RHODES UNIVERSITY
DEPARTMENT OF EDUCATION

RESEARCH PORTFOLIO

Presented in partial fulfillment of the requirements
for the degree

MASTERS IN EDUCATION
(GENERAL EDUCATION THEORY AND PRACTICE)

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PERSONAL PROFILE

PERSONAL PROFILE

1. Educational Background.

I have completed my first degree, Bachelor of Arts at the University of Namibia in 1992. I majored in Geography and Sociology. In 1993 I completed my studies with a Postgraduate diploma in Education. Afterwards I taught for a period of six years before I decided to excel and expand my educational horizons by enrolling myself at Technicon Pretoria as a distance-teaching student for the B. Tech. Management course, which I completed in 2001. Currently, I am enrolled as a distance-teaching student at Rhodes University for a General Masters in Educational Theory and Practice.

2. Professional Experiences.

I have started my teaching profession at Otjikoto Senior Secondary School, where I taught Geography and Natural Economy as from 1994-1999. After this period I have been promoted to the position of Education Officer at the Ondangwa West Education Regional office. As an Advisory teacher, I was responsible for the following subjects: Geography gr. 8-12, Development Studies gr. 11-12, as well as Natural Economy gr. 11-12. I worked for a period of almost three years after which I was transferred in 2002 to Windhoek College of Education as a lecturer. Currently, I am lecturing third year students in the Social Sciences department, Social Studies (5-7), and Geography (8-10) to be more specific.

3. Professional Development.

During the time I operated as an Advisory teacher I have been exposed to many opportunities. I received training in school-based assessment for Geography and Developments Studies by Cambridge. I was part of the Regional Aids Committee (RACE) where I received training on HIV/AIDS and Education Drama parts one and two. Also could I complete a four-

month course offered by UNISA in HIV/AIDS care and counseling. I also attended a workshop on training of trainers and material development.

4. Research Interests

I am very much interested in looking into what problems my student-teachers have in communicating spatial information about landforms on 1:50 000 topographical maps and why this is a problem to them. I have already started with a small-scale project to determine the extent to which student teachers are able to utilize and apply spatial perceptual skills and concepts, in order to observe the development of their understanding to communicate spatial information effectively in graphic form. What I would like to do next is to look at the why.

In conclusion, I would like to present a detailed copy of my CV for a perusal of all other activities I am involved in.

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Lukas Jakobus Böck

Education

2004 **University of South Africa**: Certificate in Industrial and Organizational Psychology **South Africa**

2002 – 2003 **Rhodes University**: General Masters in Education Theory and Practice **South Africa**

2003 **Harvard University** **North America**

- Certificate in Teaching for Understanding
- (On-Line training to improve transfer of training)

2002 **University of South Africa** **South Africa**

- Certificate on HIV/AIDS counseling

(Impact of HIV/AIDS on education)

2000 – 2001 **Technicon Pretoria** **South Africa**

- B. Tech Management

(See transcript of results for details)

1993 **University of Namibia**
Namibia

- Post Graduate diploma in Education

1992 **University of Namibia**
Namibia

- Degree of Bachelor of Arts

(Geography 111, Sociology 111, Industrial Psych. 11)

Professional Experience

Polytechnic of Namibia
Windhoek

2003-Currently Lecturer: Part-time & Distance Education

- **Management of training: 2nd year students in HR**

University of Namibia
Windhoek
Lecturer: Distance Education

- **Educational Theory and Practice**

2002 – Currently Windhoek

Ministry of Higher Education

Lecturer: **Windhoek College of Education**

- Social Sciences Pre-service: (8-10) Geography 3rd year Students
- Social Studies: Minor & Major (5-7) 3rd year Students
- BETD In-service Training for unqualified teachers

1999 – 2002 Ondangwa

Ministry of Basic Education

Education Officer: Section Advisory: Social Sciences (middle management)

- Responsible for designing and delivering in-service training workshops for Resource Teachers in Geography, Development Studies and Natural Economy
- Develop and implement training and development processes
- Execute policies regarding Social Sciences
- Interviews for lower level positions and inductions to newly appointed Advisory Teachers during probation
- Planning and organizational structures for teachers
- Attend to any reasonable tasks assigned by my Director and Supervisors
- Identifying curriculum needs, evaluation and approval of teaching and learning materials
- Training needs analysis.

1994 – 1999 Tsumeb

Otjikoto Secondary School

Teacher:

- Geography and Natural Economy Grades 8-12, 11-12
- Stock Control Officer
- PRO of the school
- Sport officer

Additional International General Certificate of Secondary Education: Training in School

Professional Experience Based Assessment; Geography and Development Studies,
Training on Assessment: IGCSE Examinations: Development Studies; Chief Marker Paper 1 (assisting in selecting and training of newly appointed markers)
JSC: Geography; Team Leader Paper 1
Training on HIV/AIDS and Education drama Part I and II
Training of trainers and training material development and Power point presentations

Tutor Marker: Management of Training Polytechnic. Of Namibia; Distance Teaching
Member of CPD Management Module Writing: Professional Development Division: National Institute for Education Development, Module on Continuous Assessment for Lower Primary School Principals

Committees And other Responsibilities

Member of Regional Aids Committee for Education
Member of the Ministerial Information Technology Team
Member of the Social Science Panel for policy development
Member of Geography subject committee
Regional coordinator of (H) IGCSE School Based Assessment
Member of the National Monuments Publicity Committee
Member of Graduation ceremony
Member of technology and development (responsible for training)

Computer Skills

Certificate in Microsoft windows 98; Excel 98
Working knowledge in PowerPoint and Office 2000

Personal

I am a self-driven and highly motivated person who can operate independently given the responsibility to do so. I am hardworking, duty conscious and committed to tasks entrusted to me. The diversity of my current duties resulted me in becoming very innovative in tackling problems and also foreseeing them in order to take counter-active measures. I am also an activist, competent communicator and a good listener.

Languages

Afrikaans
English

References

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Ms. Delvaline. Möwes
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CONTEXTUAL ANALYSIS: CURRICULUM EVALUATION

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1. INTRODUCTION

This paper aims to do a desktop analysis of the International General Certificate of Secondary Education (IGCSE) Geography subject curriculum for Senior Secondary Education (Grades 11–12). The purpose of this analysis is to provide a curriculum evaluation framework that will form the basis of later investigations, as well as to assess current perceptions of the curriculum, the perceived strengths and weaknesses, and finally to appraise the 'curriculum literacy' of colleagues.

The analysis will concentrate on the following areas:

1. It will focus on how and to what extent the curriculum is related to the Namibian educational reform process as identified in the document *Towards Education for All: A Development Brief for Education, Culture and Training* (1993). This will include considerations of the extent to which the curriculum addresses the four educational goals of access, equity, quality and democracy.

2. The underlying epistemology of the curriculum and the extent to which the curriculum is situated in or providing opportunities for learner-centred education and life-long learning from within constructivist epistemology.

By doing the curriculum evaluation I would also like to address content issues concerning what is taught/ and why it is taught?

2. RATIONALE/SOCIO-HISTORIC AND ECONOMIC BACKGROUND

As one of the colonised countries in Africa, Namibia was in an unfortunate position where decision making in education was left in the hands of the colonisers. The aims, content and curriculum structure were predetermined by the demands of matriculation exemption by South African universities. One of these decisions was which education system and curricula to follow. Choices of subjects were made in a random manner, not related to a coherent educational programme and not by any pedagogical goals or rationale relevant to the needs of Namibia or the learner. The content, pedagogy, examination procedures, and the ethos of the colonial educational enterprise were

irrelevant, unsuitable, and largely outmoded to the needs and aspirations of a new Namibia (Minister of Education and Culture, Hon. Nahas Angula, 1990).

To emphasise what has been mentioned above, Prime Minister, Rt. Hon. Hage Geingob of Namibia (MEC 1993) stated the following:

> It is clear that elitism accompanied by such wastage of human resources does not belong in our new education system, where equity, equal opportunity and efficiency are foundation values. In addition the matriculation system was rigid, unadaptable (*sic*) to the needs of the learner and the needs of Namibia.

This sentiment clearly demonstrates that change was inevitable. Hence the initiation of a programme of reform and renewal that included: change of educational ethos; language of instruction, administrative reform; new approaches to examinations; teacher education reform and to me, most importantly, the curriculum reform which will be the focal point of this paper.

The mission of the old mode of examination was out of variance with the philosophy of '*Towards Education for All'* (1993) that had to be replaced by an examination system which is multifarious, and catered for a multitude of learners with different abilities. The IGCSE system replaced the Cape Education Department Matriculation Examination and has been in operation since 1995. This system involves equity of opportunity, democratic participation, effective learning and efficiency and relevance. This system also aims to meet the Namibian demands, the needs of the learners and international requirements as stated by His Excellency Dr. Sam Nujoma, the president of Namibia:

> Since independence, my government has placed education at the top of our new national priorities. It is the key to a better life and therefore fundamentally important. Consequently, access to education should not be limited to a select elite, but should be open to all those who need it, especially children and those adults who previously had no opportunities to gain access (MEC 1993).

The words of the president, in my opinion, strongly influenced the current thinking around the new system. The Prime Minister, Rt. Hon. Hage Geingob (MEC and UCLES, 1993) identified some of the qualities of the IGCSE Curriculum that influenced the decision to change from Cape Education system to the IGCSE system. These include the following:

- The IGCSE is internationally recognised, and widely accepted;
- It is based on modern educational principles that reward possible achievement;
- It is adaptable for Namibia;
- It de–links Namibians from the colonial baggage carried by the Cape syllabus.

The Minister of Education and Culture, Hon. Nahas Angula (1993) equally shared this opinion with the following statement:

IGCSE is an international examination and yet is fully adaptable to our needs and our situations It is being located both in terms of new subjects, new syllabuses, and by adapting content to Namibia. The relevance of the (H)IGCSE curriculum to the social and economic needs of Namibia is ensured through the development of a number of new syllabuses, and through textbooks, teaching materials and course work relating to the local and national circumstances.

Many subjects in the IGCSE system offer content options, which are suited to students in different parts of the world. In geography, the curriculum permits teachers to select examples for case studies, which they find most appropriate for the students unlike the case within the Cape Education system where no options were given to the teacher to decide on what he/she thought best for their learners. The resource materials to be used in the IGCSE system are designed to prompt candidates to relate general principles they have studied to the particular examples given.

2.1 EPISTEMOLOGY UNDERLYING THE NEW SYSTEM

The educational philosophy that underpins the post–colonial education system has been documented in the book entitled *'Towards Education for All': A Development Brief for Education, Culture and Training (*1993). The book outlines the major educational goals (equity, democracy, access and quality). For the reform, Namibian education should endeavour to attain the curriculum to follow the medium of instruction and the mode of assessment used to ascertain the accomplishment of these goals. The document identifies learning as an active process with participation from the learners in developing, organising, implementing and managing learning.

The previous mode of evaluation found in the MEC (1993:126-127) documents read as follows:

> We have inherited an examination system and more important, a philosophy of examination that was designed for elite education. Its principal purpose was to select students for promotion to higher levels and eventually to certify their achievements. Its primary was on what students did not know. For most students, examination scores were negative and distinctly frustrating and painful messages.

It is quite evident from the abovementioned statement that it was time for a shift, from the existing paradigm to a "better" one. The shift occurred from a behaviourist (transmission) approach to learning to a cognitive approach (social constructivist) to learning. A transmission form a teacher-centred and teacher tells approach where knowledge was focused on the "Right Answer" (Cornbleth 1987), or rather on what facts, skills and processes learners could parrot to a learner-centred approach, where learners construct, apply, and use knowledge in relation to their prior knowledge in order to develop the capacity to access, analyse and evaluate knowledge rather than simply to know and accept knowledge as fact (Wilmot 1995).

The primary concern in this new approach is that the constructive teacher creates a context for learning in which learners can become engaged in interesting activities that encourage and facilitate learning. The teacher does not simply stand by, however, and watch learners explore and discover. Instead, the teacher may often guide learners as they approach problems, may encourage them to work in groups or think about issues and questions. The teacher may support them with encouragement and advice as they tackle problems, adventures and challenges that are rooted in real life situations that are both interesting to the learner and satisfying in terms of their work in order to promote cognitive development to help learners to grow in their ability to think, to reason, and to use their intellectual capacities.

The main idea of learner-centred education is that it not only will enhance independent thinking, but will also ensure life-long learning. This new approach as outlined in '*Towards Education for All'* (1993) will not only prepare the learner for a specific purpose to be selected for the next higher level, or to qualify for a particular job, but also to make learning a lifelong activity. The notion of life-long learning provides a much more 'open' understanding of the 'learner' and the 'teacher' than has been the case up to

now. In this paradigm the teacher is no longer seen as the all-knowing transmitter of facts who will mould the child. Rather, the teacher's role is seen in the context of many situations and as multifaceted. Thus, when appropriate, teachers will act as facilitators, as scaffolders and even as co-learners. The teacher's role is to construct an appropriate environment for learning. Learners, in this paradigm, are no longer seen as tabula rasa or empty buckets to be filled with information (Aspin 1995) but rather as capable of developing a set of cognitive skills that can be applied to any learning situation.

In these two preceding sections, I have attempted to sketch the Namibian educational historical background that has led to a paradigm shift from a behaviourist approach to a cognitive (social constructivist) approach to learning, which was a clear indication that an educational reform was crucial. Within these two sections I also laid the foundation of my research paper. In the next section, I will give an overview of the methods and procedures employed to answer my questions on the curriculum evaluation as explained on page one.

3. THE RESEARCH ENVIRONMENT

The school that I have decided to focus on is located in the Ondangwa West Education Region and mostly accommodates learners in the Senior Grades (11-12). It recently introduced a few junior classes. These learners are drawn from the surrounding junior secondary schools in the vicinity, as well as learners placed at the school for appropriate fields of study. This diversity of the learners' educational and cultural backgrounds, in my opinion, poses a challenge to the school to develop instructional strategies for learners from various backgrounds and with differing abilities to progress.

The school has a small library with a few resources available for the learners. In my opinion this is an indication that learners do not do much research and additional reading by making use of existing resources of the school. If this is the case, how will the school be able to enable learners to integrate scattered bits of information into a coherent understanding and then apply that understanding to unfamiliar situations?

4. METHODOLOGY

4.1. The Approach

I have decided that the most appropriate method for my research would be the interpretative tradition based on Bassey's (1995:12) description of this tradition as:

> ... a search for deep perspectives of particular events and for theoretical insights. It may offer possibilities, but no certainties, as to the outcome of future events.

This simply means that one seeks to describe what they see happening in a particular situation and creates narrative of what is happening by affording the researcher an opportunity to understand the situation of the phenomenon by putting him/herself in the shoes of his/her subjects.

I have decided to use a case study method as part of my approach. I chose a school in the Ondangwa West Region. To concentrate on one school only will allow me to go into more depth than breadth. Flake, as cited by January (2000) maintains that the essence of a case study is particularisation, not generalisation, hence the decision for concentrating on one school only. The idea is that a particular case is focused on, in order to know it well.

As a supplement and in order to get a broader view of the way in which teachers interpret and implement the curriculum, a questionnaire based on the same questions as the interview was sent to two teachers, one to a teacher in Windhoek Region and another one to a teacher in the Keetmanshoop Region. The reason for doing this was to compare responses from the two groups. Another questionnaire was given to a sample group of five learners of the selected school. The main aim was to look at the way in which these groups interpret and understand the curriculum.

4.2 Negotiating access

I received permission from the Regional Director of Ondangwa West to conduct my research. The principal and the two geography teachers for Grades 11–12 of the school were then approached to request permission to conduct the research. The matter of confidentiality was emphasised and participants were assured that their identities would remain anonymous.

4.3. The techniques

Qualitative research uses different forms of data collection. Patton, as cited by January (2000) identifies techniques such as document analysis, interviews and observations as tools to be utilised within the qualitative research framework. To ensure the validity of my data and especially for the purpose of practical situational responsiveness, I decided that a triangulation of data through multiple sources such as document analysis, interviews and questionnaires would be most appropriate for my research techniques.

4.4. THE PROCESS

4.4.1. Document analysis

Document analysis as a research technique describes a " variety of written materials for data, insights and judgements about programmes or events" (Garman 1992: 3). In addition, Hitchcock and Hughes as cited by January (2000), identify three phases in applying methods of document analysis as follows:

1. The location of documents;
2. The classification and evaluation of the documents;
3. Interpretation of the documents.

Their method of document analysis appealed to me as the most appropriate for my study, hence my decision to utilise it. I have decided to concentrate on what I felt was the key document for my analysis i.e.: *Towards education for All: A Development Brief for education, Culture and Training (MEC 1993*). Other documents that were also employed to a lesser extent were the following:

- CAMBRIDGE INTERNATIONAL EXAMINATIONS; IGCSE GEOGRAPHY: Syllabus for Examination in 2003;
- Pilot Curriculum Guide for Formal Basic education (1996);
- Pilot Curriculum Guide for Formal Senior Secondary Education.

By applying these documents together with responses to my interviews and questionnaires I could determine to what extent these aims and intentions were

successfully implemented and the extent to which these perceptions address the educational goals.

4.4.2. The interview

In line with the qualitative approach, semi-structured interviews with open-ended questions were used to collect the data, since it enabled me to explore issues more flexibly. Through these interviews an attempt was made to gain sense of the teachers experiences and insights of the curriculum. Bailey, as cited by Cloete (2002) states that interviews allow for interviewees to respond in their own words and are flexible in the sense that one can probe more specific answers and can repeat questions when the response indicates the respondent misunderstood a question.

Appointments were made once the two teachers from the selected school indicated their willingness to be interviewed. The interviewees requested a combined interview and their wish were respected.

A tape recorder was used in order to obviate the necessity of writing during the interview, which is less time consuming. The transcript of my interview constitutes the essential raw material of my research.

4.4.3. The questionnaire

Questionnaires can be very useful tools for data when doing research. The primary reason for choosing questionnaires relates to its potential to elicit first hand information such as knowledge, perceptions, beliefs and attitudes on a specific item from the respondents.

I designed a questionnaire for the respective respondents (see appendix A). The broad aim of these questionnaires was to explore the respondents' general perceptions and understanding of the curriculum and the extent to which these perceptions address the four educational goals of access, equity, quality and democracy, as well as provide opportunities for learner-centred education and life-long learning.

5. DOCUMENT ANALYSIS:

In the previous section I gave an in-depth coverage of the procedure of data collection. A description of the research methodology, the research process and the research techniques employed were given. In the next section a brief description and analysis of the policy document utilised for the study will be given.

5. A brief description of the policy document.

5.1 Toward Education for All: A Development Brief for Education, Culture and Training (MEC 1993).

The above broad policy forms the basis for the educational reform that was to be implemented after independence in 1990. The new Namibian education is guided by four major goals of the policy: access, equity, quality and democracy.

Access relates to providing education for all by expanding the school system and by removing barriers that prevent children from going to school. In this case the focus must be on learning and not simply on schooling. This means that knowledge and understanding should be accessible to them in such a way that that all learners can develop as fully as possible and to the best of their ability.

Equity reflects a commitment to allocate educational resources (teachers, textbooks, school equipment and other resources) fairly throughout the nation. This could be made possible by overcoming the legacy of discrimination and segregation that was built into the school system itself.

