identities. It can be argued that it is under these circumstances that the working-class students experience a contradiction or a clash between practices that are valued and perpetuated in university spaces and the practices that they bring with them from home. For these students, exercising their agency could be challenging, because of the proximity between primary Discourse and academic Discourse (Gee, 20008, 2012).

The situational logics expressed above speak to the ways in which students exercise their agency, either as individuals or as a group at T<sub>2</sub>-T<sub>3</sub>, in relation to structural and cultural conditions that confront them. Some of these conditions, as I have discussed throughout this dissertation, are favourable to the students and some of them are not. In that way, we get complementarity and/or contradiction. It is always up to the conditions present at the time. The mechanisms are dormant until students exercise their agency to draw on them. Rural students would, for example, be drawing on some mechanisms from another context, their home context. Other students would draw on mechanisms that are complementary in the university, because they have been groomed to do so. While I am conscious that not all students or people learn in the same way, and have no intention of essentialising how learning takes place in rural areas, the deliberations above demonstrate that some students experience formal schooling in similar ways to the ways learned at home (Boughey, 2019, 2018; Heath, 1983). For these students, participation in the conceptualization of concepts in the classroom is most likely.

For other students, formal schooling seems to be in conflict with home-taught ways and this is likely to constrain participation in settings involving literacy. Literacy, in the context of this study, does not only involve encoding and decoding of printed texts, but is construed as a set of practices, developed from birth, resulting from the contexts into which individuals are born and raised (Gee, 2008; Street, 1984). These situations highlight issues of inclusivity and/or

exclusivity from structures like curriculum in HE in general. The implication for this is that students would not be able to participate as equal and full partners in the construction of knowledge, with the result that social justice issues are likely to be compromised, either wittingly or unwittingly, by academic teachers.

On the basis of the above brief analysis, it is possible to see why the language of complementarity and contradiction is useful in this study. It was therefore crucial in this study to engage with the structural or situational logics that condition students' experiences of the science curriculum, academic teachers' observations of these, as well as pedagogic practices and assessment strategies. Curriculum contradictions that are experienced by black students are not only in the sciences, as these are structural. This is because of persistent coloniality.

The disjuncture between home literacies and formal school-based literacies can be understood as the contradictions that the inherited curriculum sets up for black students, especially those who come from marginalised backgrounds, including rural areas (Luckett, 2016).

## **7.6 Conclusion**

Chapter 7 focused on corporate agents and primary agents. Primary agents (academic teachers) can assume the roles of corporate agents, especially if they are senior members of the academic staff, and so are likely to influence decisions taken regarding teaching and learning issues; however, their influence is largely conditioned by the roles played by senior leaders in an academic environment. In this study, the influence that senior leaders have on the actions of academic teachers as they pursue their projects of teaching was shown, for example, through postgraduate degrees in professionalising teaching. Some academic teachers took up these initiatives. Nevertheless, it was not clear from the findings how these initiatives assisted academic teachers in dealing with issues that impact on the agency of the most marginalised students in HE, including those who come from rural areas.

The postgraduate diploma in Higher Education itself as a structure has the potential to shape agential actions, but the cultural domain of individual academic teachers also conditions the emergence of teaching and learning activities, either in enabling or constraining ways for epistemic access. These are important issues that this chapter has demonstrated. The discussions in this chapter focused on how corporate agency resulted in elaboration in some instances, for example, the senior leader in management, and reproduction in others, for example, the senior leader in the Faculty of Science, with the potential of shaping agential interactions and teaching and learning in the field of science. This chapter also discussed how academic teachers observe

and conceptualise students from rural areas as students who need “fixing” or development, given that most of them were “underprepared” for HE by their secondary schooling. This is correct, but these observations assumed that the teaching and learning environment is a “neutral” space which then leaves university and its structures, like curriculum and pedagogy, without critique. Such observations could thus be said to have resulted in reproduction of the established teaching and learning approaches that view teaching and learning as acultural, ahistorical, apolitical and asocial. There was, however, an acknowledgement from the agents that the new cohort of students would need a consideration of transforming curriculum and pedagogic practices, events which are likely to lead to elaboration in the structural and cultural domain in the science teaching and learning environment.

However, as shown in the analysis, the home environments of students could also be a constraint for epistemic access, as there are sometimes clashes between home-taught ways and university learning. There are also connections between home literacies and university literacies, but academic teachers seem to have no knowledge of these and so are unlikely to draw on them when making examples in classrooms, except for a few examples in the kitchens of most households, which might not be relevant in rural homes. Fundamental in this chapter was an identification of the inability of academic teachers to implement teaching strategies that value and reward the knowledge resources originating from rural homes of students, and their inability to identify the potential gains to be achieved for epistemic access, because they do not know much about students who come from rural areas. Chapter 8 concludes this study and presents key findings.

## CHAPTER 8: CONCLUSION

### 8.1 Introduction

Coloniality and the legacy of apartheid have been identified as persistent within the South African Higher Education (SAHE) sector in general, and in the discipline of science in particular. Apartheid policies worked as mechanisms that ensured, among other things, the separation of the South African population on racial grounds. In the process, these different environmental contexts shaped the emergence of the experiences of the South African population based on their geographical location and access to material resources, including access to education.

In the social world, people occupy different positions (through birth or through voluntary or involuntary placement) which imbue them with certain powers (*ibid.*, p. 177-185) which structure their life chances. The contexts into which people are born enable advantageous or disadvantageous encounters in social interactions. Attached to positions are certain material resources and therefore vested interests. Through Archer's analytical framework, it was established in this study that people may wish to maintain their positions and interests (a situational logic of protection) or may wish to improve their situation in life (a situational logic of opportunity). As such, social groups and the positions that people occupy could thus be interpreted as a structure that leads to events, observations and experiences. Based on this understanding, it is possible to see how apartheid policy structured life chances in either enabling or constraining ways for different groups of people in SA. When it comes to higher education, for example, the life chances that were conditioned by the positions that people occupy, as a result of apartheid policies, tend to impact on who get access to the academy and who flourishes within it (Boughey & McKenna, in press). Even though apartheid was abolished about 25 years ago, its influence is still being currently experienced in terms of epistemic access and success, given the proximity between primary socialisation/Discourse and secondary academic Discourse.

Boughey and McKenna (2015), as well as Street (1984), acknowledge the university as an inherently social, political, historical and cultural space to which some students have privileged epistemic access by virtue of their previous experiences. Hence, as academic teachers, what we could do is to accept that universities, the knowledge and the learning that sustains them, are not neutral.