Quality refers to the provision of good education by supplying schools with well-prepared teachers and ensuring that inspectors, advisory teachers and other officials strive to improve the system. The curriculum, the teacher, materials and the learning environment should be of a high standard and the quality of education monitored and improved where necessary.

Democracy promotes the involvement of teachers, parents, school communities and learners in the education process. Education should be democratically structured,

democracy should be taught and experienced, and the aims should be to promote a democratic society.

These four goals serve as examples of the direction in which the new education system was pointing to. The idea is that all educators should familiarise themselves with this document to get a broad overview of the educational reform, the change in educational thinking and practice and its implications for Namibian Education. This document should be seen as a departure point to prepare teachers to face and meet the challenges of reforming and staffing the new education system.

This policy document through the above four goals aims to concentrate on creating an atmosphere whereby all learners will have access to education as well as to receive education that is equitable, relevant, meaningful, of high quality and which should be based on a democratic pedagogy.

Teachers should thus maintain a balance between professional insight and skills, and subject knowledge. The focus of Basic Education is on the learners' needs, potential and abilities. Teachers should therefore have sufficient knowledge and skills to enable them to interpret the curriculum on the basis of the aims and objectives of the curriculum and basic education as a whole, and to relate subject content to the needs of the learner. They should be able to select content and methods on the basis of a shared analysis of the learners' needs and use local and natural resources as an alternative or supplement to ready-made study materials in order to enhance learner-centred education as emphasized in the above statements.

These goals could also serve as guidelines for the teacher in implementing the curriculum in order to ensure that they pursue and execute what is expected from them in the policy document for the education system to become transformative and empowering rather than limiting, restrictive and disempowering.

By looking at the policy document and the attempts being made to clarify these goals what follows next will be an analysis of the curriculum referred to in my introduction by looking at the aims, assessment objectives and scheme of assessment of the curriculum,

the curriculum content, the extent this curriculum accommodates these four goals as well as the responses from my interview and questionnaires.

6. CURRICULUM ANALYSIS

The data from my interviews and questionnaires will be analysed in the sub headings as taken from the IGCSE Geography curriculum for 2003. Copies of the questionnaires will be attached as appendixes.

6.1 AIMS OF THE SYLLABUS

The word 'aims' in the curriculum refers to the purpose of the curriculum and the direction we are pointing to, in other words what learners should know or should be able to do after having gone through certain learning experiences. Ornstein, as cited by Villet (2002) views aims as general statements that provide both shape and direction to the more specific actions designed to achieve some future product or behaviour.

These aims are based on the all-round development of the learners that equip them for life and thus should be based on the needs of the learner to guide them through the curriculum.

For learners to be able to be successful in their journey through the curriculum teachers should, as stated by Avenstrup (1999) possess curriculum knowledge and be able to work towards these aims and goals for teaching rather than concentrate on the content and objective knowledge of the curriculum, which seems not to be the case from what has emerged from the interview and questionnaires. Respondents revealed that training and guidance are needed especially for novice teachers as to the interpretation and implementation of the curriculum.

This is a clear indication that training and guidance by means of workshops is essential to assist teachers in acquiring competencies on how to interpret the curriculum in order to shape and direct learners for their future, rather than acting as agents of change who are only there to implement what is given to them.

6.2 ASSESSMENT OBJECTIVES AND SCHEME OF ASSESSMENT

Why should learners be evaluated and what do we understand by assessment? Villet (2002:89) describes it as:

> The formal determination of the quality, effectiveness, or value of a programme, product, project, process, objective, or curriculum to determine whether the planned for has occurred or is occurring in relation to the intended.

The curriculum states that learners should have knowledge with understanding in order to demonstrate an understanding of a wide range of processes and human actions to enable them to analyse geographical data, make judgements and recognise the role of decision making through investigations.

For learners to be able to perform these assessment objectives as stated in the curriculum, teachers should show a thorough understanding of the objectives and scheme of assessment. Respondents indicated that they **think** the assessment objectives are "...clear to understand, if the teacher studies it well" and that these objectives should rather be more reader friendly. To me this creates a feeling of uncertainty and doubt whether teachers really do understand how they should guide their learners through these objectives. In this curriculum learners should write three question papers at the end of the course in order for the teachers and for learners to determine the quality and effectiveness of the of the curriculum.

If the curriculum aims to be learner-centred where learners' performances are evaluated to inform teachers and learners about the progress towards aims and objectives for teaching and learning, than I fail to understand why this curriculum tends to have a more behaviourist approach when it comes to assessment. Are we not moving away from rote learning and memorisation in a direction to see what a learner understands and can do through active participation and through exploring? If it is so, why should learners write three exams at the end of the course and what happened to continuous assessment throughout in order to grade a learner at the end of the course? This, to me, would only discourage learners to work and participate throughout the course; instead, it would rather encourage learners to wait until they approach the final exams before realising that they have to study. If learners are not involve in the curriculum throughout the two years they

will tend to forget what teachers tried to teach them throughout these two years which will thus result in poor outcomes.

As for the scheme of assessment on how learners will be tested at the end of the course, respondents do not seem to experience a problem with, but rather on the weighting of the papers to contribute to the final grade of the learner after writing these papers.

6.3 CONTENT OF THE SYLLABUS

Villet (2002) describes curriculum content as the subject matter that learners are supposed to learn in order to have knowledge of certain fields of study, which are regarded as important in society. Subject matter in this regard refers to what learners should learn in geography to gain knowledge in that field. Content, in my view should be a mixture of the processes of the facts, concepts and generalisations we wish our learners to learn. It should not only focus on the information to be studied for school purposes, but should also relate to learners' concerns and be organised in such a way that they find it useful in real life situations. Content should thus be organised in such a way that the concrete (what learners already know and have experienced) should be taught first before moving to the abstract (from the familiar to the unfamiliar).

It is quite evident from the curriculum content that it includes themes and topics on what has been done in the junior secondary grades such as Population and Settlement, The Natural Environment, Economics and Development and Map work skills. Thus what is expected from the teacher is to guide the learners on how to use what they already know through previous experiences. Only if learners are able to demonstrate their understandings, to analyse geographical data, to judge and to investigate by using their experiences as outlined in the curriculum objectives, will it be possible for us to see whether the content is contributing in a significant way to the overall aims and objectives of the curriculum.

One of the respondents feels that the curriculum is too crowded/too long and that some of the topics like Marine Processes should be removed, whereas two of them do not have a problem with the length of the content, but that they have to cover too little in Grade 11 and too much in Grade 12. This results in expecting too much from the learner. These

respondents felt that while this is supposed to be a learner-centred curriculum, too much responsibility is given to them. One the other hand, a learner-centred approach demands a high degree of participation, contribution and production. Learners should rather be taught how to retrieve old knowledge, and to modify it to gain new insights. This is just more prove that teachers need guidance in planning their scheme of work for the two years so that work should be equally covered if not a bit more in Grade 11 than in Grade 12.

However, in this case the teacher must according to Villet (2002) learn to be able to decide when it is best to convey content directly, and when it is best to let learners discover or explore information on their own without any teacher intervention (especially when it comes to what learners already know and have experienced to further explore on their own), when they need direct learning (when a new topic is introduced especially when it comes to judgement and decision making as well as to investigate), and when learners can be allowed to find their own way through a topic of area of content.

6.4 LEARNER-CENTRED EDUCATION AND THE QUESTION OF LIFE-LONG LEARNING

Learner-centred education takes as it starting point the learner as an active, inquisitive human being, striving to acquire knowledge and skills to master his/her surrounding world. It suggests that learning should be a communicative and interactive process, drawing on a range of methods as appropriate for different groups of learners and the task at hand. In the classroom situation group work, learning by doing, self-and-peer assessment should take place with the support of the teacher.

The responses by the two interviewees on whether the curriculum is learner-centred read as follows: " Of course yes. The curriculum encourages learner-centred education. They give their understandings and come up with ideas, and they highlight here and there" and also because "provision is made to divide learners in groups", are an indication that efforts are made to try to implement this new approach, but how successful is it really?

This to me is no proof of learner-centred education, but rather responses of learners to questions being asked by the teacher, which led to the following two questions. Will

learners through this new approach be able to use the acquired skills and knowledge to learn the ability to apply them, to make sense of new situations or to solve problems? Do teachers really understand how to apply learner-centred education or do they just use it as a method for grouping learners together to impress others?

It also surfaced from the questionnaires that the content of the curriculum encourages learner-centred education but only "after the necessary in-service training is received". If teachers are not trained in the techniques of learner-centred education, they will find it very difficult to implement a learner-centred curriculum. Who is responsible for giving training and what about those teachers who have been teaching for twenty years and more? Are they really willing to receive this training to change the teaching style that they have been used to all those years, since this means shifting educators from current programmes to new programmes, something which is often met with great resistance.

As mentioned before, this paradigm expects learners to be actively involved in the learning process that should be related to the lives and experiences of learners. Learners can only be part of the curriculum if they have the opportunity to experience the curriculum through feeling, touching and imagining. Only when learners learn and understand the curriculum to gain knowledge and power to use it, will the curriculum have actual worth.

Life experiences and career based activities should prepare learners for adult responsibilities meaning learners should learn to work in a social setting by sharing ideas and experiences as well as operating independently to enable them to make independent decisions and to take responsibility for their actions. They should engage in the active construction of their world of knowledge, realise that their knowledge is incomplete and that they need further studies to satisfy their academic and personal matters to encourage life long learning, as schools are only a temporary base for acquiring knowledge. Most young adults only acquire knowledge outside school.

6.5 ACCESS AND QUALITY

Namibia, as is the case of many African countries after independence, faces the same dilemma of access and quality of education. A dire need was that all learners should have access to schools, which resulted in overlarge classes putting greater demands on the

quality of education. Not only overlarge classes, but also a too full curriculum poses a threat to the quality of teaching learners are expected to receive. This raises the following questions. How often do teachers get to spend some time to get to know their learners? Do they really know what their learners are capable of? How often do we/they show an interest in what learners say they really can achieve to enhance the quality in education?

We have adopted quite an expensive curriculum in comparison with the previous education system where a mere textbook was needed for a learner for a particular subject curriculum. To ensure quality education against access to schools, one should look at the availability of resources at the school and how they are utilised. We should not only look at the availability of resources, but also how accessible the curriculum is and what quality does it guarantee?

It has emerged from my study that all teachers as well as the learners complained about the lack of textbooks, although teachers have also indicated that they have sufficient additional teaching materials for learners to ensure quality education. This to me is just more prove that teachers as well as their learners feel insecure if they do not have a textbook in their hands. This system does not only rely on textbooks, but teachers are free to also make use of other resources such as overhead projectors, computers, photocopy machines, movie boxes as well as what is available in their school libraries.

The one problem is that although facilities are available at schools, principals are always nagging about the expenditure. Budgets allocated to subjects, are in most cases not enough to cover everything they desire such as making enough photocopies for all learners or buying the necessary equipment needed for the subject. The tendency in most if not all secondary schools is to concentrate on natural sciences and to invest in this field rather than in social sciences, which seem not to be important.

The second problem is that libraries in schools especially in remote areas are poorly stocked with no Internet facilities for learners to explore on their own. Even if movie boxes were available, what is the purpose of it if audiovisual materials are not available to show learners? The two respondents from the school of my case study do have one or two tapes that teachers can use to help them in their teaching.

Perhaps this is why four of the five learners indicated that the subject is "easy". The actual question is whether the subject is really easy or are teacher only covering the surface of the topics that seem to be easy to understand without going into detail to what learner should expect in the exams. If this is so, how can we expect quality education? If it is not so why are failure rates always high especially at the school of my study?

Since learner-centred education requires teachers to respond to different learners on an individual basis, it implies that teachers should acquire different teaching techniques to respond to the learners.

It is also evident that training is essential in the effective use of the prescribed curriculum content especially learner-centred teaching techniques as well as other resources such as educational technology, computer literacy and the use of the Internet as indicated by the respondents from the school of my case study. Although all four of the respondents agree that the curriculum improves quality education, the lack of these resources hampers the access to quality education.

Teachers will have to become learners who continually seek ways to bring the latest knowledge in their fields to the classroom. One the other hand, they must have access to, as well the skills to access, the technologies that will help them to keep abreast with their teaching profession to enable them to effectively implement the curriculum in order to enhance quality education.

6.6 EQUITY AND DEMOCRACY

Equity means sameness or to be treated fairly (MEC 1993:36) meaning, that all learners should have the same rights, use the same syllabi, use the same prescribed textbooks, have sufficient textbooks and facilities and should receive equal treatment. Three of the main indicators of the extent to which equity was being transformed towards equality are the allocation of material resources affecting the provision of the curriculum, the provision of qualified teachers and the participation of females in secondary education. This is actually not the same in all schools as indicated by the respondents. With regard to equity the only thing all schools have in common is the syllabi they use. Within each

subject a core of skills and content is defined to ensure that equity is maintained throughout. This is about where it stops. All respondents indicated that they have a lack of textbooks and facilities and have poorly-stocked libraries.

Schools often serve to continue the marginalisation of those less unfortunate: those who belong to certain races, those who are members of the lower economic classes, those who are female, and those who come from rural areas. The school of my case study tries to be as accommodative as possible to redress these imbalances of the past by accommodating all of these learners and by involving girls in classroom discussions, since they still seem to be inferior to boys as in the past.

Coming to the question of democracy, all respondents agree that the syllabus promotes democratic skills and attitudes in learners in the sense that learners have the right to an opinion and to make judgements and it allows for empowerment, and promotes critical thinking and self-reflection. My question is whether these are the only rights learners have in order to justify that the syllabus is democratic in nature?

Hoppers as cited by Avenstrup (1999:197) is of the opinion that:

> Democracy demands for democratic participation imply that a policy is only valid when attained through processes of consultation and consensus by the various interests in a given situation of conflict.

In this case learners and teachers form part of the "various interests". Teachers are to some extent part of policy making by serving on curriculum panels as curriculum developers. They are the ones to decide what will be learned, who will learn it and who will teach it. To a certain extent the curriculum developers try to consider the needs and interests of the learner and make the content meaningful. However, there is little consultation with learners and communities during the process of curriculum development as indicated by the respondents.

Decisions are made based on the experiences of the curriculum developers. They often assume that they know what learners need. If we are operating in a democratic learner-centred paradigm than it means that learners should be encouraged to work with teachers on planning units and their purposes, developing the content and activities, and even finding materials to be used in the process. Teachers should sit down with their learners

and discuss how they will go about teaching specific units. In that way learners have input into what they will learn as well as bring in materials that will support the process.

7. DISCUSSION OF FINDINGS.

The following main points may be drawn from the research:

- It is quite evident that teachers especially the novice ones, need training in reading and understanding the curriculum. They need training to acquire competencies on how to interpret the curriculum in order to shape and direct learners for their future;

- Examinations seem to be the major determinant on the future of learners. Only if learners perform well in exams and if they meet the necessary standards required by tertiary institutions, is the curriculum seen as successfully implemented;

- Teachers should learn to put the interests of the learners first by including interesting activities in their lesson presentations that will encourage and facilitate learning if they want this system to survive a social constructivist approach;

- If teachers can teach learners how to retrieve old information (knowledge), to modify it in order to gain new insights, they will be able to cover the work extensively and not view the curriculum content as too long;

- There is evidence that efforts are made to implement the learner-centred approach, but only after the necessary training is received. Emphasis should be put on teachers teaching for quite some time (20 years) who usually are the ones who find it difficult to change;

- There is a tendency for teachers to show a greater appreciation of learner-centred education in theory than in practice. Teachers seem to be in need of a richer repertoire of teaching methods. There is a need for more exposure of teachers to learner-centred environments where more support is given to teachers in order for teachers to successfully implement this concept;

- The curriculum seems to cater for quality education, but is affected by a few impediments such as lack of resources and overlarge classes, just to mention a few. To further ensure quality of education, teachers should always try to keep abreast with latest developments in the teaching profession by acquiring different teaching methods and techniques. Some teachers find it difficult to reconcile their new role as facilitators of learning with their previous examining role;

- Teachers should in this case become life-long learners who continuously seek ways to bring the latest knowledge in their fields into the classroom to enable them to effectively implement the curriculum in order to enhance quality education;

- Although learners are allowed to democratically participate in decision-making concerning the curriculum, it should be done under the supervision and guidance of the teacher who has a sound understanding of the subject and in this case should act in the learners' best interests.

8. LIMITATIONS OF THE STUDY

- The biggest limitation of the study was the limited time frame in which the study was conducted. The two teachers kept on postponing the appointments for the interview, while the participants for my questionnaire took extensive time to answer the questions although it was sent to them well in advance;

- The second limitation of the study was the wish of the two interviewees to make it one combined interview instead of two independent interviews. This resulted in R1 totally dominating the interview and not much information could be elicited from R2;

- The third limitation of the study was the small number of the participants. The sample size was restricted to 4 teachers and 5 learners only. This may be a limiting factor in the generalisation of the analysis, but could hopefully be regarded as sufficient representation.

9. CONCLUSION

- In this paper an attempt was made to conduct a desktop analysis of the IGCSE Geography Curriculum (Grades 11-12);

- This analysis aimed to focus on how and to what extent the curriculum is related to the Namibian educational reform process including considerations of the extent to which the curriculum addresses the four educational goals of access, equity, quality, democracy as well as whether the curriculum provides opportunities for learner-centred education and life-long learning;

- A socio-historic and economic background of the paradigm (pre-independent) in which the curriculum has initially been designed and the shift that has taken place from this paradigm to another (post-independence) has been given.

- A detailed description on the research methodology employed, was given. This includes the approach, the techniques and the processes of the research methodology;

- A document analysis, by means of a brief description of the policy document: *Towards Education for All: A Development Brief for Education, Culture and Training (MEC 1993)* as a research technique was also used. This was followed by the presentation of the data and discussions of the analysis;

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EPISTEMOLOGICAL BASES OF BEHAVIORISM AND CONSTRUCTIVISM

TABLE OF CONTENT

CRITICALLY DISCUSS THE EPISTEMOLOGICAL BASES OF BEHAVIOURISM AND CONSTRUCTIVISM

ABSTRACT

How do we come to learn? How do we know what we have learnt is true, or an accurate representation of the reality? This paper will strive to answer these questions by focusing on epistemology and the way in which it explores the theory of knowledge that underpins the practice of behaviorism and constructivism by critically engaging with these two theories and how they work as theories of knowledge. An attempt will also be made to look at reasons why these theories are important in the construction of learning as well as the era (time frame) that they are appreciated most.

1. INTRODUCTION

Before I take you on this journey of behaviorism and constructivism, I will give a brief description of the word epistemology since it will guide us through this journey. Epistemology refers to the understanding of knowledge, how we learn what we know, and how we acquire knowledge. Meredith et al. (1963) view epistemology as the branch of philosophy that studies the nature of knowledge and the process by which knowledge is acquired and validated.

Heylighen (1993) sees epistemology as the branch of philosophy that studies knowledge. According to him, it attempts to answer the basic question: what constitutes knowledge and how is it acquired and what distinguishes true (adequate) knowledge from false (inadequate) knowledge? Some philosophers viewed behaviorism as the only truth in the construction of knowledge, however it was later challenged by other philosophers known as the social constructivists.

I will start off by looking at how knowledge is constructed according to the behaviorists and the facets of behaviorism, why some philosophers still prefer it and why others oppose it.

2. BEHAVIORISM

Behaviorists, according to Heylighen (1993), see knowledge as a passive reflection of the external objective reality. This implies a process of "instruction". In order to get an image of reality, the subject must somehow receive the environment that is the subject must be "instructed". Von Glasersfeld as cited in Bodner (1986) asserts that the mind is seen as a 'black box', totally empty like a blank blanket upon which a picture can be painted. This statement supports Heylighen's argument that our senses work like a camera that just projects an image of how the world "really" is onto the brain and use that image as a kind of map, an encoding in a slightly different format of the objective structure "out there" meaning that we come into the world as discoverers who build copies or replicas of reality in our mind. The mind in this case is totally blank at birth and knowledge is acquired through what we can observe from the external environment.

For the behaviorists knowledge is out there somewhere in the real world, waiting to be discovered by scientists, and such knowledge is totally objective and free from influences such as the values and beliefs of the 'discoverer'. It is a learning theory based on the abandonment of assumptions and speculations about internal thoughts that are internal transformations and mental states, which are seen as subjective.

Learning is a relatively permanent change in behavior, due to experience. This refers to a change in behavior, an external change that we can observe and since each organism has a different experience with the environment, each will have a different set of behaviors. Thus, behaviorism attends exclusively to the observable - the objective and the scientific study of behavior.

DeMar (1988) presupposes behavior as follows:

1. Behavior is naturalistic. This means that the material world is the ultimate reality, and everything can be explained in terms of natural laws. Man has no soul and no mind, only a brain that responds to external stimuli. The primary means of learning is through active engagement and observing others.

2. Behaviorism teaches that man is nothing more than a machine that responds to conditioning. Learning processes can be studied most objectively when the focus is on stimuli and responses. Learning is therefore described as a stimulus and response relationship in which Ivan Pavlov (1849-1936) developed the theory known as classical conditioning through the study of dogs. According to Pavlov, learning begins with a stimulus response connection. In this theory a certain stimulus leads to a particular response.

   Watson (1919) as cited by DeMar (1988) on the other hand, supports this idea by stating that:

   > In each adjustment there is always both a response or act and a stimulus or situation which call [sic] out that response ... the stimulus is always provided by the environment, external to the body, or by the movements of man's muscles and the secretions of his glands...[and] responses always follow relatively immediately upon the presentation or incidence of the stimulus.

3. Consistently, behaviorism teaches that we are not responsible for our actions. If we are mere machines, without minds or souls, reacting to stimuli and operating on our environment to attain certain ends, then anything we do is inevitable.

4. Behaviorism is manipulative. It seeks not merely to understand human behavior, but to predict and control it. From his theories, Skinner developed the idea of "shaping". By controlling rewards and punishments, you shape the behavior of another person. According to him rewards or reinforcements are essential for learning to occur. Learning through rewards (either positive or negative) is preferable under the conditions of punishments. Through these rewards behavior can be "shaped" by those who are able to use the tools of behaviorism.

3. FACETS OF BEHAVIORISM

3.1 Realism

Behaviorism is related to realism in terms of the realists' 'thesis of independent reality' that is similar to the behaviorists' belief that behavior is caused by environmental conditions. For the realists, human "nature" can be explained by what traditionally has been thought to be a particular aspect of human behavior. There is no "internal' reality of the human hidden from the scientific discovery of the behaviorists, because what is real is external, factual, and observable behavior capable of being known. Realism is a metaphysical thesis about what the world is like and what it contains. One of the realists' elements of behaviorism includes going from particular, observable facts (particular behaviors) to "forms" or laws of behavior (Ozman & Craver, 1986).

Dolhenty (2002) argues that realism holds that philosophy is a genuine science in its own right, a systemized order of true knowledge, and how its principles and judgments are based on objective evidence open to any observer.

Dolhenty states that all realistic philosophers agree on three basic theses:

- There is a world of real existence, a world made up of substantial beings related to one another, which exists independently of any human opinions or desires, a world which men have not made or constructed.
- The substances and relations that are part of this world of real existence can be known by the human mind as they are in themselves. Truth is the correspondence between mind and thing and certitude is possible. The criterion of truth is objective evidence in whatever form it is presented as the knowing mind.
- Such knowledge can offer sound and immutable guidance for individual and social action and is, in fact, the only reliable guide to human conduct, both individual and social.

I want to conclude this section on realism with Aristotle and Plato's argument that realists view the world in terms of object and matter. People come to know the world through their senses and their reason. Everything is derived from nature and is subjected to laws. Human behavior is rational when it conforms to the laws of nature and when physical and social laws govern it.

3.2 Materialism

Materialism, according to Ozman and Craver (1986), is the theory that can be explained by the laws of matter and motion. Body is material and behaviors are motion. Thus, humans can be known from the standpoints of matter and motion. Human beings are part of nature. Life as viewed by Hobbes in Ozman and Craver (1986) is simply motion. We experience objects by their quantities through sensation. Behaviorism's close affinity with mechanistic materialism lies in several areas. Both believe that the significant thing is to observe behavior (motion) of body in an environment (supporting material conditions).

Marxist philosophical materialism holds that matter and nature exist outside and independently of our consciousness; that matter is primary, since it is the source of sensations, feelings, ideas and consciousness which is derivative, a reflection of matter, a reflection of being and that thought is productive of matter. The world and its laws are fully knowable, observable and measurable and should be part of the physical world that we can feel and experience in some way. One difference is that for the behaviorists' human behavior or motion is the significance datum, and the knowledge of matter is crucial because it helps us to understand behavior itself (Ozman and Craver, 1986).

The closest affinity of behaviorism to materialism is the theory of modern day philosophy that holds that matter and the material world are all there is, or more modestly, that matter is the fundamental reality from which everything derives. This means that the material world is ultimately reality, and that everything can be explained in terms of natural laws (Ozman and Craver, 1986.

3.3 Empiricism

Using the Shorter Oxford English Dictionary (1972), Aspin (1995) defined empiricism as 'the theory that regards experience as the only source of knowledge'. In this definition 'experience' refers to the data one receives through the various sense organs, providing the recipients of such data with 'evidence' of the existence of a world of real objects outside themselves. The principle of empiricism thus refers to the sense of experience and observation. The sense of experience was regarded as absolutely objective, value-free and theory free (Aspin, 1995).

The group known as the Vienna Circle (Schlick, Weismann, Feigl and Carnap) are described in Higgs (1995) as visualizing empiricism as the only sound and sure way in which human beings acquire knowledge of the world, and that empirical observation, together with certain dispositions or tendencies, is responsible for the totality of the contents of our minds.

The closest affinity of behaviorism with empiricism, according to Locke's central thesis as cited in Tripp (2002) is that all our knowledge derives from experience. At birth, Locke averred, the mind is like an empty cupboard or a blank sheet of paper, 'void of all characters, without any ideas'. He maintained that the mind has no innate ideas or principles. This has much in common with Thomas Aquinas as cited in Aspin (1995) who asserts that, 'there is nothing in the mind which has not previously been in sensation'. Aquinas describes the state of the mind at birth as "tabula rasa in quo nihil as scriptum"-a blank sheet on which nothing is being written.

The origin of human knowledge according to Aspin (1995) is through experience. The structure and contents of the mind is the product of experience only. He too insisted that all the contents of our minds are derived from and given to us through the data of the senses-outer senses such as touch, sight, and hearing and inner senses such as pain, love, hate etc.

The creative power of the mind amounts to no more than the faculty of compounding; transporting, arguing or diminishing the materials afforded us by senses and experience.

4. WHY BEHAVIORISM?

Behaviorism was an immensely popular research program or methodological commitment among students of behavior from about the second decade of the twentieth century through to its middle decade. They organized themselves into different types of research clusters, whose differences stemmed from factors such as varying approaches to conditioning and experimentation (Graham, 1998).

It was even more popular among psychologists than among philosophers. Behaviorists created journals, organized societies, and founded psychology graduate programs reflective of behaviorism. They even generated a type of therapy, known as behavior therapy (Rimm & Masters, 1974; Erwin, 1978).

It developed behavior management techniques for autistic children (Lovaas and Newsom, 1976) and token economies for the management of chronic schizophrenics (Stahl and Lietenberg, 1976). Educational research is much indebted to behaviorism for the introduction of statistical methods in human sciences to test the significance, reliability and validity of test results.

Other reasons why behaviorism was viewed as important include the following:

According to Zuriff (1985) the first reason is that behaviorism is epistemic; claiming that what is said about behaviorism is the only truth. His warrant or evidence for saying that an animal or person in a certain mental stage is grounded in behavior and understood as observable behavior.

Cowie (1998) on the other hand, states that the major difference between mentalistic (mental state in the head) and associationist or conditioning accounts of behavior is that

mentalistic accounts tend to have a strong nativist bent. This simply means that mentalistic accounts tend to assume, and sometimes even explicitly embrace, the hypothesis that the mind possesses at birth or innately a set of procedures or internally represented processing rules that are deployed when learning or acquiring new responses. Behaviorism, on the other hand, is anti-nativist. It therefore appeals to theorists who deny that there are innate rules by which organisms learn. According to Skinner and Watson organisms learn without being innately or pre-experientially provided with explicit procedures by which to learn. Learning does not consist of rule-governed behavior. Learning is what organisms do in response to stimuli. A behaviorist organism learns, as it were, from its successes and mistakes (Dennett, 1978).

The third reason for behaviorism's popularity is related to its disdain for reference to inner mental or information processing as a means to explain behavior. This disdain is most vigorously exemplified in the work of Skinner. According to him, the outside (public) is explained through behavior of a person not accounted for by referring to the inside (inner processing) behavior of the person. He further states that behavior must be explained in terms which do not themselves presuppose the very thing that is explained. This, according to him, is behavior.

A fourth reason why behaviorism is still valued today is that it made a significant contribution to our knowledge of the emotions of infants.

The last point worth mentioning is Thorndike's laws of learning which are still considered to have great practical value. It is undeniable that a child or a learner for that matter needs to be ready for a learning task; that exercise and repetition of learned material is of great importance, particularly when the material to be learned is meaningful to the learner; and that pleasant learning effects are more conducive to learning than unpleasant ones.

5. THE CALL FOR CONSTRUCTIVISM

Many educational psychologists, including Graham (2000) found the behavioural approach unsatisfying. Graham views behaviorism as unpopular and believes it has lost its strengths and influence for the following reasons. It is dismissed by cognitive scientists developing intricate internal information processing models. It is neglected by cognitive ethologists and ecological psychologists convinced that its methods are irrelevant to studying how animals and persons behave in their natural and social environment. It is rejected by neuroscientists who claim that direct study of the brain is the only way to understand the causes of behavior.

Secondly, the deepest and most complex reason for behaviorism's demise is its commitment to the thesis that behavior can be explained without reference to mental activity. Many philosophers and psychologists find this thesis hopelessly restrictive. They reject behaviorism mainly for this reason. According to Graham (2000), the rejection of behaviorism is that some features of mentality (some elements in the inner processing of persons) have characteristic 'feels' or sensory phenomenal qualities.

To be in pain, for example, is not merely to produce appropriate pain behavior under the right environmental circumstances; it is to experience a 'like-thisness' to the pain (as something dull or sharp, perhaps). Feels, or qualia, as they are also called, are difficult to account for in behaviorism because they are subjectively present in experience, but resist behavioral analysis or description. Indeed, it is tempting to postulate that feels affect non-qualitative elements of internal processing, and that they, for example, contribute to arousal, attention, and receptivity to associative conditioning.

The third reason for rejecting behaviorism is related to Chomsky in Graham (2000). Chomsky has been one of behaviorism's most successful and damaging critics. Chomsky argues that some behavior (linguistic behavior, in particular) has to be understood in terms of internally represented rules. These rules are not products of learned associations. They are part of our native psychological endowment as human beings. Chomsky charges that

behaviorist models of language learning cannot explain various facts about language acquisition, for example, a child's linguistic abilities appear to be radically under-determined by the evidence of verbal behavior offered to the child in the short period in which he/she acquires those abilities. By the age of four or five (normal) children have an almost limitless capacity to understand and produce sentences, which they have never heard before. The basic rule or principles of grammar, therefore, argues Chomsky, must be innate.

The problem, to which Chomsky refers, seems to go beyond merely the issue of linguistic behavior in younger children. It appears to be a fundamental fact that our sensitivities and behavioral capacities often surpass the limitations of our individual learning theories. Our history of reinforcement is often too impoverished to uniquely determine our behavior. Much learning, therefore, seems to require pre-existing or innate representational structures within which learning occurs.

The next section of this paper will be dedicated to understanding the essence of constructivism as well as focusing on the different facets of constructivism.

6. CONSTRUCTIVISM

Constructivism is a theory that is based on the results of Piaget's research. It differs from the traditional view that knowledge exists independently from the individual, the view that the mind is a tabula rasa, a blank tablet upon which a picture can be painted. Piaget as cited in Bodner (1986) believed that knowledge is acquired as a result of a life-long constructive process in which we try to organize, structure, and restructure our experiences in light of existing schemes of thought and thereby gradually modify and expand these schemes.

Lerman and Kilpatric in Matthews (1992) suggest that the core epistemological theses of constructivism are:

1. Knowledge is actively constructed by the cognizing subject, not passively received from the environment. This view of knowledge sharply contrasts with the behaviorist point of view that learning is the passive transmission of information from one individual to another
2. Coming to know is an adaptive process that organizes one's experiential world; it does not discover an independent, pre-existing world outside the mind of the knower as is the case with behaviorism.

Dr. John Zoniak (1995) asserts that knowledge is constructed by humans. Knowledge is not a set of facts, concepts or laws waiting to be discovered. It is not something that exists independent of the knower. Humans create or construct knowledge as they attempt to bring meaning to our experience. Everything that we know we have made.

Knowledge is conjectural and fallible. Since knowledge is a construction of humans and humans are constantly undergoing new experiences, knowledge can never be stable. The understandings that we invent are always tentative and incomplete. Knowledge grows through exposure. Understanding becomes deeper and stronger if one tests it against new encounters.

One of the most important ideas of Piaget is that we build or construct new knowledge or skills based on what we already know or can do. We do not learn things in isolation but from what we are already familiar with. Piaget asserts that it does not matter whether we learn formally, in school, or informally, at home or elsewhere. The new learning has to find a place in our mental filing system. This creates a kind of mental discomfort or classification, - an imbalance in our minds, because of the new or incoming information that should be taken in. This is called discomfort or cognitive dissonance (disturbance of mental balance or equilibrium).

In the learning environment we may experience cognitive dissonance when we have not yet grasped a concept or solved a problem or mastered a skill. The lack of satisfaction is useful because it creates an urge to dispel the dissatisfaction by completing the learning properly.

We now have to make sense of new information or practice to accommodate both old and new information in order to resolve the cognitive dissonance.

Constructivism describes two mental processes that we use to get a balanced situation or equilibrium. These are assimilation and accommodation. Assimilation is the process of noticing, thinking about and testing your understanding of new skills and knowledge. The process of learning how to write essays or applying new skills involves assimilation. Accommodation is the process of relating the new information to the old so that you now have a new enriched set of skills or knowledge. This means that we adjust what we know to fit the new learning and the old learning together in a balanced way.

Von Glasersfeld in Bodner (1986) has repeatedly described the construction of knowledge as a search for a fit rather than a match with reality. In the constructivist model, knowledge is assumed to fit reality the way a key fits a lock (3, 26, and 27). Once we allow knowledge to fit reality the way a key fits a lock, we find ourselves in a very different position because many keys, with different shapes, can open a given lock. The only thing that matters is whether the knowledge we construct from this information functions satisfactorily in the context in which it arises. The constructivist model is an instrumentalist view of knowledge.

7. FACETS OF CONSTRUCTIVISM

Constructivism has many facets, and it is important to separate them as they turn out to vary greatly in terms of practical significance. One way of distinguishing different forms of constructivism, as well as to consider the basic principles, is to search for the underlying or assumed metaphors for the mind and the world. These are quite revealing under the following facets of constructivism.

7.1 Radical Constructivism

Radical constructivism starts from the assumption that knowledge, no matter how it is defined, is in the head of the individual, and that the thinking subject has no alternative but to construct what he/she knows on the basis of his/her own experience.

Von Glasersfeld as cited by Taylor's (1993) principle of radical constructivism addresses the nature and status of an individual's knowledge. Here knowledge is recast as the cognitive activity of making sense of the experience. Knowledge, therefore, is inescapably subjective and is according to Von Glasersfeld (1989:162), defined by two principles:

1. Knowledge is not passively received either through the senses or by way of communication, but is actively built up by the cognizing subject.
2. The function of cognition is adaptive and serves as the organization of the experiential world, not as the discovery of an objective ontological reality.

This principle proposes that the individual learner's purposeful and subjective interpretations of his/her knowledge of the physical and social world constitute the genesis of the individual's knowledge. This knowledge results, therefore, from a process of making sense of experience, and is an inherently purposeful problem-solving cognitive activity. The individual's personally constructed knowledge remains viable for as long as it enables him/her to make sense successfully of their experiences. This principle sees the individual as a self-regulated and autonomous thinker whose knowledge results from reflection on personal experience. The emphasis here is clearly on the individual learner as a constructer.

7.2 Social Constructivism

Social constructivism is seen as the newest form of constructivism (Ernest 1990). Social constructivism regards individual subjects and the realm of the social as indissolubly interconnected. Human subjects are formed through their interaction with each other (as well as by their individual processes). Thus, there is no underlying metaphor for the

isolated individual mind as in the case of radical constructivism. Instead, the underlying metaphor is that of conversation, comprising persons in meaningful linguistic and extra-linguistic interaction.

The social constructivists' model of the world is that of social reality, the socially constructed world, which creates the shared experience of the underlying physical and social worlds. The socially constructed reality is being modified all the time to fit ontological reality, and to pre-structure it according to socially accepted assumptions although it can never give a 'true picture' of it.

The social world of the individual includes the people that directly affect that person, for example teachers, friends, students, administrators, and participants in all forms of activity. Many of the authors that identify with social constructivism trace their ideas back to Vygotsky (1978), a pioneering theorist in psychology who focused on the roles that society played in the development of the individual. Social constructivists model the social entity as a learner (for example, a football team, a business or a family), to be compared with the learning of an individual in a social setting. Salomon and Perkins (1988:124) identify three main types of relations:

- Individual learning can be less or more socially mediated learning.
- Individuals can participate in the learning of a collective, sometimes with what is learned distributed throughout the collective more than in the mind of any one individual.
- Individuals and social aspects of learning in both of these senses can interact over time to strengthen one another in a 'reciprocal spiral relationship'.

7.3 Critical Constructivism

Critical constructivism looks at constructivism within a social and cultural environment, but adds a critical dimension aimed at reforming these environments in order to improve the success of constructivism applied as referent. Taylor (1993) describes critical

constructivism as a social epistemology that addresses the socio-cultural context of knowledge construction and serves as a referent for cultural reform. It confirms the relativism of radical constructivism, and also identifies the learner as being suspended in semiotic systems similar to those earlier identified in social and cultural constructivism. To these, cultural constructivism adds a greater emphasis on the actions for change of a learning teacher.