There have been a number of initiatives that have been put in place, in the SAHE landscape, to improve equity of access and success of students who are “other” to those who come from middle-class educated families, who supposedly have received quality education that had prepared them for HE. These initiatives were, among others, academic support which aimed to offer support to the emerging group of black students who were enrolling in HWUs in the late 1980s, consequent to the apartheid regime’s relaxation of its laws (Boughey, 2007; Boughey, 2012a; McKenna, 2012); the academic development phase, which was characterised by the ideological shift from the discourse of students’ “deficit”, with a focus on the development of teaching and learning in an “attempt to embed academic development work in faculties and departments to bring about change in mainstream practices related to teaching and learning” (Boughey, 2013, p. 15), in order to meet the needs of the incoming black majority in the early 1990s (Hlatshwayo & Fomunyam, 2019); and the institutional development phase which focused on acknowledging that it is not just students that are “underprepared” for university education, but that academic teachers and the university itself were “underprepared” to teach the new group of black students in HWUs.

These phases were under the banner of the field of academic development. Even though there had been initiatives like these, equity of outcomes is still skewed in favour of white students who come from middle-class educated families (Boughey, 2018; Shay *et al.*, 2016) and the skewed educational outcomes could be said to be the legacy of apartheid. Recent research has shown the contested nature of the field of academic development in the SAHE landscape (Hlatshwayo & Fomunyam, 2019) in that, within the academic development discourse, there is a dearth of literature regarding the experiences of black students in academic development, and the extent to which being in the programme has made a difference to their university experiences (Hlatshwayo & Fomunyam (2019), experiences which are informed by curriculum events, pedagogic practices and assessment strategies.

In this study, curriculum is understood as a structure that regulates access to knowledge and knowing, and is observed as imbued with coloniality of knowledge in the sense that how it is designed and thus enacted covertly limits, silences, constrains participation, excludes other world views in knowledge construction and thus adversely affects epistemic access for some students, but not so much for others. Using Archer’s analysis, it was possible to see that a curriculum could be described as having “culturally emergent properties”, where structural and cultural conditioning have already been set up before students joined the university, as they interact with other agents, structures and cultures of the academy (Lockett, 2016). The issue of

equity of access and success was seen to be an important aspect of curriculum in that curriculum, as much as it is exclusive in how it is designed and thus enacted, has a potential to be inclusive of the experiences of all students, including those who come from lower-class backgrounds, including rural areas. This is seen as a social justice issue, which was a motivation for this study in an attempt to improve “parity of participation” in knowledge construction in the field of science, with an attempt to acknowledge all students as legitimate knowers. It was partly because of these reasons that this study sought to answer the following question(s):

*What are the enabling and constraining factors that influence teaching and learning of second year science students who come from rural backgrounds at a South African University?*

Research sub-questions:

1. What practices shape the learning habits of second year science students from rural backgrounds at a South African University?
2. What knowledge, cultural and technological resources do second year science students from rural backgrounds bring to negotiate epistemological access in the sciences?
3. How do academics who teach second year science students understand the knowledge resources that students from rural areas bring to their classrooms?

To answer these questions, I conducted a Participatory Action Research study that was subjected to the tenets of CR and SR to investigate home practices that shape approaches to the learning of students from rural areas in universities, and the challenges they face in higher education curricula, which remain imbued with coloniality and the legacy of apartheid, and the potential contribution of and challenges associated with digital technologies and social media, both in rural communities and when entering higher education from a rural background. It was therefore necessary to understand how home contexts and university contexts shape epistemic access for these students and how the university teaching and learning environment conditions epistemic access. What I needed was to identify underlying mechanisms that were responsible for the manner in which students’ historic and current practices have contributed to accessing the university space, intellectually, ideologically and physically, and those mechanisms that shaped the emergence of teaching and learning in the field of science. I also investigated how an inclusive and living curriculum could be developed, that built on the experiences of all students, including those from rural contexts, by studying the knowledge resources that these students bring with them from home to university and how the informal acquisition of home practices with scientific underpinnings could be harnessed and contextualised to science

disciplinary learning. The findings of this study provide significant implications for the development of an inclusive and living curriculum that draws on experiences and world views of all students, including those from rural areas.

Arguing for inclusive curricula that draw on the experiences of all students is in no way suggesting that the knowledge resources that students from rural areas bring to university are fixed and thus need to be left intact. Instead, these should be viewed in terms of how they can assure students that what they already know has value in the university space, as proximity between primary Discourse and secondary academic Discourse plays a significant role in epistemic access and ontological density.

## **8.2 Key findings**

This study has used the Archerian framework of morphogenesis, which was drawn on in order to review the conditions that shaped co-researchers' home practices before joining the university, and how these might have played out in conditioning the learning habits of these students and their epistemic access in the field of science in HE. This review took place in a period known as T<sub>1</sub>. This period also involved a review of the conditions in HE in general, and in the field of science in particular, before the interaction between academic teachers and co-researchers, an interaction which takes place in a period known as T<sub>2</sub>-T<sub>3</sub>.

The identified structural and cultural conditions enabled and constrained the manner in which, and/or through which, individuals could enact their agency relative to the T<sub>2</sub>-T<sub>3</sub> period when interactions between agents took place, an interaction which is informed by curriculum events. Tracing how these conditions played out in this period, I analysed co-researchers' focus group discussions, drawings and mappings, and digital documentaries. Co-researchers participated in data generation for approximately seven months (April–October 2017). As reported in Chapter 3, I also analysed focus group interviews and interviews with academic teachers and senior leaders. Three focus group interviews were conducted with academic teachers and two with senior leaders. This section thus reflects on some of the main findings that were reported in these analyses in Chapters 6 and 7.

One of the major findings in this study was that colonialism and the legacy of apartheid shaped and conditioned life chances of the rural population, a condition which affected access and success at school and/or university. The study has shown that there is a correlation between socio-economic background and success at university. The South African schooling system was historically centred on segregation strategies which ensured white supremacy and exclusive

access to material resources and opportunities, including educational opportunities. These structural and cultural conditions were important to consider in this study, as universities are part of the socio-political and cultural circumstances shaping the communities from which universities have emerged and are part of.

It has been demonstrated that the teaching and learning environment in South Africa, prior to 1994 and perhaps during the early 2000s, was characterised by segregated institutions designated for certain groups of people based on race. Some institutions were predominantly white and privileged and the research site, for example, fell in this category. So, when white students from middle-class educated families enrolled at the university, their home literacies did not clash with those of the university, while the opposite is true for a number of black students from lower class-backgrounds, including rural areas, as these areas are characterised by underdevelopment. For these students, there seems to be tension between home-taught ways and university or academic literacies, and this tension plays itself out in severely affecting educational outcomes, as these are still racially skewed in favour of white students from middle-class backgrounds. So, the interplay between geographical location and education, as a result of apartheid legacy, is a constraint for the enactment of agency in higher education in general and the field of science in particular, as these students are mainly cut off from mainstream discourses, including educational discourse. It is possible to see how the agency of these students is constrained in the field of science, as the following major finding show.