8. BEHAVIORISM VS CONSTRUCTIVISM: TIME FRAME OF OPERATION.

It was the social and cultural turmoil of the 60's and 70's that was the seedbed for the beginnings of change in so many of the American institutions, of which education was one. The 80's and 90's have seen the ideas of the construction of knowledge combined with a postmodern awareness of culture and all its myriad parts. The result has been the theory of constructivism whose main claims are that "knowledge cannot be instructed (transmitted)" by one person to another, rather "constructed" by an individual, also that "knowledge cannot be represented symbolically" (Marti 1997).

The espousal of constructivism and the disavowal of behaviorism championed by Skinner were not universally accepted by all. It was thought by some to have arguable extreme proponents as stated by Kearsley in Marti (1997), that there seems to be a readiness to polarise one theory of learning (behaviorism) with a metatheory (constructivism). He furthermore views the former as grossly deficient and the latter as the only credible explanation of student learning. This is one of the complaints that the constructivists have against the behaviorists. The behaviorists, on the other hand, are not saying that they are totally right. In fact they admit that the main components of behaviorism (or at least the behavioral theory of Skinner) were largely discredited as general truths in the 1970's.

They further maintain that the principles of contiguity, repetition, reinforcement through feedback and motivation are still recognised as important in the process of learning. In this I would support behaviorists in that we can't actually throw the baby out with the bath

water, meaning that some points of behaviorism are still valuable and appropriate in this post modern era the world is operating in.

The behaviorists claim that there are other elements to this theory that still hold true and are valuable today. Some of these claims are:

1. Some skills do transfer from one context to another
2. Knowledge does transfer between tasks
3. Abstract training can be effective when taught under the right circumstances

Although constructivists and behaviorists are depicted by each other towards the extremes, they are not mutually exclusive. However, there are certainly more and less appropriate times to apply the ideas from each camp. What is important is that whatever theories or ideas we apply, they must do the most to enhance the learning possibilities in the given environment and particular domain.

The 80's and 90's, as referred to before, have seen the construction of knowledge changing to such an extent that the question is whether it still meets the increased needs of the society in a post modern era. If constructivists claim that knowledge is conjectural and fallible, it means that knowledge can never be stable and is subjected to changes throughout.

Total mastery and liberation are dismissed as the discourses of terror and forced consensus. In its place post modernism appears as an ideological and political maker for referencing a world without stability, a world where knowledge is constantly changing and where meaning can no longer be anchored in a teleological view of history. According to the constructivists, knowledge does grow through exposure and understanding and can only become deeper and stronger if one tests it against new encounters (part of the postmodern era).

9. CONCLUSION

The objective of this paper was to promote an understanding of the theory of knowledge that underpins the practice of behaviorism and constructivism. Attention was given to the key epistemologies of behaviorism (materialism, realism and empiricism) and constructivism (radical, social and critical).

In the analysis not only were these two theories discussed, but an attempt was also made to look at why behaviorism was considered as extremely important during the early twentieth century, why it was partially abolished, what theory of knowledge prevails in the postmodern era and why.

It emerged from this paper that we cannot totally throw behaviorism out of the window and simply forget about it, as there are other elements to this theory that still hold true and are valuable today. On the other hand it also emerged that for individuals to survive in this postmodern era, a constructivist learning theory should be adopted.

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LITERATURE REVIEW

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LITERATURE REVIEW

1. INTRODUCTION

One of the aims for Social Sciences Education in the Basic Education Teachers Diploma (BETD), as established in Namibia by the Ministry Of Basic Education, Sport And Culture (MBECS) and the Ministry of Higher Education, Training And Employment Creation (MHETEC), (2002:4), is to enable learners to "acquire communicative, numerical, graphical, intellectual, social and moral skills, which would be used in solving problems individuals may face in their lives". This study will explore the teaching of graphicacy as a form of communication and as a form of literacy that involves the interpretation of maps (1:50 000 in particular), photographs, diagrams, sketches, pictures, graphs, and cartoons.

It is essential that student teachers acquire foundational knowledge of spatial perception and the skills and concepts that underpin graphicacy, to enable them to facilitate learning in various areas. The main aim of this study is to investigate the extent to which student teachers are indeed able to utilize and apply spatial perceptual skills and concepts in order to facilitate learning in geography.

This Paper will offer a review of the literature relevant to the study. I begin by critically examining and reviewing some of the key readings on graphicacy and its importance in the geography classroom. I then attempt to give a general overview of the role of education in communication, followed by a more detailed examination of graphicacy as a form of communication. The latter represents the empirical dimension of the research, which concerns:

- the extent to which student teachers are able to utilize and apply spatial perceptual skills and concepts, and
- the spatial/ graphic skills needed to develop these skills.

This study is a small-scale research project that forms part of a bigger programme aiming to develop student teachers' understanding of how to communicate spatial information effectively in graphic form. This in turn will give them guidance in developing children's competence in understanding and interpreting maps, diagrams, graphs, photographs and cartoons, thus effectively mediating learning in geography.

2. EDUCATION AND COMMUNICATION

Balchin (1972) in Fien et al. (1984) describes four complementary modes of communication in which all students need to develop competence. These are shown in the table below.

1.Graphic communication (graphicacy) • Spatial relationships through symbols	2. Verbal communication (oracy) • Spoken language or oral Communication
3. Literacy • Writing and Reading	4. Numerate communication (numeracy) • Counting and using numbers

Wilmot (1998) argues that children of today live in a multi-dimensional world, and in order for them to survive and thrive in it, they have to be able to communicate effectively. She agrees with Balchin in arguing that children should be able to communicate effectively in all four modes of communication. Graphic communication, according to Wilmot, requires an ability to both encode and decode spatial information using symbols, which in turn requires the utilization and application of spatial perceptual skills and concepts.

In past years teachers have been bombarded with reminders of the importance of literacy and numeracy and with demands that students be able to read, write and do arithmetic – to the detriment of the visual and graphic aspects of learning. Even if we

could make a clear-cut and reasonable distinction between purely verbal texts and purely visual ones, it would still be a mistake to concentrate our teaching efforts on reading and writing to the exclusion of other modes of communication and the neglect of visual forms (Hill 2002). Geography teachers therefore should take great care that equal attention is paid to the visual and graphic aspects of learning.

3. DEFINING GRAPHICACY AS A MODE OF COMMUNICATION

The syllable "graph", according to Balchin and Coleman in Bale et al. (1973), is common to the names of all visual aids such as graphs, photographs, cartography, the graphic arts and so on, and can be used as a root to coin the word "graphicacy" by analogy with literacy, numeracy and oracy. The word graphicacy can therefore be defined as the ability to understand and present information in the form of sketches, photographs, diagrams, maps, plans, charts, graphs and other non-textual, two dimensional formats (Wilmot 1998:20). The information conveyed could be directly representative of what we see (as in photographs or drawings), or more abstract – for example information, which is spatial (as in maps, plans and diagrams) or numerical (as in tables and graphs) (Aldrich and Sheppard 2000).

Graphicacy is concerned especially, but not wholly, with spatial relationships – as is the case with representational documents like maps. It also involves the use of spatial relationships, usually in two dimensions but sometimes in three, to portray other kinds of relationships, such as time scales, rates of change, derivatives, abstractions, and so on (Balchin and Coleman in Bale et al. 1973).

Spatial relationships and graphs may suggest geometry and other branches of mathematics, but mathematics cannot absorb the whole of graphicacy, which is more the province of geography than anything else. Just as geography plays a role as a bridge between the arts and the sciences, so graphicacy spills over into literacy on the one hand and numeracy on the other, while being identical with neither (Balchin and Coleman 1965). In sum, graphicacy involves the interpretation, or the communication

through graphic images or relationships, of concepts or data that cannot be successfully communicated by words or mathematical notation alone (Balchin and Coleman 1973). Indeed, Poracsky et al. (1999) regard the importance of graphics as inherent in their ability to communicate both sensory/emotional data (commonly described in words) and measured/quantified data (commonly described in numerical symbols).

For Wilmot (1998), graphicacy is underpinned by a complex and interconnected network of spatial perceptual and spatial conceptual skills in that it:

- utilizes some form of symbolic language to convey information about spatial relationships;
- requires that the reader/creator of graphic language possesses conceptual knowledge of the phenomena represented in the graphic representation as well as the spatial perceptual abilities and an understanding of spatial concepts; and
- requires practical skills of being able to create graphic forms to communicate information to others.

According to Boltt and van Harmelen (1993), graphicacy arises from the acquisition in various ways of a complex combination of skills that vary in difficulty and sophistication. However, without these skills Boltt and van Harmelen (1993) claim that a child's schooling and education is incomplete.

4. THE ROLE OF EDUCATION IN DEVELOPING SPATIAL AND GRAPHIC SKILLS

Balchin and Coleman (1965:82) refer to graphicacy, oracy, literacy and numeracy as the four "aces" in the pack. Wilmot (1998) insists that good education should be concerned with the development of all four "aces in the pack".

Gillespie (1993), as cited in Kenyon (2001), takes the idea of explicitly teaching children to decode pictures quite seriously, saying that children must be shown which graphics are important and how to read and interpret them. She asserts that one of the biggest dangers when teaching graphic analysis is that teachers tend to teach pictures

without focusing on the content. Kenyon extends this argument by pointing out that, while any learner can give a literal account of a picture, the ability to interpret what he or she is seeing is another concern altogether. Interpretative skills must nevertheless be backed up by content knowledge and other skills: for instance, maps usually require the learner to be competent in both graphicacy and literacy because of the importance of words or map signs in combination with the picture or map.

Since graphicacy is regarded as one of the earliest form of communication to which children are exposed, it is essential that the spatial development of children be addressed from the first year of their schooling, and continue throughout their school career (Boltt and van Harmelen 1993). Wilmot (1998) maintains that there is therefore an urgent need to explore and understand the theoretical underpinnings and the importance of graphicacy as a form of communication if an appropriate, explicit pedagogy is to be introduced in the primary school.

The curriculum should be designed in such a way as to facilitate understanding of different visual and tactile experiences. Geographical theory has often appeared to be mathematical, and has sometimes been connected to mathematical language (as opposed to human natural language). For example, geometry has been described by Harvey (1969: 191) as "the language of spatial form".

Geometry thus in the lower grades plays a vital role in developing the child's spatial skills, for all kinds of projections of reality play a part in geometry. For instance an important component of geometry is the recognition of the different geometrical shapes and patterns in the world around the child. The ability to recognize geometrical shapes allows the child to reason, construct and orientate (Van Niekerk 1994).

Geometric shapes are hidden in spatial objects and this lends itself to the valuable experience of moving from three-dimensional (orientation) to two-dimensional (insight) perception, and vice versa (Abels et al. 1992 in Van Niekerk 1994). The important objectives here include the discovery or recognition of symmetry (mirror and

rotational) and repetition (periodicity) in objects, and making qualitative and quantitative judgments about the characteristics of the different shapes.

There is little doubt that maps allow people to extend the geometry of small-scale space outward to geographic space. Determination of place and a sense of direction are very common everyday phenomena. There are a number of different systems for determining place, depending on the situation. Children should be able to utilize various kinds of graphical data in order to locate not only places but also to understand information that is represented graphically. This is viewed by Catling (1978) as cognitive mapping, which he describes as the way in which we perceive our spatial environment, the way in which our minds store such information and how we use that information to make a variety of complex spatial decisions.

Such a 'memory map', according to Catling (1978), can be used to develop the geographical and environmental experiences of young children: first, as a diagnostic instrument to assess the child's developing spatial cognition; secondly, as an informative guide for the map-maker and reader as to the perception the drawer has of the local environment; and lastly, as an instructive activity that can be utilized by the teacher to develop the child's cartographic ability, spatial concepts and environmental perception. It is therefore important to develop activities in such a way that a child is able to move from 3-D (mental) representations to 2-D representations, and vice-versa (Van Niekerk 1994).

A child's first encounter with a range of graphics other than storybook pictures is likely to be at primary school. Learning to draw and to understand simple drawings begins in early childhood. Most young children are fascinated by pictures and exuberant in their desire to communicate imaginative ideas through drawing. Graphics endeavours to recreate that excitement and foster the development of those natural creative talents.

Graphicacy focuses on communicating ideas and precise information through drawing. It conveys something that cannot be fully expressed in words, something that may

appeal to the perceiver's intellect, or emotions, or both at the same time. Through graphic communication, students give directions to others, plan a procedure or system of operation that exactly describes a mechanism, or realistically portrays the shape and form of any object (Aldrich and Sheppard 2000).

Primary level books have a higher ratio of graphics to text than most adults' books, because they aim to attract beginning readers to the page. Primary science teaching provides a unique opportunity to address the issue of graphicacy explicitly and thus lay a firm foundation for this life skill. Science books in particular make use of a wide variety of graphics to communicate information about structures, processes, procedures and measurements encountered in learning about living things, about light, sound, chemical reactions, and so on (Aldrich and Sheppard 2000).

Despite its importance, graphicacy – unlike literacy – is rarely explicitly taught. Research has shown that understanding graphics is not 'natural' but depends upon prior knowledge. Benjamin in Boltt and van Harmelen (1995), analyses the interpretation of photographs by Xhosa-speaking children.

He shows that the way in which his participants responded to the photographs was indeed related to their prior experience in reading and interpreting pictures: that is, that their responses reflected how they had been (or had not been) taught to 'look' at pictures, so as to find or make meaning. Benjamin demonstrates how the children's response to the photographs was contextualized – in the absence of specific guidance – by their own experience in their own world situation (Boltt and van Harmelen 1995).

Aldrich and Sheppard (2000) have identified three categories that are integral to an understanding of graphicacy:

4.1 Views

This includes different perspectives on objects or parts of objects, including a magnified view, a distant view, cross sections, changes of scale, and 2-D depictions of 3-D objects. Cross-sections, for example, are often deceptively familiar to adults but may need to be explained to children.

4.2 Formats

This refers to various types of graphics and their associated sets of conventions. Pictures and photographs are readily interpreted even by very young children, but the meanings of maps, pie charts, bar graphs, line graphs, etc., are not readily apparent to a first-time viewer. Various conventions pertaining to symbols, keys, axes, x/y co-ordinates and so on must be learnt before graphics can be understood.

Any gap in the understanding of such conventions creates the potential for confusion and misinterpretation. This is quite evident from the research done in South Africa by Boltt and van Harmelen (1995), who found that not one of a group of Grade 9 geographers was able to complete any of the tasks related to a simple read-and-interpret exercise based on contours, after having been taught three lessons on contours.

4.3 Commentary

This category refers to commentary objects, which often take the form of lines or arrows. These objects are not supposed to be interpreted literally, as a part of a visual scene, but symbolically, as a 'commentary' on that scene. It is frequently assumed that the meaning of commentary objects is self-evident and needs no explanation. But this is often not the case, for the meaning of commentary objects varies according to context. For instance, arrows can be used for labeling, to show movement, and to indicate direction, sequence and choice points.

Misunderstandings about commentary objects arise in two ways: when children interpret them as real objects within a scene, and when they jump to conclusions about their meaning, having previously encountered similar objects in a different context. According to Boltt and van Harmelen (1995), such misunderstanding can occur among adults as well as children. Research done on a group of women in the Brits district in South Africa has shown that these women could not understand the sequence pertaining to the use of contraceptive pills and kept on falling pregnant. It appears that they had no concept of the arrow as a symbol, so could not follow the sequence when taking the pills.

5. THE ROLE OF GEOGRAPHY IN DEVELOPING GRAPHIC AND SPATIAL SKILLS

5.1 Using images in geography

Since geography is a 'discipline in space', maps are an essential tool of the geographer (Nightingale in Hall et al. 1991:26). The ability to use maps of different scales is a skill not easily acquired. Hurry (1991:43) agrees with Nightingale in his statement that: "Maps cannot be learnt as such and the ability to interpret maps correctly can only be acquired through doing practical work with them."

Hurry (1991) views a map as particularly difficult for a young person to grasp. He concurs with Nightingale (in Hall et al. 1991) that children should learn how to understand and analyse material presented to them by means of a variety of different types of graph and other statistical diagrams, tables and sketches. Both scholars are of the opinion that a wide range of graphical and cartographical skills should be taught in geography. These skills should be taught not simply as skills, but as useful means of representing and analyzing information about specific areas and phenomena.

The opportunities provided by visual images in the geography classroom, to enhance geographical knowledge, understanding and skill development, are seldom fully

exploited by teachers (Yates 2000). According to Yates, this is also the case with many textbooks, where images are deployed merely to provide relief from written text rather then used to their full potential in conjunction with appropriate tasks. Visual images that are meant to develop learners' understanding should therefore be based on activities, and should be reproduced in the text as close as possible to the written section to which they refer.

Examination papers – not only in geography, but also in other subjects such as development studies, economics, history, and so on – contain sketches, diagrams, graphs, maps, cartoons and photographs. Research in Namibia has shown that students often lose marks by not making appropriate use of the visual information provided, especially in the case of papers that test their understanding, interpreting, and decision-making skills in this context. What educators fail to realize is that empowering students to interpret visual images would remove some of the barriers to understanding that written text effectively imposes. The use of images, moreover (according to Yates 2000), can unlock some of the unused talent in low achievers and in the process boost their self-esteem.

In the light of these arguments for the use of images in the geography classroom, it is surprising that – however good the quality of photographic reproduction, etc. – many geography textbooks do not exploit the full potential of visual resources by providing accompanying tasks to enable learners to improve their graphicacy skills.

5.2 Graphicacy in geography

According to Boardman (1983), although graphicacy is very important in the geography classroom, it continues to be the most underutilized form and area of instruction. Fuglesang (1982:145) concurs, arguing:

> There is a prevailing assumption that pictures, as a mode of expression are universally understood. Many observations from the field confirm that this is not so. People learn to read pictures as they learn to read the pages in a book.

> This is not recognized because education in reading presentations is an informal process. ... In social environments with no pictorial tradition or very few pictorial representations – the situation in remote African villages – the informal process of learning to read a picture simply does not occur... Rather, we should recognize that people's ability to read pictures is correlated to the amount of pictorial stimulation to which they have been exposed in their social environment.

The necessity of developing visual literacy is emphasized by Langham (1993) in Bolt and van Harmelen (1995), who points out:

> That methods of reading pictures have to be "learnt, like one learns to read pages of a book" (Lanham 1990:1), is often taken for granted because learning to read pictures seems to be an informal process that goes on automatically in a society where a variety of pictures are presented daily through different media.

Despite the power and ubiquity of graphic images, educational curricula continue to pay little attention to graphics training. In fact, this deficit increases in secondary and post-secondary education. There is little doubt that the increasing prevalence of textual forms of communication is one of the reasons that so many students arrive at tertiary institutions with apparently little experience of visual communication. And so far, our education system has failed to take seriously and to respond adequately to the fact that so much information is in text form (Poracsky et al. 1999).