Another major finding of this study was the clash between primary Discourse and secondary academic Discourse. The perception from co-researchers was that literacies socialised from home pose a challenge and confusion for them once at university, and the university seems not to appreciate such challenges sufficiently. There is thus a potential impact on the agency of students in accessing the secondary academic Discourse in general, and of science in particular. Not only did co-researchers acknowledged this clash, but also the senior leader in the Faculty of Science as well academic teachers when they commented on the insecurities that these students face in lecture halls.

The study showed that explanations, among other ways of coming to know, are valued in science; however, in most rural homes, children are told how things are or should be. These children are likely not exposed to environments where opportunities for questioning things and being critical are encouraged. When they are supposed to question things at university, they struggle to do so, and this negatively impacts on participation in knowledge construction. The

inability of students to participate effectively in lecture halls emerged from structural constraints such as geographical location and home-taught ways or literacies. Emerging from the findings is that students from rural areas end up afraid to ask in class, or to engage an older person, and so the learning practices that the students end up adopting are rote learning without the amount and quality of depth and comprehension that is required at university. In science, for example, students are expected to respond to questions that not only require rote learning (define, label or list) but also to questions that require basic understanding (describe, discuss, and so on), demonstration of deeper understanding (explain), integration of diagram and text, application of a concept, analysis of a context, and synthesis (drawing on many concepts) (Ellery, 2019). It is possible to see how learning habits that are adopted by students from rural areas are a constraint in engaging with a variety of questions that are asked in science, which potentially affect how a student should learn.

This kind of learning practice that is adopted by these students (rote learning) is likely to lead to negative educational outcomes, as it would be difficult to answer the kinds of questions that are asked in science. So, there was some evidence from data of cultures from home that did not value critical thinking, as questioning and providing explanations is part of critical thinking, an important trait at university. The role of such cultures emerged as a constraint in the construction of knowledge at university.

Another finding which poses tension between primary Discourse and secondary academic Discourse, and coincides with the finding of being afraid to ask questions, was that of respect. In rural areas, students are taught to respect because respect is something humane to do. However, respect is likely confused with fear, such that these students respected teachers from rural schools to the extent that they could not ask questions in class, even if they did not understand the concepts being taught. Sometimes, they would assume that an elder person was correct, not because they agreed with what s/he said, but because they respected them or feared them. In HE, such practices are disadvantageous, because the university environment necessitates engagement with issues, making arguments and providing evidence for the claims made. The work of theorists like Gee (2008, 2012) was useful in conceptualizing the role of primary Discourse, as it clashes with secondary academic Discourse. This study has showed how useful the conceptualization of Discourses could be for academic teachers in shaping their pedagogic practices in conjunction with Bernstein's pedagogic device in enabling epistemic access for all students, including those from rural backgrounds.

While there are clashes that were observed from the findings, there were also connections that were observed. What this means is that the findings were contradictory. Then the question becomes, what do you as a researcher do when confronted with a situation like this? The answer lies in the tenets of the theoretical framework used in the study. In this study, for example, it was argued that the conditions that people are confronted with are not deterministically oriented (Archer, 1996) but have enduring effects on human agency. Critically, although structures like the constraining beliefs and cultures located in rural homes have enduring causal powers in constraining the agency of these students to participate as legitimate knowers in the science lecture halls, these structures and mechanisms are not strictly causal but tendential – it depends on the structures and mechanisms operative at the time for the emergence of particular experiences. It is then possible to understand why other findings showed interaction between primary Discourse or socialisation and secondary academic Discourse.

Another major finding was that there are rural home practices which have scientific underpinnings and that there is a potential that these could be harnessed to facilitate access to formal, disciplinary science knowledge. It could be argued, based on the findings, that there is another dimension of rurality which challenged the assumed “deficit” discourses about rural areas. There was evidence from the findings that some practices originating from rural homes of the co-researchers are underpinned with concepts and procedures and ways of knowing valued in science, such as observing cows, observing and experimenting with the soil before planting, use of traditional herbs and so on. As academic teachers, we need to consider what to select and how to adapt it into an educational format in our course guides, textbooks, lesson plans and so on in deciding what to teach, how to teach it and why, what Bernstein (2000) refers to as different fields of the pedagogic device. All these choices could be reproduced through teaching and learning and assessment. Through understanding the relationship between these fields, we can begin to think about the legitimacy of rural home practices with scientific underpinnings when designing the science curriculum, and in the process, realise how those experiences could be used in order to provide students from rural areas with access to the ways of knowing and being in science. This could help re-think teaching and learning in the sciences, so that attention is not just on knowledge acquisition in a decontextualized manner, but also on how students have learned to see the world.

It has been shown in this study that if students are presented with knowledge that seems separate from them, their being, it is inordinately difficult to access that knowledge. This situation was evidenced when students were presented with contradictory curriculum events. When they were

in the field, for example, conducting an experiment on planting, students from rural areas drew on Discourse learned from home, and it was helpful to the student in executing an experiment, but this experience or practice from home was not drawn on to teach about said planting experiment. The academic teacher's beliefs or knowledge about this home way of knowing were seen as limited.

The university and its structures, like curriculum, were constructed by the academic teacher as acultural and asocial, and such construction was construed as aspects of morphogenesis both in the domain of culture and structure, because the demographics of students have changed, yet findings show that pedagogic practices and curriculum enactment seem to have remained the same.

The implication for not acknowledging the knowledge resources that students from rural areas bring with them was associated with the conceptualization of rurality, in that as academic teachers, we do not know much about students from rural areas, nor about the condition of rurality itself. In fact, one academic teacher pointed out that, "...we actually know very little about our students... we as lecturers, we have no knowledge whatsoever" (Focus group, Science, 16 April 2018). Although the academic teacher acknowledged in the findings that these were perceptions, as she had no data to back them up, such perceptions were crucial in this study as they allowed an understanding of the extent to which teachers draw on knowledge resources that students bring with them from home to their lecture halls. Evidently, if teachers do not know much about students, who they are, their background, it would be difficult to draw on knowledge resources that students bring with them, hence the relevance of this study.

Rurality is not a fixed construct. While there may be "othering" of rurality as a condition which is often seen not as a viable resource for knowledge construction, as rurality is usually associated with "deficit" discourses, the findings above shift the view about students from rural areas. The implication for this shift is that knowledge generation should not only be aligned with monolithic world views which then influence what counts as knowing and what does not. In a situation like this, there is a potential of structure (curriculum) and culture (beliefs about ways of knowing) to condition the agency of rural students in contrast to or in collaboration with the way the agency of their academic teachers, who may come from very different backgrounds, plays itself out. The domain of culture, in this study, was seen as tremendously significant in reproducing and/or transforming dominant ideas about teaching and learning in higher education (CHE, 2017). The significance of agency was thus validated in this study in

that, if the findings demonstrated that there are practices with scientific underpinnings from students' rural homes or environments, agency and reflexivity have the potential to promote the negotiation of obstacles embodied in curriculum in accessing science disciplinary knowledge, by drawing on knowledge resources that students bring with them. The role of academic development was found to be useful in this regard, to assist and encourage academic teachers to learn to teach in contexts where there are students from various backgrounds, but this also depended on the uptake of these initiatives by academic teachers.