Boltt and van Harmelen (1995) state that the notion of 'reading' a picture may seem so obvious as to require no further discussion; it may even strike some as absurd. They are of the opinion that when we stop to consider the cognitive processes involved in 'making sense' of pictures, in what ever form, we may begin to appreciate that pictures are as complex as any written text or number presentation.

According to Poracsky et al. (1999), educators are developing curricular units and materials at nearly every educational level to help students interpret and accurately respond to visual messages. Still, these initiatives are often treated as add-on units, subordinated to the larger goal of developing students' reading and writing abilities. Educators need to introduce visual analysis into writing classes by first demonstrating

how writing is partly a visual medium. Too many people, including many writing instructors, think of the visual elements of written texts as mere ornamentation, or perhaps as aids to comprehension. What many people fail to understand is that visual elements are powerful and essential features of almost every written text.

Poracksky et al (1999). regard it as absolutely necessary to require students to include graphic elements in many assignments, just as they are required to write frequently in virtually every discipline. Anything less is to fail to challenge students to reach their full potential as communicators, while simultaneously communicating the message that visuals are not essential or important. Instead, "we should be reinforcing the fact that graphics can be both satisfying and helpful in learning, thinking and communicating". This aim should be pursued through the regular use of graphics and images as examples, examination of the principles of visual composition, systematic application of visual design elements for analysing graphic images, and assignments that involve the production of graphics.

According to Sekete (1991) in Hall et al. (1991) problems encountered by students in the use of visual aids and maps may well be rooted in their teachers. If teachers have no basic understanding of map work or how to link theory with practice, they may fail to lay a sound geographical foundation for the learner. Research done by Boltt and van Harmelen (1995) has shown that maps were like a "foreign language" to teachers and that any diagrammatic representation presented "enormous problems". Their research further revealed that as a result of the problems teachers experienced in the field of spatial development, diagrams, photographs, cartoons and maps in textbooks tended to be ignored and were thus rendered 'invisible'.

Sekete (1991) in Hall et al. (1991) puts the blame on the ineffectual methods teachers employ when teaching map work, such as poor questioning styles. According to him, questions that usually call for map-reading are emphasized at the expense of map interpreting skills, for example, low-order questions like the 'what' and 'where' are used rather than high-order questions like 'how' and 'why'. This appears to elicit recall

responses from the pupils and limits their mental growth, hampering comprehension and other high order skills in map work. Teachers should concentrate on conceptual learning instead of verbal learning, which in most cases will result in more complicated lessons.

6. IDENTIFYING THE SKILLS OF GRAPHICACY

6.1 Cognitive development of spatial capacity

Numerous experiments conducted over many years by Piaget and Inhelder (1956) and Piaget, Inhelder and Szeminska (1960), as cited in Boardman (1983), have shown that children's spatial understanding develops gradually and passes through three stages. The first stage is what they call the Topological stage, which develops during the early part of the pre-operational stage (2-4 years); the second, the Projective stage, which develops during the concrete operational stage (7-12 years); and the third, the Euclidean stage, which develops towards the end of the concrete operational stage, but mainly during the formal operational stage.

Boardman (1983) summarizes these three stages as follows:

> At the Topological stage children understand spatial location solely in terms of points connected to them in a simple linear manner. When children manage to move away from this egocentric viewpoint and adopt a projective one, they are able to relate various objects to each other and understand the structure of their spatial distribution. By the time they reach the Euclidean stage of spatial concept development they are able to co-ordinate locations using abstract reference systems and comprehend the relationships between objects. During adolescence spatial understanding continues to mature and with it develops the capacity to study maps and draw conclusions about spatial location, distributions and relationships.

Catling (1978) in Boardman (1983) links the development of spatial concepts in children as identified by Piaget to the development of their understanding of the three fundamental concepts in geography: spatial location, spatial distribution and spatial relationships. At the perceptual level of development children first show an awareness

of the spatial location of objects in the environment around them. This subsequently develops into recognition of the spatial distribution of objects in their environment. Children then learn to appreciate the existence of spatial relationships between the various objects. A similar sequence may be observed at the conceptual level of development.

In a study of 6-11 year olds mapping their home area, it was found that:

- whilst children as young as six possess the skill of rotation, not every 11-year-old has acquired it; such children are thus unable to transform environmental images topologically;
- very few children of ten or older drew maps other than in plan form; and
- most of the older children chose to embellish their maps through some kind of labeling.

In short, this study revealed that children's spatial comprehension improved with age, and that by the age of 11 years most children were able to represent space in a highly organized manner (Matthews in Wilmot 1998:28). The diagnostic activities used in this research attempt to illuminate a group of children's spatial perception and spatial conceptual skills. Activities of this kind should be an integral part of teaching and learning programmes in the primary school.

The idea that children's spatial comprehension improves with age is supported by Sanford (1972) in Hall et al. (1991). Conducted in the U.S.A., Sanford's research shows that the capacity of the child to understand maps develops with age. Hence the approach of the teacher in teaching map work may well affect the child's ability to understand maps. From Sanford's study it further emerges that, generally speaking, by the age of seven, pupils can draw maps in plan or pictorial form but may not be able to use standard symbols. Relative scaling of 'larger than', 'longer than' and 'further from' can be appreciated by eight year olds and absolute scaling can be mastered at around eleven. At any age, pupils are better at reading maps than at drawing and interpreting them.

6.2 Foundations of Graphicacy

This section of the paper focuses specifically on theories of development which inform current practice, and in terms of which spatial perception and spatial conceptualization are the foundations on which graphicacy rests. Understanding graphicacy, according to Boardman (1983) in Wilmot (1998), requires an understanding of children's' perceptual abilities and spatial conceptual development toward higher thinking skills, specifically those that complement verbal processing skills.

Whilst most people may be able to 'see' and 'read' visual material as well as react to it, on another level they need to develop a critical understanding of it, and this requires instruction (Horten 1994 in Wilmot 1998). Despite this, visual literacy has remained a neglected area of communication in the school curriculum, perhaps because not enough is known about how to teach it (Dondis 1973 in Wilmot, 1998). Yet it seems that the many strategies for teaching literacy are applicable to the teaching of visual literacy (McGee and Richgels 1990 in Wilmot 1998).

The question of what mental skills are necessary to make sense of visual perceptions remains problematic. Wilmot (1998) fears that in attempting to teach certain technical skills, the underlying graphic skills might be neglected. The latter include spatial perceptual abilities and spatial conceptual understanding, which as mentioned above are seen as the foundations on which graphicacy rests.

6.2.1. Spatial Perception

Spatial perception relates to "how an individual perceives space" (Boltt and van Harmelen 1995). To geographers, space is an idea in the mind that permits the structuring of relationships between objects. Space is subjective and relative, depending on the way it is structured by the mind on a particular occasion. There is no objective or absolute space; rather, there are variations in the idea of space held by different people at different times. There are similarly considerable variations in the idea of space held by children at successive stages of their intellectual development (Boardman 1983).

Perception – according to Stern and Robinson (1994) in Moore and Dwyer (1990) – is "the gathering of information through our senses and the organizing of that information in order to create meaning". We learn by means of our senses, through visual and other forms of perception. In short, perception is the active acquisition of knowledge about the self and the world by making sense out of our experiences.

Spatial perception also relates to the spatial skills of an individual. Tartre (1990) views spatial skills as those mental skills concerned with understanding, manipulating, reorganizing, or interpreting relationships visually. In his review of spatial factors, McGee (1979) in Tartre (1990) distinguished two major types of spatial skills: visualization and orientation. Linn and Petersen (1985: 1484) in Tartre (1990) define spatial visualization as "those spatial ability tasks which involve complicated multi-step manipulations of spatially presented information". Guilford and Lacey, as cited by Schäfer (2003), describe spatial visualization as an ability to imagine:

- the rotation of depicted objects,
- the folding of unfolding of flat patterns,
- the relative changes of position of objects in space,
- the motion of machinery.

On the other hand, Thurston (as cited by Michael et al. 1957: 188 in Schäfer 2003) defines spatial visualization as an "ability to visualize a configuration in which there is a movement or displacement among internal parts of the configuration". Schäfer (2003) endorses the connection between visualization and movement, transformation and manipulation, and is strongly supported by McGee (1979:893), in Tartre (1990), who maintains that visualization tasks "all involve the ability to mentally manipulate, rotate, twist, and invert a pictorially presented stimulus object" (see also Kersch and Cook, 1979, in Tartre, 1990).

Spatial orientation, on the other hand, is seen by Thurstone (as cited by McGee 1979 in Schäfer 2003), as the ability to recognize the identity of an object when it is seen from different angles, while French (in Schäfer 2003) describes spatial orientation as the ability to perceive spatial patterns accurately and to compare them with each other.

McGee (1979:897) in Tartre (1990) offers a more elaborate definition: spatial orientation involves the "comprehension of the arrangement of elements within a visual stimulus pattern, the aptitude to remain unconfused by changing orientations in which a spatial configuration may be presented, and the ability to determine spatial orientation with respect to one's body".

While spatial visualization requires that all or part of a representation be mentally removed or altered, spatial orientation tasks do not require mentally moving an object. Only the perceptual perspective of the person viewing the object is moved or changed (McGee 1979, Connor and Sarbin 1980, and Kersch and Cook 1979 in Tartre).

Spatial development has been defined as our ability to navigate in our space: the capacity to perceive the world accurately and to recreate visual experience in the mind's eye (Fisher 1990 in Boltt and van Harmelen 1995). Catling (1987) in Boltt and van Harmelen (1995) suggested that all children are geographers by dint of their having developed the facility to navigate in space through their developing identity of place and time. The key here is the idea of development. The extent of a child's spatial development therefore depends on the spatial perceptual skills that comprise the ability to:

- recognize objects in the environment through recognizing and identifying relationships among shape, colour, size, pattern, texture;
- orientate ourselves in the world;
- achieve perceptual constancy (recognition that real objects are constant in shape, size, and colour, but that they may appear distorted when viewed from different perspectives);
- transfer 3-dimensional space into 2-dimensional form and vice versa;
- recognize depth and distance/proximity;
- identify perceptions of elevations including vertical/aerial, oblique and horizontal/normal views;
- identify and understand relationships of location/position, scale and size.

(Van Harmelen and Boltt in Schäfer 2002)

However, Van Harmelen and Boltt (1995), as cited in Kenyon (2002), have pointed out problems attending the notion of graphicacy. They link spatial perception with the extent of young children's ability to interpret and analyse pictures, and they regard spatial knowledge as essential in reproducing pictures: in other words, one should first understand the encoding process in order to understand the decoding process, the skill employed in the analysis of maps and diagrams.

Van Harmelen and Boltt discovered that Xhosa teachers might be deficient in skills relating to spatial perception because of being tied to their mother's backs as children and therefore not running around and exploring things. As a consequence of this childhood conditioning, they tend to have life-long problems with interpreting pictures. This has important implications for geography teachers from this community, as, it suggests that these teachers would not be able to explain the encoding and decoding processes involved in the analysis of maps, and therefore their learners would struggle with it.

6.2.2 Spatial Conceptualization

If spatial perception relates to how an individual 'sees' space, spatial conceptualization refers to how an individual 'understands' these perceptions (Yelon and Weinstein 1977, Grove et al. 1989, Wickens 1992, Atkinson et al. 1993, Golledge et al. 1995 as cited in Schäfer 2003). Tartre (1990), as cited in Vye (2001), on the other hand, views spatial conceptualization skills as "those mental skills concerned with understanding, manipulating, reorganizing, or interpreting relationships visually". Spatial conceptual skills, according to Wilmot (1998; 28), include the ability to:

- categorize and reduce the complexity of the environment;
- organize, categorize, structure/order and interpret/make sense of one's percepts of what objects are, where they are, and how and why they are such;
- identify, describe, analyze, explain, and justify objects and relationships of both a concrete and abstract nature; and

- acquire, organize, store, recall and decode information obtained about the relative location and attributes of objects and phenomena in the external environment, by means of a 'cognitive map'.

As cited in Vye (2001), Wilmot (1998) maintains that we cannot actually distinguish between spatial perceptual skills and spatial conceptual skills, since they do not operate in isolation but are interdependent and interconnected and therefore should be seen holistically. If spatial perceptual skills are poorly developed, an individual will not be able to develop spatial understanding. Conversely, if spatial conceptual understanding is poorly developed or lacking, an individual will not be able to utilize and apply spatial perceptual skills effectively. To communicate spatial information effectively in graphic form requires that an individual not only recognize and possess spatial perceptual skills but also have the ability to apply these skills. The latter requires spatial conceptual understanding. It also requires an appropriate level of hand-eye co-ordination and fine motor skills to execute a drawing (Wilmot 1998).

7. CONCLUSION

In this literature review an attempt has been made to offer a critical analysis of the theory informing the study by examining current views and practices regarding graphicacy as a form of communication. An inevitable inference from this process is that, while as teachers we all understand the skills relating to reading, writing and mathematics as forms of communication, only a few of us really understand the skills related to graphicacy as a form of communication and know how to teach them.

A general consideration of the graphic domain of communication led to a discussion of how to develop graphicacy alongside literacy and numeracy, and how to inculcate the skills required for its practice.

It was also deemed necessary to look into the role of education in communication, as well as the role of geography in developing graphicacy skills, by examining the function and value of illustrative material in the geography curriculum, concentrating on analyzing and developing an understanding of the graphic material used in

textbooks, both with regard to the teacher's role as an interpreter and the child's role as a learner.

Finally, in order to enhance the reader's understanding of the role of graphicacy as a mode of communication, emphasis was placed on the importance of spatial perception and spatial conceptualization as the essential foundations of graphicacy.

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RESEARCH PROPOSAL

RESEARCH PROPOSAL

FIELD OF RESEARCH: General Masters in Education, Theory and Practice

PROVISIONAL TITLE: Investigating student-teachers foundational competencies for teaching graphicacy in geography: A Case Study

CONTEXT

Examination reports (1997-2002) from the office of the Directorate of National Examinations in Namibia (DNEA), have shown that students often lose marks not only in a subject such as Geography, but also in other subjects such as History, Economics, Mathematics, and Physical Science, due to their incompetence to read and interpret questions that contain sketches, diagrams, graphs, maps, cartoons and photographs.

This is especially the case with papers that test the understanding, interpreting and decision-making skills of students. What teachers fail to realize is that exploring images within geography and other subjects would enable them to read a text by interpreting visual images, which would remove some of the barriers to the information that texts impose.

However, current trends in education have been that teachers are bombarded with the need for literacy and numeracy and with the demands that students be able to read, write and do arithmetic with the neglect of the visual and graphic aspect of learning. Wilmot (1998) argues that children of today live in a multi-dimensional world, and in order for them to survive, they should be able to communicate effectively in it.

Balchin in Fien et al. (1984), describe four complementary modes of communication in which all students need to develop, i.e., oracy, literacy, numeracy and graphicacy. Communicating in graphic form (Wilmot 1998) requires the ability to both encode and

decode spatial information using symbols, which require both the utilization and application of spatial perceptual skills and concepts.

Since Geography is a 'discipline in space', maps are viewed as an essential tool of the geographer (Nightingale in Hall et al., 1991:26). Hurry (1991) concurs with Nightingale in Hall et al. (1991) that children should learn to understand and analyse material presented to them by means of a variety of different types of maps, graphs, and other statistical diagrams, tables, sketches, cartoons and photographs. Both of these authors are of the opinion that map reading and map interpretations as a form of graphicacy should be taught, not simply as skills but as a means of representing and analysing information about particular ideas. They therefore suggest that a wide range of graphical and cartographical skills could be taught.

Graphicacy is defined as the ability to understand and present information in the form of sketches, diagrams, photographs, maps, plans, charts, graphs, and other non-textual, two-dimensional formats (Wilmot 1998:20). Graphicacy is concerned especially, but not wholly, with spatial relationships such as those found as in maps. It also uses spatial relationships, usually in 2D but sometimes also in 3D, to portray other kinds of relationships, such as time scales, rates of change, derivatives, and abstractions (Balchin and Coleman 1965). Thus, graphicacy involves the interpretation of or communication through images or relationships that cannot be successfully communicated through words.

Balchin and Coleman (1965:82) view graphicacy, oracy, literacy, and numeracy as the four 'aces' in the pack. Wilmot (1998) suggests that every child needs to be taught how to utilize these skills; while Boltt and van Harmelen (1993) suggest that without these skills a child's education is incomplete. Unlike literacy, graphicacy is rarely taught explicitly, despite its power and ubiquity. (Benjamin in Boltt and Van Harmelen 1993) However, curricula continue to pay little attention to graphics training.

Understanding graphicacy according to Boardman in Wilmot (1998) requires an understanding of children's spatial perceptual abilities and spatial conceptual development in order to develop higher level thinking skills specifically those that complement verbal processing skills. Spatial perception and spatial conceptualization are regarded as the foundation on which graphicacy rests.

Van Harmelen and Boltt (1995) link spatial perceptions and the ability to which young children interpret and analyse pictures with the extent of a child's spatial development. Graphic competencies therefore depend on the spatial perceptual skills that comprise the ability to recognize objects in the environment through recognizing and identifying relationships among shape, color, size, pattern, texture; transferring 3D space into 2D space and vice versa; and the ability to identify and understand relationships of location/position, scale and size (Van Harmelen and Boltt in Schäfer 2002).

Spatial conceptualization specifically refers to how an individual 'understands' these perceptions. Tarte in Vye (2001), on the other hand, views spatial conceptualization as those mental skills concerned with understanding, manipulating, reorganizing, or interpreting relationships visually.

Since spatial perceptual skills and spatial conceptualization skills are viewed as interdependent and interconnected, by Wilmot (1998), she argues that if spatial perceptual skills are poorly developed, an individual will not be able to develop spatial understanding. Conversely, if spatial conceptual skills are poorly developed or lacking, an individual will not be able to utilize and apply spatial perceptual skills effectively. To communicate spatial information effectively in graphic form requires an individual not only to recognize and utilize spatial perceptual skills but also to have the ability to apply these skills.

RESEARCH GOALS AND OBJECTIVES:

The goals of this study are to investigate:

1. the extent to which student teachers are able to utilize and apply spatial perceptual skills and concepts, and to;
2. observe the development of their understanding to communicate spatial information effectively in graphic form.

With a view to extending the research to

1. examine and evaluate methods and tools to improve the interpretation of various forms of graphicacy, in order to
2. develop their understanding to communicate spatial skills effectively for developing children's competence in understanding and interpreting maps, photographs, graphs and cartoons etc.

RESEARCH METHODOLOGY

To meet the goals and objectives of the above statements I will first do a literature survey of current views/practices on graphicacy. For my research design, I decided to take a lead from the research question and the contextual realities of my situation and make decisions of the method based on these.

The research is located within an interpretative research paradigm. Interpretivism means that one seeks to describe what they see happening in a particular situation and creates a narrative of what is happening by affording a researcher an opportunity to understand the situation of the phenomenon by putting him/herself in the shoes of his/her subjects. Thus this approach is subsumed in the qualitative framework in which values would become an integral part of the study in terms of participants' experience and the understanding of it by the researcher as well as to provide the depth and the complexity of detail needed in the evaluation (Adler and Adler 1987, Cantrell 1993).

The method of the research will be a case study. I intend to carry out my research at the institution where I am lecturing by involving my second year student teachers. I will use this group as my research subjects since involving one group only will allow me to go into more depth than breadth. Flake (1995), as cited by January (2000), maintains that the essence of a case study is particularisation, not generalisation, hence the decision for involving my second year students only.

Using the case study method will also allow for an in-depth search for, and an understanding of, recurring patterns of events and the collection of data in a context-specific situation (Adler and Adler 1987, Robson, 1993). The idea is that a specific case is focused on in order to know it well.

RESEARCH TECHNIQUES

Case study research has no specific methods of data collection or of analysis, which are unique to it as a method of enquiry. It is an appropriate strategy for answering research questions which ask how and why and which do not have control over events (Winegardner 2001). Using the case study method will also allow for an in-depth search for, and an understanding of recurring patterns of events and the collection of data in a context-specific situation (Adler and Adler 1987, Robson, 1993). The idea is that a specific research subject is focused on in order to know it well.

The most appropriate method for me to use in this case is to concentrate on a focus group by using classroom observations over a period of five sessions, followed by a set of diagnostic activities that represent key skills and capacities as set out in the geography syllabus that they are expected to teach.

The inclusion of a questionnaire for the provision of additional data would be considered useful in this study. Questionnaires can be very useful for data when doing research. The primary reason for choosing questionnaires relates to its potential to elicit first hand information such as knowledge, perceptions, beliefs and attitudes on a specific item from

the respondents. A key element in questionnaire use is that they can be designed and structured to suit specific needs and purposes. They may, with imagination and due cognisance of validity and reliability considerations, be used in very flexible ways.

A pilot study will be conducted with a sample consisting of three second year students "since it is crucial that an appropriate focus question to be asked, a pilot study is often adjunct to the main endeavour" (Stones in Kruger 1988:151). This is consistent with Johnson in Swarts (1998) that a pilot study tries out the research tool on respondents who would be eligible to take part in the main study. The purpose of the pilot study is to help identify obvious flaws in both the instruments and the method so that the researcher can redesign the questionnaire if deemed necessary.

PROCEDURE

First of all, a meeting will be scheduled with the participants in order to give a short introduction of the study. This research will be done in three phases.

Phase one

Classroom observations will be done over a period of five sessions in order to observe the students' classroom behaviour during lesson presentation as well as to establish the extent to which they show recognition of linking prior learning to new learning. To supplement the observations a set of activities will be given to them that include the following:

1. a topographical map,
2. a few graphs,
3. a sketch map of part of a town including a street map,
4. two cartoons, and
5. a photograph

Students will be asked to complete the activities given to them by interpreting these forms of graphicacy. The purpose of this activity will be done in order to investigate the current status of the students understanding and interpreting skills in graphicacy.

Phase two

The first research activity will be followed by a questionnaire to be filled out by the participants. This activity will shed some light on the foundations laid during their primary and secondary phases at school level to compliment the above findings.

Phase three

If deemed necessary, a structured interview will be conducted, which will be based on the information and insights acquired form the statistical and content analyses of the activities and questionnaires to follow up on issues that will surface from the analysis. Sherman and Webb in Swarts (1998) indicate that the interview can help the researcher to see situations through the eyes of the participants.

DATA ANALYSIS

Data analysis will be conducted as an activity simultaneously with data collection, data interpretation, and narrative report writing by using qualitative data techniques by looking for naturally occurring units and reducing them to natural meaning units to check for regular patterns of events and themes (Stones 1998, Robson 1993, Cantrell 1993).

Data will be carefully examined and re-examined in order to find constructs, themes and patterns that could be used to describe the phenomenon to be studied (Gall in Holmarsdottir 2000). In short, the researcher takes a voluminous amount of information and reduces it to certain patterns, categories, or themes and then interprets the data by using some schema. The key words, sentences and paragraphs will subsequently be identified and coded by identifying and classifying major ideas that emerged (Strauss & Corbin in Holmarsdottir 2000).

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EMPIRICAL STUDY

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ABSTRACT

Why is it that so many students arrive at the College with apparently little experience of visual communication? What are the basic graphical and cartographical skills needed when students arrive at tertiary institutions? This paper will strive to answer these questions by focusing on a set of diagnostic activities that represent key skills and capacities in the geography syllabus that Junior-Secondary Geography student teachers are expected to teach, of which the most essential and neglected is graphicacy.

1. INTRODUCTION

One of the aims for Social Sciences Education in the Basic Education Teachers Diploma (BETD), as established in Namibia by the National Institute for Educational Development (NIED 2001:4), is to enable learners to "acquire communicative, numerical, graphical, intellectual, social and moral skills, which would be used in solving problems individuals may face in their lives". This aim does not appear to have been achieved because examination reports (1997-2002), from the office of the Directorate of National Examinations and Assessment (DNEA), in Namibia have shown that students often lose marks not only in a subject such as Geography, but also in other subjects such as History, Economics, Mathematics and Physical Science, due to a lack of competency in reading and interpreting questions that contain sketches, diagrams, graphs, maps, cartoons and photographs.

This is especially the case with papers that test the understanding, interpreting and decision-making skills of students. What teachers fail to realize is that exploring images within geography and other subjects would enable them to read a text by interpreting visual images, which would remove some of the barriers to the information that texts impose.

However, current trends in education have been that teachers are bombarded with the need for literacy and numeracy with the demand that students be able to read,

write and do arithmetic with the neglect of the visual and graphic aspect of learning. Wilmot (1998) argues that children of today live in a multi-dimensional world, and in order for them to survive, they should be able to communicate effectively in it.

This paper is based purely on a series of diagnostic activities that represent key skills and capacities in the geography syllabus that these students are expected to teach, of which the most essential and neglected is graphicacy.

This research paper is a small- scale study that forms part of a bigger program aiming at developing student teachers' understanding and of spatial concepts and skills underpinning graphicacy so that they can communicate spatial information effectively in graphic form. It is expected that it will give them guidelines in developing children's competence in understanding and interpreting maps, diagrams, graphs, photographs and cartoons.

All of the above require graphic skills that will enable the student teachers to mediate learning in geography. Until we are fully aware of the student teachers' levels of competence in terms of the primary skills and techniques they are expected to teach, we are unable to remediate. Hence the main purpose of the larger study is to analyse the student teachers capacity to interpret maps as a means to illustrate and identify the key problems they experience in this crucial dimension of geography in order to remediate learning.

2. THE RESEARCH CONTEXT

2.1 Site of the study

The research included a small-scale interpretative study. I decided to carry out my research at the institution where I am lecturing by involving my nine second year student teachers. The reason for focusing on this group as my research subjects is that smaller groups allow the researcher to probe deeper since they are usually manageable thus it allows for individual attention of specific aspects of the research as Flake (1995) (as cited by January 2001) argues that the essence of a

case study is particularisation, not generalisation, hence the decision for involving my second year students only.

This is a case study. A case study is an appropriate strategy for answering research questions which ask how and why and which do not have control over events (Winegardner 2003). Using the case study method will also allow for an in-depth search for, and an understanding of recurring patterns of events, and the collection of data in a context-specific situation (Adler and Adler 1987).

I considered that most appropriate approach to use in the section of the study reported on in this paper would be to concentrate on a focus group by using classroom observations over a period of five sessions, followed by a set of diagnostic activities that represent key skills and capacities as set out in the geography syllabus that students are expected to teach.

2.1 Selection of the respondents

The reason for concentrating on this group is due to the way that the BETD programme is structured. It is a three-year programme consisting of nine terms. Terms one and two form part of the foundation block that is an introduction to the programme. As from term three (year 2) onwards students move into their specialization phase. During this period lectures should provide these student teachers with the skills necessary to become competent teachers in their various fields of specialization.

3. RESEARCH METHODOLOGY

3.1 The research paradigm

Methods used in research processes are multiple and many of them can be used under different paradigms. Durrheim (1999) points out that it is important for researchers to recognize that their research is embedded in a paradigm and that the research design is to be coherent.

Bassey (1995:12) defines a research paradigm as:

A network of coherent ideas about the nature of the world and the functions of research which, adhered to by a group of researchers, conditions the patterns of their thinking and underpin their research actions.

I have decided that the most appropriate method for my research would be the interpretative tradition based on Bassey's (1995:12) description of this tradition as:

> ... a search for deep perspectives of particular events and for theoretical insights. It may offer possibilities, but no certainties, as to the outcome of future events.

This simply means that one seeks to describe what he/she sees happening in a particular situation and creates a narrative of what is happening so affording the researcher an opportunity to understand the situation of the phenomenon by putting him/herself in the shoes of his/her subjects.

3.2 RESEARCH TECHNIQUES

Data has been selected through participant observation in the classroom followed by a set of diagnostic activities to test their ability to analyse and apply the particular skills embedded in the activities (see page 20). Murray (2003) refers to skills as the tools for learning. She furthermore refers to tools as enabling mechanisms for how we learn, rather than what we learn. Student teachers need to be aware of these tools as well as knowing the content of learning. It is furthermore necessary that teachers' quire theios 'tools' themselves if they are to teach them effectively.

3.2.1 Observations

What the teacher says and does in the classroom is observable. Researchers such as Anderson (1990) and Creswell (1994) suggest that the direct observation of the participants is one of the distinctive characteristics of qualitative research. In using participant observation in this part of the study the main purpose was to observe the students' classroom behaviour during lesson presentation and

classroom activities (including map orientation, use of scales, distance, coordination (using longitudes and latitudes to locate a place, calculation of time) over a period of five sessions in order to establish their own abilities in relation to the set activities. My decision was based on the fact that because observations take place over a an extended period of time, the researcher can develop a more intimate and informal relationship with those he is observing, generally in more natural environments than those in which experiments and surveys are conducted (Cohen and Manion 1989).

3.2.2 Activities

The analysis of examination question papers (grade 10), reveals that the most common skills tested in graphicacy include landscape drawings; horizontal, oblique, and vertical aerial photographs, ortho photo maps; satellite images; graphs; plans; diagrams; models; cartoons; and maps.

Geography teachers use a large range of materials including maps, graphs, photographs, flow diagrams, and drawings in their lessons. Through these lessons, learners should develop skills and abilities which are common to many other subject areas, such as observations, recordings, information processing and communication skills, of which graphicacy is of particular importance.

Given the inventory of skills needed, (please see page 20 for a list of the skills), the six activities provided for my students were developed within the grouping indicated above. The selection of the activities used in this research was based on previous grade 10 examination practical papers. The data collected was then analysed both quantitatively and qualitatively.

3.2.3 DATA PRESENTATION

Quantitative and qualitative approaches are part of the descriptive research. The main difference between the two approaches is that while quantitative approach uses numbers in analysing data the qualitative research describes its data without

numerical expression. It is imperative that when analysing qualitative data the initial task is to find concepts that help "make sense of what is going on" (Hammersley & Atkinson 1995: 209). In the same vein variables and procedures are important for quantitative analysis.

In this study the data were analysed by presenting the information in two traditions. The first tradition makes use of the matrix that will cover the first three activities. Miles and Huberman (1984) support the idea of displaying the information in a spatial format that presents information systematically to the reader. These displays are tables of information known as a process of segmenting the information in order to develop and generate categories, themes, or patterns (Marshall & Rossman 1989).

Secondly, I would like to present the open responses given by the group by making use of Natural Meaning Units that will cover the last four of the activities (NMU's). Cloonan as cited in Cloete (2002:43) defines Natural Meaning Units as:

> a statement made (by the subject), which is self defiable and self-delimiting in the expression of a single, recognisable aspect of (the subject's) experience.

These meanings are then transformed by the researcher in his/her own words to describe the essence of the experience for the subject in whom the researcher strives to synthesize and blend the transformed meaning units into a descriptive statement (Polkinghorne 1989).

4.1 OBSERVATIONS.

During my observations I noted that most of my students could not perform the exercises given to them during and after lesson presentation. I constantly had to repeat lessons and assist them with these exercises including map orientation, scales, distance, (coordination) using longitudes and latitudes to locate a place, calculation of time), over a period of five sessions in order to establish the extent to which student teachers are able to utilize and apply spatial perceptual skills and

concepts. The reason for concentrating on specific activities given was based on results that emerged from the observations.

The next section deals with an analysis and discussion of data obtained from activities that had been given to them. The data obtained from the various activities was analyzed and discussed both in terms of the students' ability to recognize and utilize the relevant skills and the efficiency with which they were able to apply the skills to the task at hand.

5. DATA PRESENTATION AND ANALYSIS

Data were carefully examined and re-examined in order to find constructs, themes and patterns that could be used to describe the phenomenon be studied (Gall in Holmarsdottir 2000). In short, the researcher takes a voluminous amount of information and reduces it to certain patterns, categories, or themes and then interprets the data by using some schema (see table 5.1.1).

5.1 The contour map.

This task was designed to elucidate the skills utilized when interpreting and analysing maps. This activity required the students to utilize a number of spatial skills namely:

- the ability to show reversibility of 3-D shapes in 2-D form;
- the ability to recognize the folding and unfolding of flat patterns;
- the ability to identify and understand relationships of location/position, scale and size;
- the ability to recognize depth and distance/proximity

In order to perform the task, the students needed to recognize spatial characteristics, to utilize and apply the skills listed above and to understand the spatial concepts associated with these skills.

5.1.1 Results

Table 5.1.1 presents results of activity one.

Question/Activity	Number of correct responses	Number of incorrect responses	No response at all	Total
1. To identify map	9	0	0	9
2. Vertical Interval	1	4	4	9
3. Types of slopes:				
(i)	0	7	2	9
(ii)	0	5	4	9
(iii)	0	5	4	9
4. Types of landforms:				
(i)	0	8	1	9
(ii)	0	8	1	9
(iii)	0	8	1	9
5. Main stream with all tributaries	0	7	2	9

Table 5.1.1 highlights the problems my students encounter as future geography teachers. First of all, students are familiar with this type of map since all of them could recognise the map as a contour map. The problem seems to be reading and interpreting the map. Only one of them could tell what the vertical interval of the map is. Four of the nine gave incorrect answers while the other four did not give a response at all. This illustrates that they either do not know how to calculate the vertical interval, or that they are not familiar with this concept, since the word contour interval is more common in our schools.

It was also interesting to notice that none of these second year college geography students could successfully complete the exercise of identifying slopes on a contour map. The fact that some of them attempted to answer these three sub questions under question three, indicates that this must have been dealt with at school level, but I'm concerned about those who did not respond at all. The same problem appeared when they were asked to identify the landforms types on the map. Although eight of the respondents tried to identify the landforms, none of them was correct while one did not respond at all. None of them could draw in rivers with tributaries.

As mentioned above, the fact that all students could identify the map as a contour map reveals that they had been exposed to map work at school level. However, it is the extent to which they utilize it as a useful means of representing and analysing information presented on these maps that actually matters. My findings following this activity showed that students could not really interpret and analyse this map since none of them could identify landforms, not to mention drawing in rivers.

I believe that this could be traced back to the extent to which they were exposed to a range of graphical and cartographical skills at school level. This gives me the idea that understanding graphics is not 'natural' but rather depends on prior knowledge. Based on the results and responses given by the students, it is quite evident that the ability to use maps of different scales requires not only careful teaching of basic procedures but a deeper conceptual understanding of the ideas underpinning these and other apparently simple tasks.

5.2 Graph interpretation

This task was designed to shed light on skills utilised when reading and interpreting graphs. This activity required the students to utilize skills needed in the interpretation or the communication through graphic images.

In order to perform the task, the students needed some knowledge and understanding of graphic language used, of the phenomena presented in the graphic representation as well as practical skills of being able not only to read and understand graphic representation but also to be able to link the graphic representation with the underpinning mathematics. As this activity also investigated the extent to which students are able to access information from and to communicate through; processing, analysing and evaluating statistics and measuring and applying number systems in the context covered.

5.2.1 Results

Table 5.2.1 presents results of activity 2

Question/Activity	Number of correct responses	Number of incorrect responses	No response at all	Total
1. Range on January 6.	6	2	1	9
2. Relative humidity on January 5.	5	4	0	9
3. Day with highest air pressure.	4	5	0	9
4. Rainfall measured on January 9.	0	9	0	9

This activity seems to be better answered. This activity deals with graph interpretation. Four graphs were given to them for interpretation illustrating different aspects of weather.

Six out of the nine candidates could calculate the temperature range on the 6th of January, two responded incorrectly and one did not respond at all. For question three of the activity where they were asked to name the day with the highest air pressure the results are as follows: five correct responses and four incorrect responses. Calculating and interpreting numbers is also of great concern since none of them could give a correct answer for rainfall measured on January the 9th. This is a very critical component of the study. Student teachers should demonstrate the ability to calculate so that they understand map interpretation such as calculating the true north from the magnetic north. Without mathematical capacity, the teachers to be will not be able to impart such knowledge to learners. Although through geography children should learn how to understand and analyse material presented to them by means of a variety of different types of graphs and other statistical diagrams, tables and sketches, what has emerged from this activity reveals that students struggle with basic mathematic calculations such as working out the range as well as with interpreting these graphs.

This also indicates that we as geography teachers fail to realize that geographical theory often appears to be mathematical and is sometimes linked to mathematical language as in the case of the activity being given. This indicates that students

should not only read and understand graphic representation but should also be able to recognize that relationship between spatial visualization and mathematical performance.

5.3 Map orientation

This task was designed to illuminate the skills utilised when interpreting and orientating maps. This activity required the students to utilize a number of spatial skills namely:

- recognize the "right way up' of objects; the ability to orientate themselves in the world and to orientate objects in relation to themselves and/or other objects;
- recognize the relationship between spatial visualization and orientation factors;
- the ability to identify and understand relationships of location/position, scale and size;
- the ability to recognize depth and distance/proximity

In order to perform this task, the students needed to orientate figure 1b, which illustrates a map drawn from figure 1a. This spatial orientation activity does not require the student to mentally move the object only the perceptual perspective of the person viewing the object should be changed or moved. It involves the comprehension of the arrangement of elements within a visual stimulus pattern and the aptitude to remain unconfused by the changing orientation in which a spatial configuration may be presented.

5.3.1 Results

Table 5.3.1 presents results of activity 3.

Question/Activity	Number of correct responses	Number of incorrect responses	No response at all	Total
1. Name of street marked A in fig. A	5	4	0	9
2. Building marked b in fig. B.	8	1	0	9
3. Position on fig. B from which photo was taken in fig. A.	7	2	0	9

4. Direction from which photo was taken.	6	3	0	9

For the activity on map orientation as shown in table 5.3.1 above the following emerged. This activity seems to be the best answered since all of them tried to respond to all sub questions irrespective of whether they were correct or not. It is quite interesting to notice the responses given for questions one and two that involve the same skill but use different representations.

Only five of the candidates could identify the name of the street marked A in map a, compared to eight of them who could identify the building marked B in map b. It is also quite strange to see that most of them could determine the position from where the photo was taken (7) as well as to give the right direction from where the photo was taken (6), compared to five of them who could identify the name of the street marked A in map A.

This to me is an indication that some of them could utilize various kinds of graphical data needed in order to understand and locate places that are presented graphically. This is also an indication that more time should be spent on the way students perceive their environment and to develop activities in such a way that a child needs to move from 3-D (mental) representations to 2-D and vice versa (Van Niekerk 1994). An activity that would fit in perfectly for developing their sense of location, direction and orientation, is making use of cognitive mapping (Catling 1978) whereby students should be taught to utilize various kinds of graphical data to locate not only places, but to understand the information that is represented graphically.