Another major finding was an acknowledgement by the corporate agency and primary agency alike for the need for institutional change and curriculum change. Institutional change involved, among other things, an acknowledgement that a university teacher should have a teaching qualification in the form of a postgraduate diploma. This move was seen as an enabling structural factor to enhance the teaching and learning environment, thus improving cultures about teaching and learning. Professionalising teaching and learning meant that academic teachers are equipped with teaching and learning theories on which to base their approaches and so, pedagogic work became part of these initiatives, with the potential to realise that teaching and learning are more than content, but are also about who teaches, who is being taught, why we teach the way we do, and so on. These were seen as enabling factors regarding institutional change through corporate agency, at least at the level of the senior leader in management.

There was, however, some level of contradiction in terms of how corporate agency conceptualized the teaching and learning environment, at least at the level of the senior leader in the Faculty of Science. While there is an acknowledgement in this study that students from lower/working-class and marginalised settings received education from school which did not prepare them well for university education, there is also a recognition that some practices from rural homes are congruent with the ways of learning at university and so, in our teaching, we can draw from these to enhance the ease of access to disciplinary science knowledge and ways of knowing.

Dominant in the findings from the senior leader in the Faculty of Science was what could be termed the discourse of the “decontextualized learner” and the “decontextualized university”, discourses which mainly perceive education as asocial, acultural, ahistorical and apolitical, and that the student needs to be “fixed” in some way to be able to cope with university education, and that success depends on factors inherent to the individual. These dominant ideas

constructing students, particularly those from rural areas, as well as their learning and the role of academic teachers therein, were seen as persistent in the cultural realm. Effectively, what these findings seem to suggest is that, while the primary agents involved in teaching and learning could draw on enabling structures such as PGDipHE and curriculum review documents, they were also likely to draw on discourses which could be viewed as less likely to contribute to change by drawing on the experiences of all students in the construction of knowledge in the sciences. This could be said to result in morphostasis in the deeper exploration in the domain of culture, paralleled by morphostasis in agential domain. Due to what was widely experienced as students' "under-preparedness" in the findings, minimal attention was paid to the "under-preparedness" of academics to teach the current cohort of students, which includes a significant number from rural areas. There was, however, an acknowledgement of the "under-preparedness" of academic staff, evidenced at least from curriculum review documents.

Another major finding was on language challenges in HE. Students' lack of participation in class was associated with English, the LoLT, but that English itself is not a problem. The problem is that students had been exposed to environments wherein mother tongues such as Xhosa were used more than English. Had they been exposed to English more, they would be able to develop conceptual understandings in class and so participate effectively. It is true that, given the background exposure to English, grasping the "fundamental cognitive concepts" (as the senior leader in the Faculty of Science pointed out in the findings) would be daunting for these students, but it is also true that our view of language in the process of conceptualization plays a significant role in enabling or constraining access to these "fundamental cognitive concepts". If we assume that the difficulties that students have as far as LoLT is concerned are located in students having not mastered the forms of the language, or as a result of a set of acultural, asocial language skills (Boughey, 2002), then we run the risk of viewing language as not embedded in social contexts. In the context of this study, this would mean that language should be understood in terms of structured use and development of the use of English as students engage with meanings in an academic context (Boughey, 2005; Gee, 1990; Jacobs, 2007; Street, 1984). So, familiarity with the context in which language is used for meaning making would enable the appropriate use thereof. I have argued in this study that it should be every teacher's responsibility to expose students to how the discipline of science constructs itself through language. This does not suggest that academic teachers in the sciences should now teach forms of language, but in their teaching, students should be exposed to how the Discourse is constructed.

If the above issues are not considered, the likelihood is that the challenges that students are confronted with in the field of science would be approached only superficially by focusing on the events and not on the structural, cultural and agential issues forming the generative mechanisms that led to these constraining events for epistemic access and thus success. Ignoring these generative mechanisms absolves the university and its structures and cultures, even though they serve some students better than others. This has the potential of perpetuating the reproduction of the status quo, as most students from historically marginalised backgrounds already experience epistemic constraints due to the interplay between structures like curriculum, cultures such as academic teachers' beliefs about teaching and learning, and how the agency of academic teachers and that of students plays out, as they come from different backgrounds.

The focus on constraints identified above should not be seen as an argument that the teaching and learning environment in the field of science at the research site is not effective in providing enabling conditions for black working-class students, and mainly those who come from rural areas, because there are a number of initiatives in place, including curriculum reviews and additional tuition provided to students in the form of extended studies programmes, among others. This study did not however, analyse the effects of these initiatives, though it seems evident from the findings that much is being done that is hoped to have positive outcomes for all those involved. Based on findings, we should be cautious of the persisting cultures that are likely to constrain transformation in the practices and attitudes towards teaching and learning that would allow and acknowledge other world views in knowledge construction, so that all students could see that what they already know is valued in academia. Of course, we need to ensure that students do not misread the academic context by just taking any experience from home and thinking that it could be appropriate in an academic context, and this is where judgemental rationality comes into play. The resilience of cultures that marginalise teaching and learning work and thus compromise agential efforts to advance teaching and learning have been challenged in literature (see for example, Boughey & McKenna, 2016; Boughey, 2002; Luckett, 2012; Leibowitz *et al.*, 2014). This study thus aimed to further contribute to this literature by offering alternative ways that teaching and learning could be approached, especially in the context where the student body is no longer monoculture.

### **8.3 Contribution to new knowledge**

Usually, the contribution to new knowledge that a PhD study presents is understood to be in the findings, as many people ordinarily assume. In this study, I argue that the contribution that a PhD renders is not only in the findings, the whole PhD contributes to new knowledge. First, a researcher identifies the problem. The problem statement was discussed in Chapter 1 of this dissertation and was supported with evidence from literature. This study presents a new look or approach to the identification of the problem, in that a theoretical lens adopted in this study allowed a move from empirical data to come as close as possible to mechanisms shaping agential experiences and observations, or put differently, participants' interpretation of their experiences. There is vast literature in South Africa that has looked at the challenges that students from marginalised backgrounds face in HE, but none have looked at the condition of rurality and its dimensions, and how this condition could act as an enablement or constraint for students accessing science disciplinary knowledge. In this study, this was done by combining PAR, PAL, SR and CR as well as a decolonial gaze. This whole dissertation has produced a new way of looking at challenges which students from rural areas are usually confronted with in HE in the field of science. The conventional scientists might not see that the relative realm of human experience and observations is tendential to the real realm of the objective world, such that not only what we teach (curriculum) in the classroom/lecture halls legitimizes one's identity as a scientist or science student, but also how we teach it (pedagogic approach).