The next three activities will be presented and analysed via Natural Meaning Units (qualitative).

The key words, sentences and paragraphs were subsequently identified and coded by identifying and classifying major ideas that emerged (Strauss & Corbin in Holmarsdottir).

5.4 Pictures: Cartoons

This task was designed to explicate the skills utilised when interpreting and orientating maps. The activity required the students to utilize a number of spatial skills namely:

- the ability to both encode and decode spatial information, including reading and interpreting pictures and cartoons;
- the ability to utilize some form of symbolic language to convey information expected to make the necessary links in order to decode information from both pictures and cartoons;
- the ability to utilize spatial conceptual skills to understand the ideology behind what they are seeing and whether they would be able to extract the main points about these pictures.

In order to perform this task, the students needed to analyse and understand the ideology behind the pictures as creative thinkers to look beyond surface expression and seek hidden information.

The natural meaning units for the respective participants are presented in table form in the left side, with transformations of the responses in the right hand column. In short, the description aims to explicate the meaning that dominates the Natural Meaning Units.

5.4.1 Results of activity 4, which shows one of the causes of land

1. What is the message of the cartoon?

STUDENT RESPONSE	INTERPRETATION
R 1: How people use cattles to digrate their lands.	The keeping of cattle promotes land degradation.
R2: The cartoon shows a farmer encouraging his cow to eat up the land as quick as possible because he is afraid that land must be used up by others.	The farmer would rather let his animals deplete the resources before others do.
R 3: It showing the scarce of water. Animals need water while a farmer try to dig deep in the soil.	The spade indicates that the farmer desperately digs for water, which is such a scarce source.
R4: The animal should produce manure	Manure is essential for the land.

for the land.	
R 5: Owners of animals should not mishand their animals.	The farmer is mishandling his animals.
R 6: Sustainable development, because if we build our house everywhere there will be no place for animals to graze.	There should be space for animals to graze.
R 7: There is no trees to be used for fire wood due to land degradation that's why this man is telling the cow to hurry up, probably for the cows manure, too keep the fire going. (This response was scratched out by the student after having been written down).	Animal manure is used as form of energy.
R 8: It says that the man wanted to clean up the mess.	The man wants to clean where his cow has messed.
R 9: The person behind the cow is taking the cow dung to use as a manure while is needed to fertilize the land.	Animal dung is used for energy instead of fertilizer for the land.

As seen from the above table all nine of the respondents attempted to answer this question. Various responses were given on how they as individuals interpret this picture. It is hard to say that all of them were wrong, but we should also be realistic about what the picture really illustrates. Students were supposed to be guided by the verbal expression given in order to make a link between the action illustrated and the link with geography. This also illustrates the integratedness of subjects since this could be a typical question for a Life Science question paper.

It also to a certain extent demonstrates their incompetence to read the picture by focusing on the content and so retrieving the message hidden behind the ideology. The fact that all the students responded, can be attributed to the idea that mathematical competency is needed for map interpretation while visual interpretation does not require it. It can be safely argued that the instruction received by the students at high school level did not emphasize much on mathematical competency for geography or human sciences in general and this places student teachers in a disadvantage where map reading is concerned.

It also shows that visual interpretation is an idiosyncratic experience and thus the whole sample population responded because each one interpreted the visuals from

their own perspective without the inhibitions that are usually presented by the need for mathematical principles.

2. **Explain how the act illustrated in the cartoon can cause the degradation of land.**

R 1: No response	No response.
R 2: This may cause land degradation because the cow will start eating up at a high pace and by this the land will be degradated	The depletion of resources will end up in land degradation.
R 3: The land will be not formal as erosion will occur cause by digging up in the land.	Digging holes in the land leads to erosion.
R 4: Too many animals would fertilize the land with cow dung.	Many animals can fertilize the land by making use of their dung.
R 5: If the man do not move the rubbish it will root and soil be harmed.	Animal dung should be removed otherwise it will rot and can harm the land.
R 6: Because the animals will just go for are place where they can find little food.	Animals usually move to place where they can find grazing.
R 7: No response.	No response.
R 8: The degradation of land will be dirty.	Land degradation can spoil the environment.
R 9: Planting of trees- people often take cow dung and use it for plantation in this process the dung which has to fertilize the soil is taken, also there is overgrazing caused by this animal.	Animal dung should be used as fertilizer to grow crops. Scarcity of food cam lead to overgrazing.

Only three of the respondents could make a link between the message of the cartoon and how it is linked to their subject knowledge. Other responses are also to some extent linked to geography but not within this context. The main concern in this activity to me is the fact that two of the respondents did not attempt to write anything at all. The question to me is did they do it at school level and to what extent? Have they been taught how to read pictures without being subjective and relying on their prior knowledge?

5.4.2 Results of activity 5 that show how migrants are discriminated against in foreign countries.

1.What is the message in the cartoon?

R 1: How people who migrate suffer in getting accommodation and work in cities.	Migrants usually experience problems in the new country.
R 2: These show how people from other countries come as either a tourist or as investors (doing business in other countries).	Migrants from other countries come either as tourists or investors.
R 3: Immigration and overpopulation as well as lack of houses and unemployment.	Immigration can lead to overpopulation that can cause problems such as lack of houses and unemployment.
R 4: "Overpopulate in areas, lack of enough places for all".	Lack of space. Some areas are overpopulated.
R 5: Every one is looking for help, and everytime they are being denied. 'help others'.	People need assistance but in vain.
R 6: The message is overcrowding or overpopulation in towns. People want accommodation but there is no accommodation.	Overpopulation results in lack of accommodation.
R 7: Probably, the fact that it can be that its showing a sign of discrimination when … .(This response was scratched out afterwards).	Immigrants are usually discriminated against in the new country.
R 8: The Turkish man is looking for a flat to let, and other are looking for a job.	Some are looking for accommodation like the Turkish guy, while others are for jobs.
R 9: The cartoon is about the migrant workers across Europe that moves in high number from Turkey to industrial part of Germany.	Flocking of migrants into Europe especially from Turkey and Germany.

My findings following this activity are that most of the time we assume that should such a familiar picture like the one in the activity above be put into an examination question paper, students would score high marks since it appears to be common knowledge. It actually surprises me to discover that again like in the case of the previous activity students could make the link, however some of them still failed to use both the image and the content to make meaning and put it in the rightful context. That they have the subject knowledge is not questionable, how to use and apply it seems to be the biggest problem.

It is quite evident that some of these students had been exposed to such activities and that they could easily rely on prior knowledge in interpreting and analysing it. However, it is rather the way in which they make meaning of it that should be attended to. I absolutely concur with Hodge and Tripp in Kenyon (2002) that they are indeed familiar with looking at pictures. They show an understanding of it, but at a very superficial level.

The actual problem seems to be the message behind these images and the failure to extract the main ideas behind images/pictures. It seems as if teachers tend to teach pictures without focusing on the content (Kenyon 2002). According to Kenyon (ibid), a learner will give a literal account for a picture fairly easily if they do not have any content knowledge. This results in poor scores, as they will not be looking at the same image with their subjectivity.

5.5 Pictures: Photograph

This task was designed to explicate the skills utilised when reading and interpreting pictures (photographs). This activity required the students to utilize the following spatial skills namely:

- the ability to recognize size, pattern/detail, perspective, scale, fore-ground orientation, spatial relationships;
- the ability to understand what is recognized by discriminating, analysing, judging, and evaluating spatial information in a picture – spatial conceptual understanding;
- the ability to scan for specific information and to link it to prior experience;
- the ability to describe and express what is observed in written mode of communication.

In order to perform this task, the students needed to show an understanding of the interaction between people and their physical and human environment as geography seeks to explain the relationship/interaction between these two dimensions within a conceptual framework.

5.5.1 Results of activity 6 which show a picture related to subsistence farming.

1. What do you see on the photograph?

R 1: A man with two cattle in a crop field.	The man with his cattle in a crop field.
R 2: I see a big boy with oxen plaughing the field.	A boy ploughing the field with his oxen.
R 3: A men with two oxen and green vegetation.	A man with his oxen in a green area.
R 4: Guy using animal power for transport.	Person using his animals for transport.
R 5: A boy and two oxes, ploughing the field.	A boy ploughing the field with his oxen.
R 6: A boy ploughing the field with oxens and woods and some trees.	A boy ploughing with his oxen as well as wood and trees.
R 7: Cows ploughing.	Using cattle for ploughing.
R 8: The boy is ploughing with the oxen.	A boy using his oxen to plough.
R 9: A typical Indian farmer plough in sugar plantation using animal as ploughing machine.	An Indian farmer using his animals to plough a sugar plantation.

The above-given results of the activity seem to be the best answered. Students could identify what is shown on the photograph, but missed out on the detail being given in the background. This is also an indication that they immediately link what they've seen in the photograph with their prior knowledge. It also demonstrates that although all of them could see the boy with his cattle, they differ in their skills of interpreting the picture as per responses given above.

1. Is there a link between the photograph and geography?

Responses: Yes 9 No 0

2. Why?

R 1: The picture deals with agriculture and agriculture is part of geography.	The link between geography and farming.
R 2: Because when this boy have to plant his garden he have to know his rainy seasons in which to plant in and he will only know this when he knows geography.	The link between geography and climate.
R 3: Because geography is a subject which deals with vegetation, agricultural system and environmental issue.	The link between geography and the environment
R 4: Animal power can be used to transport	The link between geography and the use of

goods, of even for planting purposes to grow food and satisfy eradicate poverty.	animals for transport purposes. Also animals can be used for agriculture to uplift standards of living.
R 5: Geography also has to do with the environment, crop farming and that is what is being illustrated.	The link between geography and farming.
R 6: Because geography teaches us how to sustain our land when we are ploughing. To keep it productive and not to cut down trees as we see them in the photograph.	The link between geography and sustainability.
R 7: Simply because I think ploughing is linked to agriculture and agriculture is dealt with in geography.	The link between geography and farming.
R 8: It links in different types of land use now this photograph represent the agricultural land use.	The link between geography and farming.
R 9: Because plantation or growing of food has often led to many trees cleared for cultivation leaving baren areas open to soil erosion and degradation. Because the cultivation activities are affected by the weather condition which are done in geography.	The link between geography and farming. Clearing land for growing food crops which results in soil erosion and land degradation.

The idea behind this activity was to identify what the students considered to be of interest in the photograph, they way they analyzed it, and what prior knowledge they brought to the situation. It appears that they were familiar with looking at photographs whatever their educational background.

The way the photograph was interpreted and the links made to their subjectivity proves, according to Boltt and Van Harmelen (1995), that these students linked it to prior experiences in their own world situation. It is the way we as educators look at it that made me realize that we actually lose out on a wealth of knowledge that they could bring to the learning situation based on their educational background. Equally important is how we relate such an activity to their conceptual understanding or misconceptions about graphic images.

The concern, according to Boltt and Van Harmelen (1995), however, is the extent to which we as educators are able to unpack the 'baggage' and misconceptions that learners bring to the learning situation. This would enable us to "look in the

minds of our learners" to uncover in more depth how we can use those experiences, values and concepts to our own advantage in the teaching profession.

6. DISCUSSION OF FINDINGS

In this section I shall discuss the main findings of the study and attempt to link them to the research questions that directed the data gathering and analysis. This small-scale study as indicated earlier forms part of a bigger program that aims at developing student teachers' understanding and communication of spatial information effectively in graphic form. It endeavors to give them guidelines of developing learners' competence in understanding and interpreting maps, diagrams, graphs, photographs and cartoons which all form part of graphicacy.

Hence the main purpose of this study is to analyse student teachers' ability to interpret graphic images as mentioned above as a means of illustrating and identifying key problems that they experience in mediating. The main findings of this study will be presented in the form of a matrix regarding the skills of my students in understanding and interpreting graphic images.

6.1 MAIN FINDINGS

Table 6.1.1, below summarizes students' abilities to utilize 'tools' when doing these activities.

Table 6.1.1

	SKILL	EXTENT OF STUDENTS ABILITY TO UTILISE SKILLS in %				
		100-80	79-60	59-40	39-20	19-0
ctivity 1	1. The ability to show reversibility of 3-D shapes in 2-D from.					√
	2. The ability to show the folding and unfolding of flat patterns.					√
	3. The ability to identify and understand relationships of location/position, scale and size.					√
	4. The ability to recognize depth and distance/proximity.					√

	5. The ability to recognize the relationship between spatial visualization and mathematical performance.					√
tivity 2	1. The ability to recognize the relationship between spatial visualization and mathematical performance.			√		
tivity 3	1. The ability to recognize the right way up of objects, the ability to orientate themselves and/or other objects.		√			
tivities 5 & 6	1. The ability to utilize some of the symbolic language to convey information expected to make the necessary links in order to decode information from both pictures and cartoons.			√		
	2. The ability to utilize spatial conceptual skills to understand the ideology behind what they are seeing and whether they would be able to extract the main points about these pictures.			√		
	3. The ability to describe and express what is observed in written mode of communication.		√			

The table above illustrates a summary of the basic skills students are expected to be equipped with when entering the College as student teachers that specialize in Geography. It is the role of the student-educator to develop these skills on a higher level in order to produce quality teachers. However, the table above illustrates the extent to which student teachers are able to make meaning and utilize these skills in order to facilitate learning in geography. Therefore, it is essential that student teachers acquire foundational knowledge of spatial perception and the skills and concepts that underpin graphicacy, to enable them to facilitate learning in various areas.

The problems encountered by these students in the use of visual aids such as maps, may be well rooted in their teachers (Sekete in Hall. et al. 1991). As stated before, if teachers have no basic understanding of map work or how to link theory with practice, they may fail to lay a sound geographical foundation for the learner. In this case the results of the research illustrate that the ability to use maps of different scale is a skill not easily acquired.

I would also like to concur with Hurry (1991:43) in his statement that "Maps cannot be learnt as such and the ability to interpret maps correctly can only be acquired through doing practical work with them". We as teachers should learn to understand and analyse material by means of a variety of graphical and cartographical skills first before presenting it to learners. These skills should be taught simply not as skills but as useful means of representing and analysing information about specific areas and phenomena.

Although it seems as if students are quite competent in recognizing the relationship between spatial visualization and mathematical performance, however this does not mean that because they could to some extent (40-59%) read and interpret these graphs they would be able to draw them (activity 2). This assumption can be ascribed to the fact that because they could not work out vertical interval on a map, they would also struggle to work out frequencies on the Y axis and can sometimes get confused in labeling graphs when asked to construct them themselves.

The fact that determination and sense of direction are common every day phenomena could perhaps explain why students to a larger extent could identify and understand relationships of location/position, scale and size to make a link between spatial visualization and orientation (activity 3).

Pictures and photographs (activities 5 & 6) are readily interpreted compared to the map work activity. Learners are more exposed to pictures and photographs (than to map work) from an early stage, even before primary level and their interpretations mostly are based on prior knowledge. The actual task is not what they see and read, but rather how they react to it. This reaction is based on the way in which they can link their interpretation to their subjectivity as well as the message behind the picture. Map reading and interpretation on the other hand is more demanding as it makes use of mathematical principles.

It is important to teach learners to look for the (hidden) message behind the message (verbal expression). Again, these activities should be backed up by

content in order for learners to look beyond surface expressions and seek hidden information. The learner should be able to link the verbal expression with gestures of the characters to convey a certain message in order to develop a critical understanding of it, and this requires instruction. Any gap in the understanding of such conventions creates the potential for confusion and misinterpretation.

7. CONCLUSION

Through this study I came to learn that despite the power and ubiquity of graphic images, educational curricula continue to pay little attention to graphics training. In fact, this deficit increases in secondary and post-secondary education. There is little doubt that the increasing prevalence of textual forms of communication is one of the reasons why so many students arrive at the College with apparently little experience of visual communication. I would also concur with Poracsky (1999) that our education system fails to take seriously and to respond adequately to the fact that so much information is in text form.

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APPENDIX A

DIAGNOSTIC ACTIVITIES FOR DATA COLLECTION

ACTIVITY 1 IS BASED ON FIGURE 1

1. Identify this type of map.

---

2. What is the vertical interval on this map?

---

3. Name the types of slopes which occur at (i), (ii), and (iii).

---

4. Name the landforms which occur at (v), (vi), and (vii).

---

5. Fill in the main stream and all it tributaries.

ACTIVITY 2 IS BASED ON FIGURE 2

The four graphs A to D shown in fig.3 were taken from the readings at a school weather station.

---

1. What is the difference between the highest and the lowest temperature on January the 6^{th}?

---

2. What was the relative humidity on January the 5^{th}?

---

3. On which day was the highest air pressure recorded?

---

4. What was the rainfall on January the 9th?

ACTIVITY 3 IS BASED ON FIGURE 3

Figure 1A is a picture of a small town and figure B is a map of part of the town. In order to answer the questions you will need to orientate the picture to match the map.

1. Write down the name of the street marked A in figure A.

---

2. Identify the building marked B in figure 1 B.

---

3. Which one of the positions W, X, Y, or Z in figure 1 B is most likely the position form which the photo (in figure 1 A) was taken?

---

4. In which approximate direction will you be looking if you were standing in the position mentioned in question (3) and looking at the church building?

Draw a circle around your choice.

North-west North-east South-west South-east

ACTIVITY 4 IS BASED ON FIGURE 4

1. What is the message in the cartoon?

---

2. Explain how the act illustrated in the cartoon can cause the degradation of land.

ACTIVITY 5 IS BASED ON FIGURE 5

1. What is the message in the cartoon?

ACTIVITY 6 IS BASED ON FIGURE 6

1. What do you see on the photograph?

---

2. Is there a link between the photograph and geography?

Yes ☐ No ☐

Why?