Based on the brief deliberations above, another major contribution is that the analytical nature of this study ensured that all the complexities, including complimentaries and contradictions, that students from rural areas face in HE in the field of science, given their home backgrounds, the structure of curriculum and its enactment, were taken into account. The findings of how the experiences of these students have emerged and academic teachers' observations of these in the South African higher education sector are particularly important at this point, given the political, structural, cultural and agential influence on issues of access and success and their tendency to be conditioned by the proximity between primary Discourse and secondary academic Discourse. These aspects of learning and teaching can no longer be assumed to be acultural, ahistorical, apolitical and asocial. Given that in some instances in the findings, there were covert assumptions that learning and teaching were still associated with these aspects, drawing on Archer's framework, this forms the T<sub>4</sub> point in the morphostasis framework.

The above-mentioned understanding of learning and teaching could be seen as reproduction of academic teachers' observations about it. These observations would constrain academic

teachers from drawing on knowledge resources or literacies that students from rural areas bring with them into higher education, and so there will be no change in terms of how curriculum is structured or enacted. This study has demonstrated that HE favours certain world views to the exclusion of others in knowledge construction, and that the teaching and learning environment could be alien to other students. Therefore, failure to take account of the relationship between home socialisation and secondary academic socialisation of these students poses the potential for the reproduction of experiences that constrain access to disciplinary science by students whose home literacies are viewed as not relevant for knowledge construction.

An elaboration in morphogenesis framework was also presented in this study in the form of corporate agency, through provision of postgraduate diplomas to professionalise teaching for academics, establishing platforms for curriculum reviews and so on. This study however, acknowledges that enabling structures alone cannot lead to the recognition and reward of knowledge resources originating in rural areas. For example, cultures must also change as the continual cultural constraints resulting in the marginalisation of teaching and learning could yield to complementarity in the parts (Archer, 1996), whereby constraining cultures within institutional setups reinforce constraining structures in the form of curriculum and teaching approaches, for example, that defend, protect and reproduce the status quo. There is thus an important obligation on the part of corporate agency and primary agents for innovative interventions. This is a contribution that this study is making by drawing on knowledge resources that students from rural areas bring with them to HE. This realisation would enable the mediation for elaboration of constraining cultures if structural interventions in the form of curriculum and curriculum reviews are to yield epistemic access for all, as there is persistent poor performance among black students, with many taking longer than regulation time to complete their degrees (Letseka & Maile 2008; Scott *et al.*, 2007).

Another contribution of this study is that it will be useful to academics and researchers working in the fields of rural education; rural research methods; higher education; widening participation; inclusive education; social justice in education; critical realism and social realism; technology and education; academic and digital literacy; indigenous knowledge systems and the decolonisation of knowledge. The findings have, at various levels, from a theoretical perspective, delivered fresh insights into qualitative research, using PAR and PAL in proving the relative world of experiences and subjecting these to the real world of objects to account for mechanisms responsible for human experiences and observations, without clamping these into a “conceptual vice”. The findings have also provided insights into the

concept of rurality, and how it is manifested in South Africa, thus what shape it assumes in specific contexts. These are theoretical insights that should be useful to scholars and senior students alike. The findings are also relevant for lecturers and academic developers, and should lead to good/best practice guidelines regarding creating a more inclusive curriculum. We should, however, be prudent that in our bid to be “scholarly” and draw from (so called) “strong” theories about best practices, we have ourselves predominantly drawn on theories and ideas about teaching and learning from the UK, USA and Australia” (Vorster & Quinn, 2017), theories which might not be relevant for contextual experiences in the Global South. So, while we advocate for best practices, we should be cautious of a myopic focus on methodology which often serves to obfuscate the real question – which is why in our society, subordinated (marginalised) students do not generally succeed academically (Jacobs, 2019).

Lastly, the findings contribute to the ongoing debates in South Africa about the decolonisation of knowledge.

#### **8.4 Implications for the study**

It has been argued in this study that the science discipline draws, at most, from the Western perspectives of modern science in terms of providing evidence for the claims made, rationalisation and so on. In the domain of culture, Oyedemi (2018), for example, notes that “The European culture and ways of producing knowledge and meanings became imposed on the dominated and the colonized, and all existing patterns of knowledge creation were relegated” (p. 3). However, it is not only the European culture that is rational (Quijano, 2007). Based on this understanding, some questions emerged in this study: Who is a curriculum for? What should be taught and how; by whom and to whom? (Luckett, n.d). So, questions about the fitness of purpose of inherited curricula are crucial in terms of responding to the current demographics of students. It should however, be clear that this study is not about providing an alternative view of science, nor is it about changing science. Firstly, the premise of the questions emerging from the study imply that we have been obsessed in HE with epistemological questions, for a long time, in terms of transmission of skills and transmission of knowledge, which is correct. But what we need to start asking and focusing on is, among many things that my study and the findings are revealing, is ontology. We need to turn and ask questions such as what kinds of dispositions are generated when our students finish their degrees, and when we confer degrees – when we say Bachelor of Science, what are we conferring? What world views are we conferring upon these students and this generation in terms of what constitutes

and who, most importantly, is a standard for what counts as science? What dispositions are we valorising, giving them an upper hand when we graduate our students?

Secondly, science as an ontological entity, objectively does not happen in Europe only. The experience of scientificity, for example, evaporation, fertilization of the soil, solubility, co-solvent, melting and so on, happens everywhere in the world. How we define fertilisation, for example, is always imbued by our language, because language explains the world we see. If I am Chinese, for example, and were to explain how fertilisation occurs, my Chinese-ness will be lacing my scientific explanation on how fertilisation happens, and if I am growing up in a Zulu context and am asked to explain how fertilisation happens, my language has given me a particular world. Language and the world I see are two sides of the same coin. When I explain fertilisation, a scientific and universal concept which is generally known, how I grasp that abstract concept will always hinge on my world and the language I use as I explain – there is no separation between my world and the language I speak. If there is separation, then the language that is used to explain that concept and those who are part of that language are already five steps ahead of me. The implication is that, I am not just learning the concept, but am also forced to learn the world that is constructed by the language that is used to explain this phenomenon.

While the LoLT is not expected to change, that is English, it should be acknowledged that there is more to language than just say, Language of Learning and Teaching. In this sense, by language, I mean the symbols that over time have been established as a pattern that the group that speaks that language are already aware of. English, for example, as a language has very specific patterns and idioms, and so on, aspects that were developed over time. Shakespeare, among others, contributed immensely in the development of English as a language, for example. If we refer to mannerisms by considering what is acceptable, it is possible to see that that is intertwined with English. In the English world, which is communicated through language, symbols and behaviour, you may not leave the table without saying “excuse me” when you are eating. That particular behaviour reflects a particular world view and that world view is captured in language, and the phrase that gets used is “manners”. The word “manners” is linked to the behaviour, which is linked to a particular context, on the one hand.

On the other hand, as a Zulu or Xhosa young person, if we are in some occasion/event, having African beer, and we are all excited, I can go and come any time and there is no issue with that behaviour, because the world that I occupied has defined things through language which has

produced certain behaviours. There is alignment between the behaviour, language and the world that we occupy. So here we have a clear understanding of three things: language and culture are two sides of the same coin, and the world that we see is always defined by the language we speak. The world that I see is always reflected in the language I speak. Then, it is possible to see why and how certain groups of students in the HE system would have more leverage than others because of the language they speak, for epistemic access. But more than this, the implication for the study is that we need an ontological turn, because your being cannot be separated from where you come from. This could be done by changing the curriculum and starting to free it from the framings that influence content that is used and examples that are used to illustrate concepts. In this way, we could free students to demonstrate their understanding of the lecture from their world. Suppose we had a lecture on evaporation and I try my best to explain what evaporation is and so on. Instead of prescribing for students examples that demonstrate the concept, I let them identify examples that speak to them about that concept before we contextualise it to science. They would all have learned evaporation, but the world from which they come will give them the material to talk about it.

The idea is not to replace what is already there in terms of content, but is about ontological orientations, that is, freedom of all ontological orientations to have space in science. It is the being that is inculcated about what constitutes material that we use to explain the scientific concepts. That is the significant implication for the study. The material that is used to illustrate our understanding of concepts is monolithic, monocultural, monolingual and therefore exclusionary. The material that we use to illustrate our understanding is at issue, it is not just epistemological issues. Evaporation will always be evaporation – observations will always be observations, measurements will always be measurements. It is not as if observations, for example, accumulative knowledge and rationality are just European concepts. They are not. Studies have shown that these scientific aspects have taken place in Africa (Medupe, 2017; Zinyeka, 2013). The only difference, the only reason they seem to be difficult to access is because the points of reference are misaligned to students' world views and identities. The concern therefore is to have an ontological turn (Torres, 2011), by which I mean considering what being we confer in relation to science. My view is that science has to be diverse, multicultural, as long as we all reach the same point. It is here that pedagogy comes into play.

Thirdly, the implication is that when academic teachers go into a lecture, the idea is not to transmit knowledge but to co-construct knowledge with young adults, who should be actively involved in bringing their ontological orientations into the construction of this knowledge. The

actual classroom interaction is one aspect of pedagogy. There is also the course content, type of assessment tasks, and question of whether we have a place for examinations, as well as what contribution examinations make in terms of developing ourselves as humanity. At a pedagogical level, we need to consider how we interact within lecture halls, what content we choose, including readings, which worlds find space in the curriculum. At the research site, if you have a student from the Middle-East, Russia, Uganda, KZN, all these students need not feel that they need to let go of their ontological orientations just because they are in this space, which happens to be quite biased toward one type of ontology.

Ontological turns in knowledge construction provide a framework to realise that in HE we had spent much focus on epistemic access without asking whose epistemology, and who decides access, and how does it position the players in this discourse. Chapter 5 of this dissertation, for example, engages with issues of epistemic access but it situates these in relation to ontological orientation. The nature of a field like science, for example, foregrounds epistemology and backgrounds dispositions and so, questions about who the legitimized knower is and which ontological positions are legitimized in this space are of secondary importance, as long as you have the knowledge. As academic teachers, individually and collectively, I argue, we need to immerse ourselves in the conversation for inclusive and living curricula that provide space for different ontological orientations in the construction of scientific knowledge. As scholars, we shall never cease reading to orientate ourselves with different orientations and dispositions of the students we teach.

Some findings in this dissertation have indicated, for example, that when academic teachers teach they end up not teaching knowledge/content, but end up teaching students how to describe, how to explain in science, which is good, because this acknowledges that teaching is not just about knowledge. But the undertone is that it should not be the responsibility of the teacher to teach these aspects. However, research has shown that any knowledge that does not include how to speak the knowledge that is being taught is incomplete (Boughey & McKenna, 2016; Mgqwashu, 2012, 2019b). Giving students the content on the one hand should also imply giving them ways and means of communicating it through language in writing or in speech, on the other hand. It cannot just be content. Giving content must also reflect Discourse construction. Knowledge and how it is communicated in writing or speech cannot be separated. Otherwise, our job is half done.

While teaching how to communicate the content, in this study, I argue that it is possible to draw from different world views, as there are instances of descriptions, explanations, observations and so on in rural areas. In these areas, knowledge is also cumulative; it builds from the previous knowledge, although it is everyday knowledge. Maton (2014), in extending Bernstein's (2000) notion of vertical and horizontal discourse, has argued that sometimes there is no clear boundary between these discourses, so it would be incorrect to assume that in rural areas there could be no cumulative or vertical knowledge. In our teaching, what do we see as a point of legitimation? We need to consider how we, as academic teachers in the field of science, work with students who might be coming from a background where there are practices with scientific underpinnings but are unable to express these because they are not proficient in English and are therefore struggling to untangle "cultural codes" constituted of material cultural objects, for example, writing, acting and being in the field of science (Hlatshwayo & Fomunyam, 2019; Ellery, 2017). These are significant social justice issues.

## **8.5 Conclusion**

Chapter 8 has presented a summary of findings which largely point to structural and cultural constraints that prevented agential development for students who come from rural areas in HE in the field of science and potential gains for epistemic access from the knowledge resources that they bring with them from home. While the study demonstrated constraints from the university structures like curriculum and pedagogic approaches, home environments of these students also present tensions between home values and university academic values, and this results in frustrations, loss of confidence and feelings of alienation within an academic space, traits which are not conducive to epistemic access in academia and in the sciences. The university and its structures and cultures have also been shown to be "underprepared" to teach in an inclusive way.

Even though, based on data, access was provided to students, sometimes through academic development initiatives, teaching and learning approaches failed to meet the social justice mandate articulated in South African literature and Department of Higher Education (DHE, 2017) to provide a reasonable chance of success for all students, irrespective of racial, cultural or home background. In this way, the teaching and learning environment in the field of science could be seen, in some instances, as unproductive for either the individual or groups of students who come from the most marginalised backgrounds in rural areas, resulting in low throughput rates. A more inclusive and living curriculum and pedagogic approaches should be developed,

as these low throughput rates are a cause for concern in relation to the persistent structural and cultural constraints embodied in languages and institutional cultures.

There is thus a tendency for these students to be lost in the system, as they drop out before completing their degrees or take much longer than their middle-class counterparts to complete the courses for which they are registered.

In order to meet the demands of the social justice agenda in order to enable equitable outputs and for the transformation of curricula and pedagogic approaches, knowledge about rural students could act as a mechanism that could lead to widening participation of all in the construction of knowledge, and thus equitable and better educational outcomes. This study has shown that there are knowledge resources that students bring with them from rural areas and some of these have scientific underpinnings, and so these could be activated by academic agents in ways that could yield participation for all in the construction of knowledge toward epistemic access in the field of science. Provided we come to know how these resources could be contextualised for conceptual development, period T<sub>4</sub> could involve a teaching and learning environment that is conditioned by these knowledge resources as academic teachers design their curriculum and implement it.

T<sub>4</sub> then gives rise to structural and cultural traits which could be responsible for conditioning “new” agents or agents re-entering the given environment. It is important to note that the preconditioning or “pre-structuring of actor’s contexts (environments) and interests is responsible for shaping the pressures for transformation by some and for stable reproduction by others in the present (or given point in time)” (Archer, 1995, p. 152).

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## Appendix A: South African Rurality in Higher Education (SARiHE) Research Project



### South African Rurality in Higher Education (SARiHE) Research Project

This is an exciting new research project being conducted at the universities of Johannesburg, Fort Hare and Rhodes, in collaboration with colleagues from the Universities of Bristol and Brighton in the UK. The project aims to explore the experiences of students who have lived and learnt in rural areas, and how they make their way through university life. We hope that through the stories from students that we capture, we can make recommendations to university administrators and academics, about the curriculum and university systems.

#### Involvement in this project will mean:

- Attending 7 sessions of up to two hours from March - September 2017, where you will engage in discussions and activities with other students
- Posting approximately 3 – 6 elements onto a system called 'Evernote' between sessions
- Creating your own 5 minute digital documentary about your experience which will be shared with others
- Receiving a min-Ipad with which to collect your documents and create the documentary.

If you are interested in being part of this project, fill in this form. We will make a selection and let you know if you are chosen.

Thank you for your attention

Surname:
First name:
Telephone number:
Email:
Race: African/coloured/Indian/white/other
Gender: Female/male
Nationality: (eg South African/Kenyan)
Did either of your parents attend university: yes/no
Did you live in a rural area? (If so, for how many years?)
Did you attend school in a rural area? (if so, for how many years?)
How would you describe the rural area: farm/smallholding/rural village/tribal village or other tribal settlement/other (explain 'other')
Programme or courses you are studying

## Appendix B: SARiHE Co-researcher Consent Form



### SARiHE Co-researcher Consent Form

*Please read the following statements and tick the boxes. This is so that we are all clear on the points covered.*

I have read the above information. I have been given an opportunity to ask questions and my questions have been answered to my satisfaction Yes  No

I understand that any material I provide is for education and research and will not be used for commercial purposes Yes  No

I understand that if any material I provide is to be used in project materials, including the website, specific permission will be requested for any item and I can agree or disagree Yes  No

I understand that I can withdraw from the research at any time and that my digital entries will not be used in the research, although data from group discussions will be and anonymised in the usual way Yes  No

I understand that if I provide my cell phone number (below), I agree I can be contacted on WhatsApp by the UK Research Associate, Karen Desborough (for support) Yes  No

I agree to participate in this research. I will be given a copy of this signed and data form Yes  No

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Email

\_\_\_\_\_  
Cell phone number

## Appendix C: Email Correspondence

From: "Emmanuel Mgqwashu" <e.mgqwashu@ru.ac.za>  
Subject: RE: REQUEST FOR AN INTERVIEW - RURALITY PROJECT  
Date: 03 April 2018 at 13:35:39 SAST  
To: "'Emmanuel Mgqwashu'" e.mgqwashu@ru.ac.za  
Cc: "'Nkosinathi Madondo'" N.Madondo@ru.ac.za [Name removed]; [Name removed] [Name removed]; [Name removed] [Name removed]

Dear [Name removed], [Name removed], [Name removed] and [Name removed]

Dear Colleagues,

I write this e-mail to you on behalf of the Southern African Rurality in Higher Education project. We received permission to conduct this study here at Rhodes University in 2017. The attached letters present a brief on the study and its ethical approval.

I am copying [Name removed] to this email as the Dean of the [Name removed] Faculty.

The First Phase in 2017 involved generating data with Second Year students in the faculties of [Name removed] and [Name removed]. In 2018, the Second Phase involves interviewing University lecturers and tutors for YEAR TWO courses the students we worked with attended in 2017.

We humbly request your availability for a short Focus Group interview on the following date and time:

Monday, 16 April 2018 from 9:00 - 10:30 (venue to be confirmed)

Unfortunately, we will not be able hold this interview on another date as colleagues will be traveling back to the UK the following day.

May you copy everyone as you respond so that, if need be, we could adjust the time.

We will appreciate sincerely if we could receive a response at your earliest convenience colleagues.

Kind regards

<<http://www.ru.ac.za/>> RU\_P\_RGB-A4(65).gif

A/Prof Emmanuel M. Mgqwashu, PhD

Deputy Dean: Education Faculty

Head of Department: Education

Cnr. Grey & Somerset Road, Grahamstown, 6139 PO Box 94, Grahamstown, 6140, South Africa

-----Original Message-----

From: [Name removed] [mailto:[Name removed]]

Sent: Tuesday, 03 April 2018 1:08 PM

To: Emmanuel Mgqwashu <E.Mgqwashu@ru.ac.za>

Cc: [Name removed]; [Name removed]' <l.dalvit@ru.ac.za>; 'Ntsikohlanga Kitsili' <N.Kitsili@ru.ac.za>; 'Tatenda Chatikobo' <tatendachatz@outlook.com>; 'Nkosinathi Madondo' <N.Madondo@ru.ac.za>; [Name removed]; [Name removed]; [Name removed]; [Name removed]; [Name removed]

Subject: Re: REQUEST FOR AN INTERVIEW - RURALITY PROJECT

I can be available then.

Regards,

[Name removed]

Quoting Emmanuel Mgqwashu <E.Mgqwashu@ru.ac.za>:

## **Appendix D: SARiHE Ethical Principles**

### **SARiHE Ethical Principles**

The following principles have been agreed as principles we should all bear in mind throughout the project.

- Student co-researchers' privacy and confidentiality should be assured. Participants may choose to be identified by name or remain anonymous (through a pseudonym) in the research. If co-researchers choose to remain anonymous, the project team will ensure that their participation in the study is confidential.
- Co-researchers have control over the data they submit to the project and can select out anything that they do not wish to share. Co-researchers will be able to access their data at the end of the study and have a copy of the digital documentary they create.
- During workshops, co-researchers will be asked to share their experiences in small discussion groups. Prior permission must be sought – and given – to share anything that is discussed in small groups with the larger group throughout the whole period of the project.
- Two members of the project team will have immediate access to any data that co-researchers share to the SARiHE Evernote account. The wider project team will also have access; however, the other co-researchers will not.
- The local research teams (plus core research team) will have access to audio recordings of workshop discussions, which will be stored on site-specific folders in the Data folder on Google Drive.
- Co-researchers should be made aware of what will happen to their data – information may be used in reports, published papers, or presented in public using a pseudonym, but participants' name or personal identifiers will not be used without their permission. Specific permission will be sought to use any digital data/images in publications and other materials.
- Co-researchers have the option to withdraw from the study at any stage in the research process. If participants withdraw, their digital entries will not be used in the research, although data from group discussions will be used and anonymised in the standard way.

## Appendix E: An outline of the seven sessions with Co-researchers

The table below provides an outline of the seven sessions with co-researchers. Sessions were between 90 and 180 minutes in duration.

Session Title	Focus
<b>1&gt;Welcome and introduction to the project</b>	In this session students are introduced to the project. They consent to being part of the project, develop and agree to a set of rules of engagement which included issues of confidentiality, managing disagreement, helping each other, how to build the community/how to communicate. Students share thoughts on what rurality is.
<b>2.Learning in rural areas Part 1</b>	<ul style="list-style-type: none"> <li>• The Participatory Learning and Action (PLA) Activity involves</li> <li>• Co-researchers ‘Mapping their rural learning world – learning in and out of school’. The drawings are discussed in groups.</li> <li>• Co-researchers photograph their drawings and upload to Evernote.</li> <li>• Plenary report-backs and debriefing (recorded).</li> </ul>
<b>3.Learning in rural areas - Part Two</b>	Critical Incidents and Story-Telling: Co-researchers given time to select one critical incident on learning in rural areas in diverse settings (e.g. family, school, church, traditional cultural activities, using technology) and to compose this into a story, including an explanation of why they chose it. The stories and ensuing discussion are recorded and uploaded
<b>4.Focus: Transition to higher education</b>	<p>Student co-researchers draw or depict on iPad their lifeline or ‘river of life’, depicting their transition to university. The following questions are suggested to enable the co-researchers to focus on this transition:</p> <ul style="list-style-type: none"> <li>• When did you first hear about university?</li> <li>• Did someone encourage you to apply?</li> <li>• What was the role of digital technologies and the Internet in the process? For example, in gaining information about universities or applying?</li> <li>• What other ways did you use to gather information e.g. newspapers, radio etc.?</li> </ul>

	<ul style="list-style-type: none"> <li>• Why did you choose this university? Did you have any connections in this city?</li> <li>• What were the key turning points in your life that made it possible for you to go to university?</li> </ul> <p>Co-researchers asked to consider strengths/supports; hurdles/challenges; and how they navigated the transition to higher education. Photographs and recordings saved on Evernote.</p>
<b>5.Learning at university</b>	<p>Co-researchers share one item they have collected in Evernote in groups of four, discussing what these activities meant to them, with the following prompts:</p> <ul style="list-style-type: none"> <li>• How is this typical of your experience of university teaching and learning?</li> <li>• How might it be similar to or different from learning before university?</li> <li>• What has helped you in your learning beyond formal classes, e.g. digital technologies and the Internet? And in what ways?</li> <li>• • What special steps has this required of you, if any?</li> <li>• • What sort of social networks do you rely on?</li> </ul>
<b>6.Learning and Values</b>	<p>This session took the form of group discussions where co-researchers reflect on the following questions:</p> <ul style="list-style-type: none"> <li>• What is valued in rural areas?</li> <li>• What is valued in the university?</li> <li>• What is valuable to you now? (in either) Co-researchers receive advice and resources to help develop their digital documentaries.</li> </ul>
<b>7.Sharing documentaries</b>	<p>Co-researchers share and reflect on documentaries.</p>

## **Appendix F: Focus Group Interview Questions: Academic Teachers**

### Contextual questions

1. Can you say something about your involvement with students at the university?
2. Are you involved in any educational projects, if so, in what capacity?
3. Can you say something about the key values that inform the work that you do?

### Rurality questions

4. Based on your experience, what do you understand by rural students and how they may differ from an urban student?
5. Are there any support mechanisms that the university or the Faculty of Science provide to support students transitioning from rural areas to HE?
6. Is there any other support given to students in subsequent years?
7. What is the role of language in the teaching of science? To what extent are students from rural areas affected by the language of learning and teaching (LoLT), if at all?

### University systems questions

8. When students join the university, their identities shift as they transition from rural areas to university life. Is there any support provided for identity development, to be a science learner/knower?
9. Are there any mechanisms through which diversity is addressed in the classroom, given the current cohort of students?
10. How do students deal with feedback from assessments?

### Access to resources and use

11. Are there any challenges that you can say are faced by rural students in terms of access to resources such as computers and so on, and their use?

### Curriculum development questions

12. Are there any challenges or renovations in curriculum or anything that would relate to rural students in particular?
13. Given the decolonization agenda, to what extent do you think the curricula has to change?
14. Do the pedagogic practices in the sciences ever draw on examples from rural areas, examples that might be relevant in the context of science?

## **Appendix G: Academic Interviews: Senior leader in Management**

### Contextual questions

1. Can you say something about your background in education as well as your current role?
2. What would be the key values that inform your own approach to your current role?

### University system questions

3. Is there anything you are doing about recruiting the students from rural background and what support is there for their recognition?
4. What has been your experience as far as completion on record time as well as retention for rural students?
5. Are there any identifiable challenges when it comes to accessing technology, particularly for students who come from lower-class backgrounds including rural areas?
6. Given the current narratives on Africanisation or decolonisation of curriculum, what are your views on knowledge that originates from rural areas, to encourage students' engagement or participation? Is there a place for such in university curriculum?
7. What support systems are for the new cohort of students that has begun to enter the university, particularly non-traditional students?

## **Appendix H: Academic Interviews: Senior leader in the Faculty of Science**

### Contextual questions

1. What would you say is your background in Higher Education (HE) before your current role?
2. What does your current role involve?
3. What are the key values that inform the work that you do?
4. What are your views on the equality of opportunity and equality of outcomes?

### Rurality questions

5. Based on your experience, what do you understand by rural students and how they may differ from an urban student?
6. Are there any support mechanisms that the university or the Faculty of Science provide to support students transitioning from rural areas to HE?
7. Is there any other support given to students in subsequent years?
8. What is the role of language in the teaching of science? To what extent are students from rural areas affected by the language of learning and teaching (LoLT), if at all?

### University system questions

9. Is the university doing anything to specifically recruit rural students?
10. Does the university look at rural students as a specific category in terms of completion and retention?

### Access to resources and use questions

11. Are there any challenges that you can say are faced by rural students in terms of access to resources such as computers and so on, and their use?

### Curriculum development questions

12. Are there any challenges or renovations in curriculum or anything that would relate to rural students in particular?
13. Given the decolonization agenda, to what extent do you think the curricula has to change?
14. Do the pedagogic practices in the sciences ever draw on examples from rural areas, examples that might be relevant in the context of science?

## Appendix I : Certificate of Research Participation



### SOUTHERN AFRICAN RURALITY in HIGHER EDUCATION

This is to certify that

[NAME]

Has participated in the SARiHE research project as a

**CO-RESEARCHER**

From [dates]

[Signature/s from lead researcher/s]