APPENDIX B

FIGURE 1 FOR ACTIVITY 1

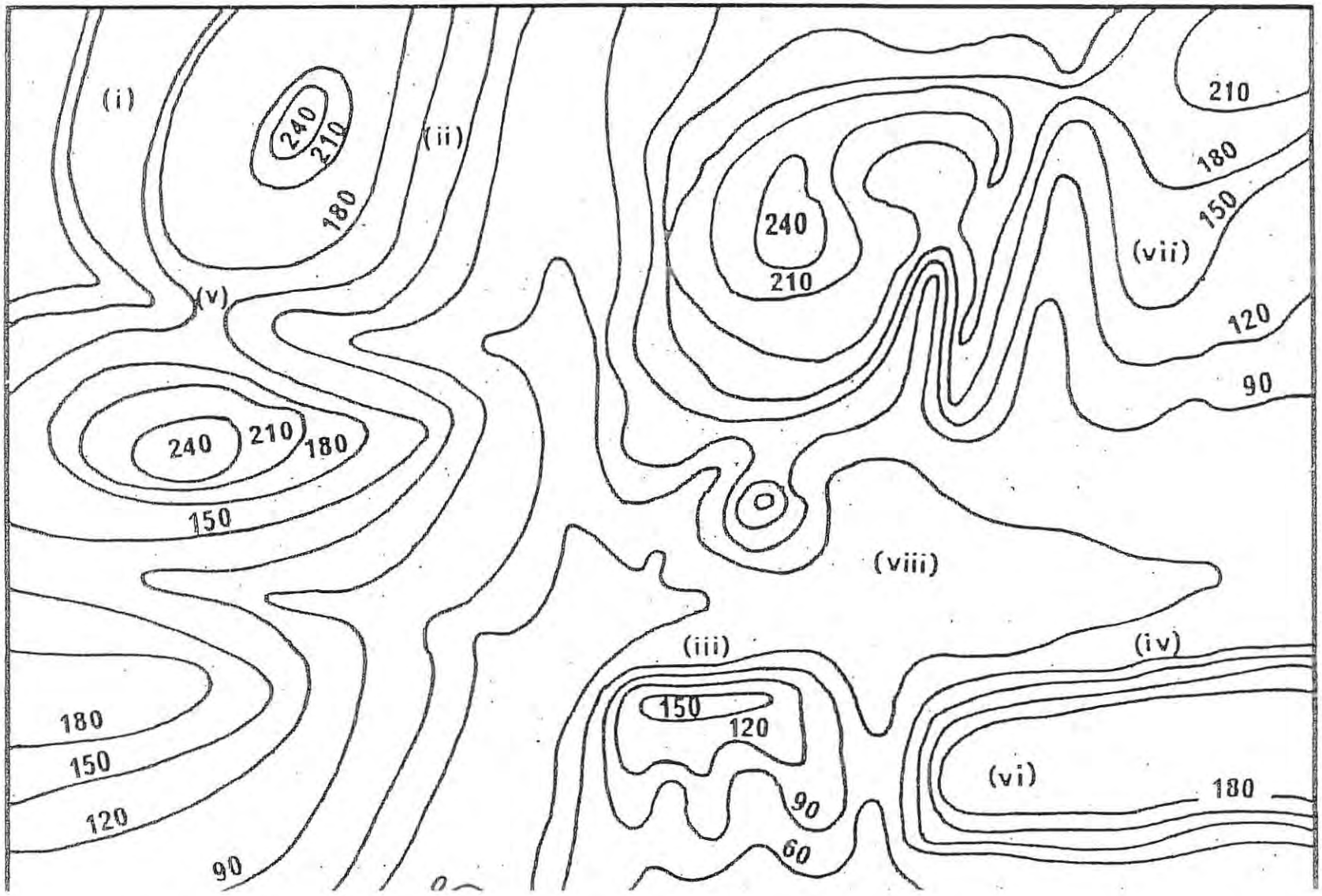


FIGURE 2 FOR ACTIVITY 2

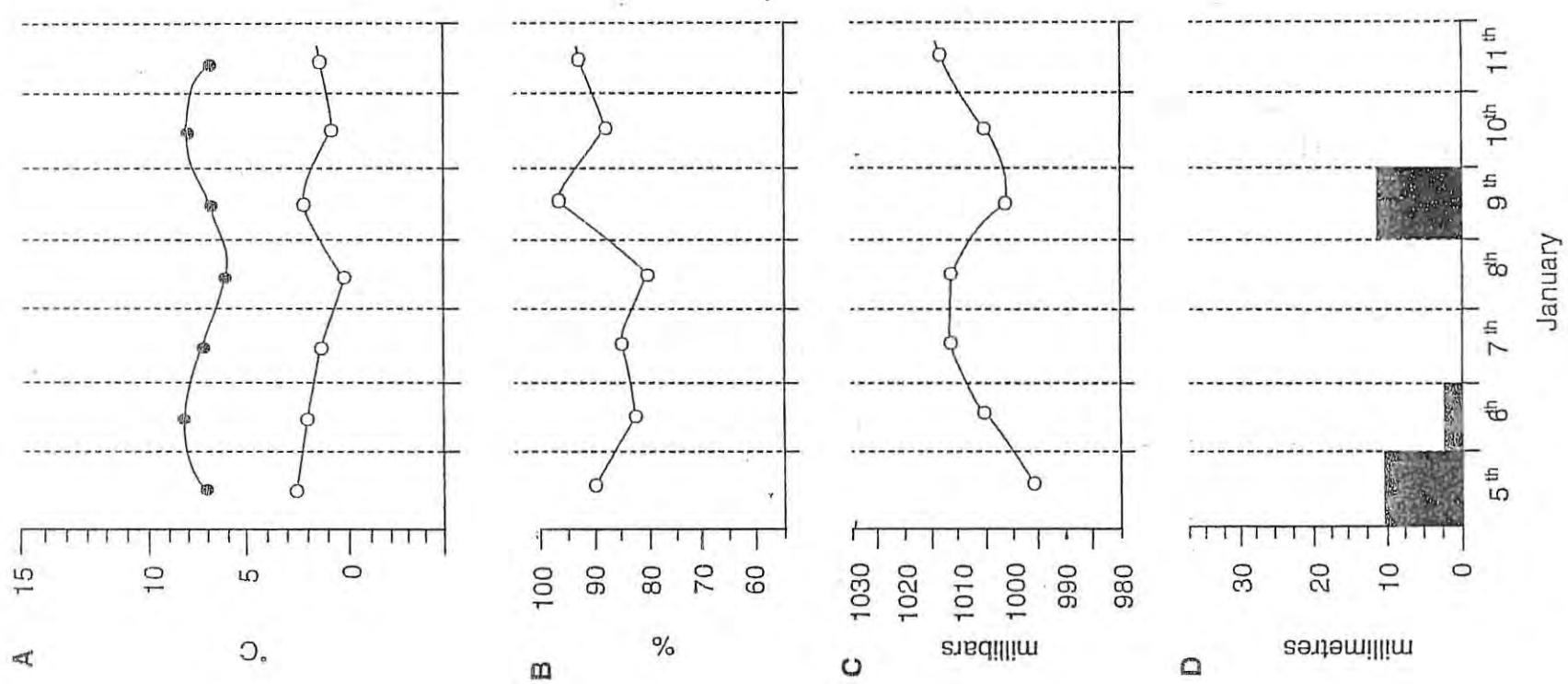


FIGURE 3 FOR ACTIVITY 3

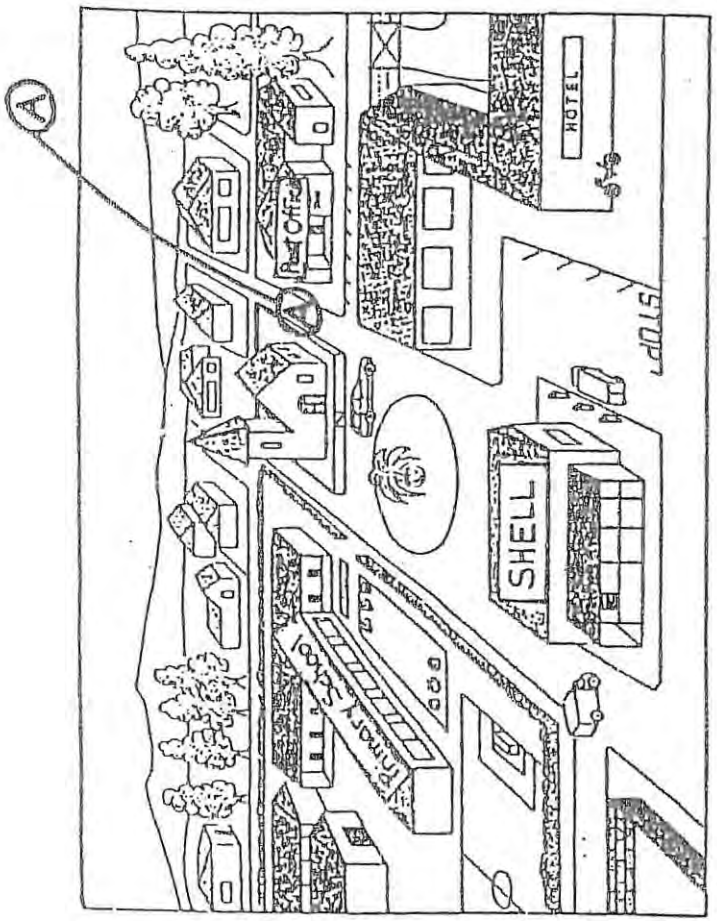


Figure 1A

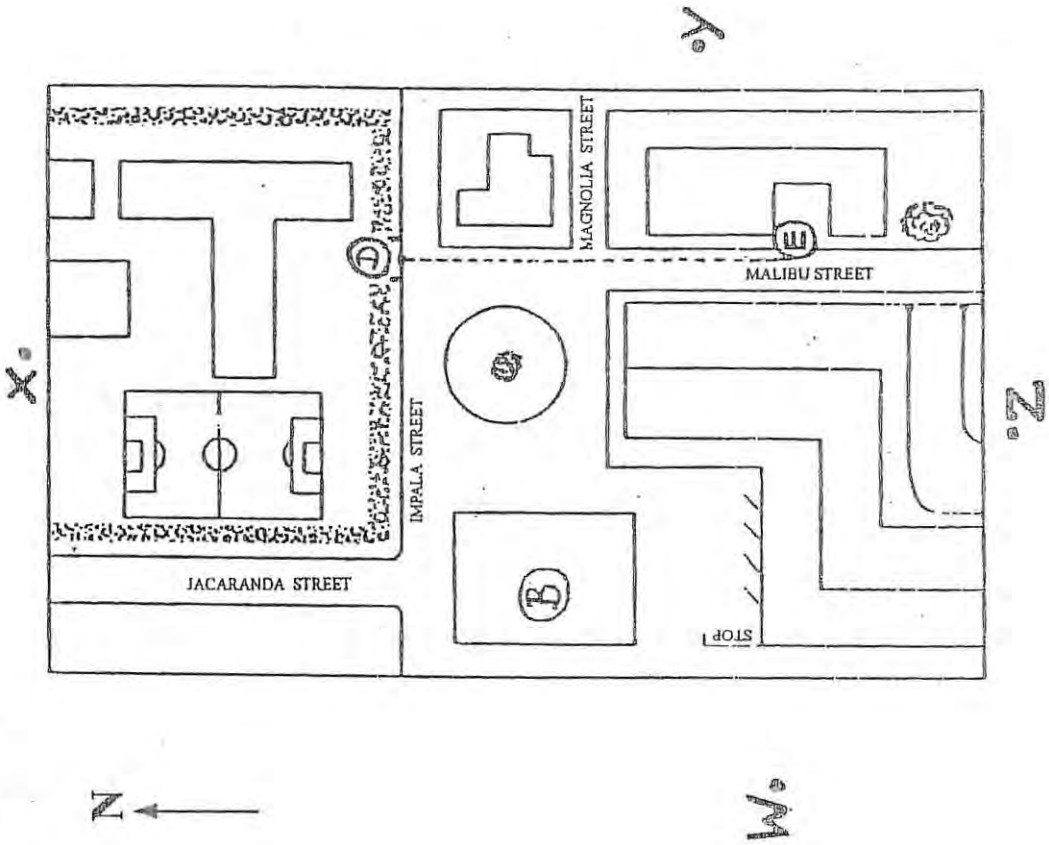
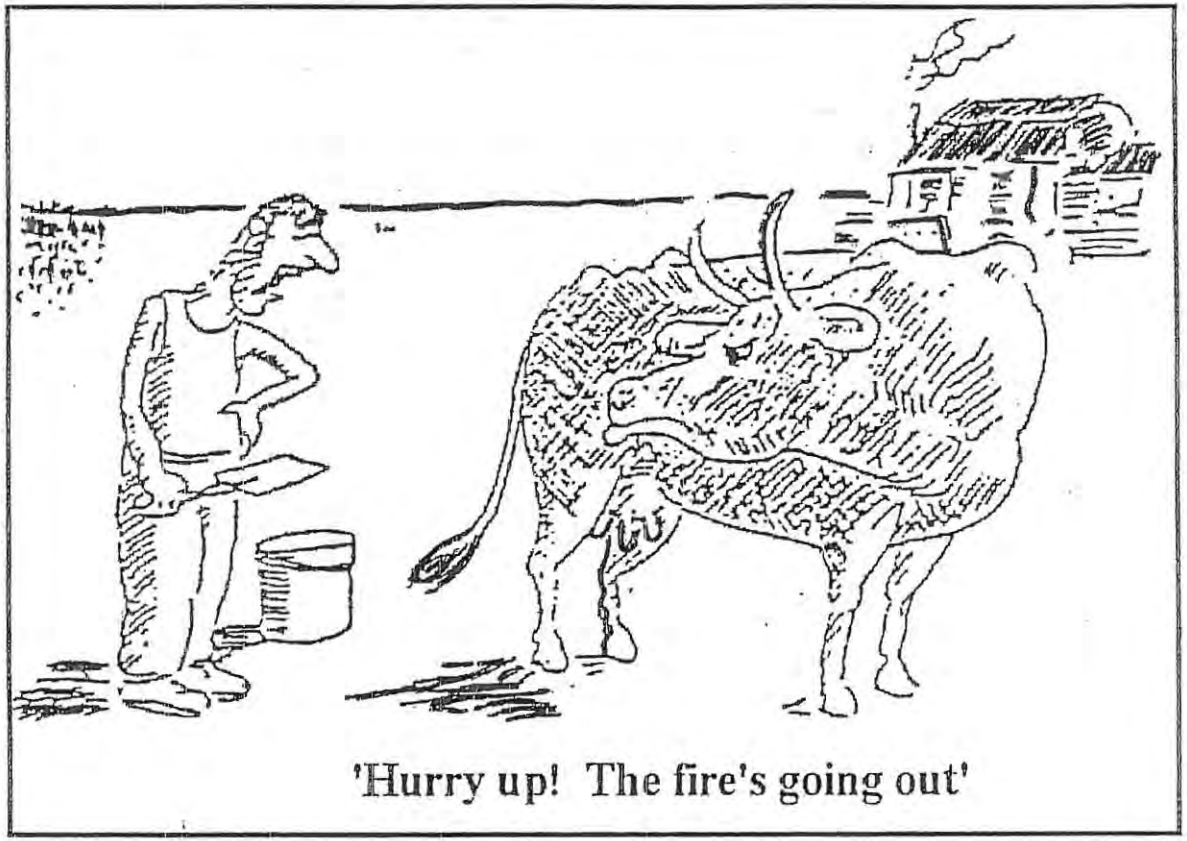


FIGURE 4 FOR ACTIVITY 4



'Hurry up! The fire's going out'

FIGURE 5 FOR ACTIVITY 5

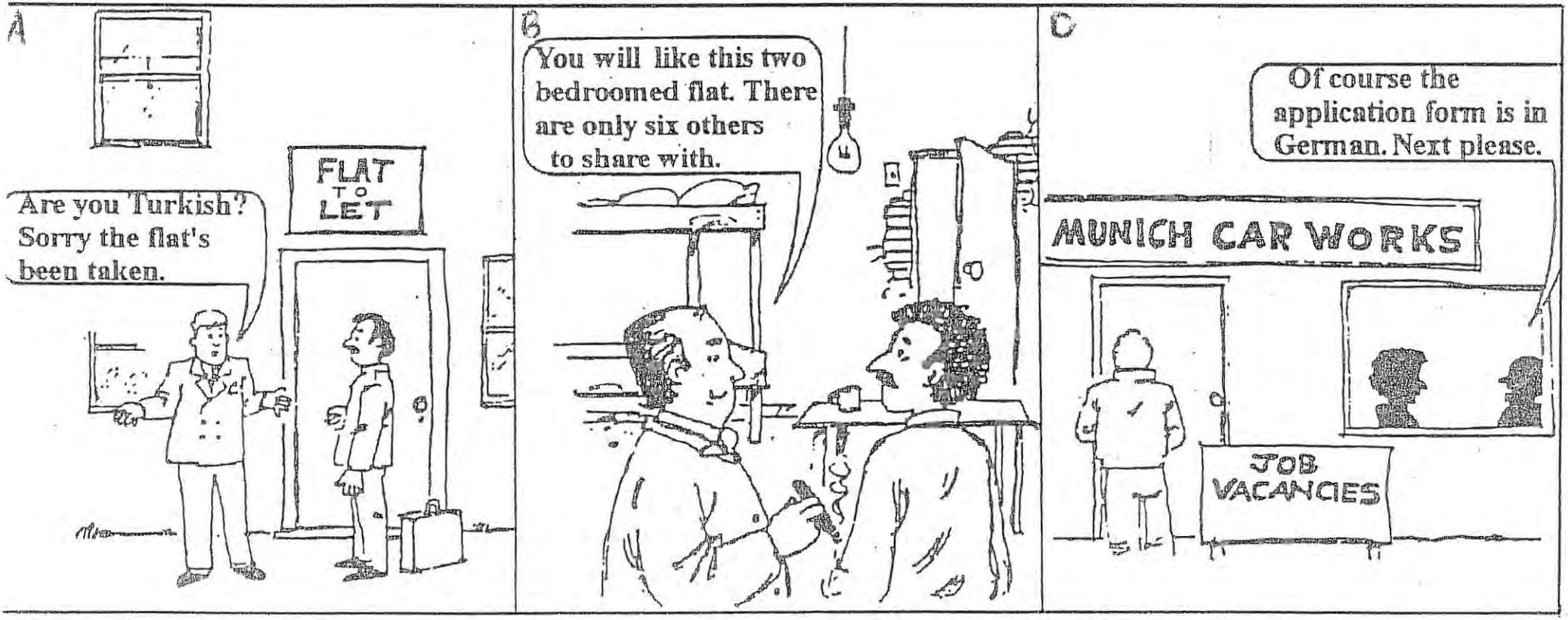


FIGURE 6 FOR ACTIVITY 6

FINAL REFLECTION OF RESEARCH PROCESS

PORTFOLIOS AS A TOOL FOR COURSE WORK ASSESSMENT WITHIN THE CONTEXT OF MASTERS IN EDUCATION

INTRODUCTION

This article describes and evaluates portfolios as a tool for course work assessment in Masters of Education.

The word portfolio means different things to different people, depending on the context in which it will be used. Portfolios should contain a diverse set of information gathered across a variety of learning contexts, content areas and forms of communication; otherwise the full range of an individual's talents and interests may not be revealed. It is the process of looking back on what one has done and asking what, why and how learning has taken place. It also implies a self-evaluative segment in which we as students contemplate what will be done next time to improve. This sets the platform for the establishment of new goals in the future.

Practice in goal setting and experience in constructing a reflective portfolio establish the framework for us to think about what we know, how we know, and what we want to know, to set specific goals for learning and for the implementation of strategies in constructing meaning. How one proceeds is determined by one's educational goals. If my goal is to develop, encourage, and enhance reflective thinking, then I should be able to create an environment that allows my students to reconstruct events, emotions, and accomplishments of an experience in order to increase their control over variables that affect learning.

CONSTRUCTING THE PORTFOLIO

Developing the portfolio guided me through a process of:

- selecting a sample of writings (drafts) over a number of occasions;
- a variety in the kind of writings or purposes for writing that are represented;
- writing emphasized by editing, revising, and rewriting;
- reflection and change on individual pieces as a writer across time.

Working through the portfolio afforded my supervisors and myself the opportunity to consider the effort, improvement, process, and achievement across a diverse range of texts that were read or written. It also included a process of collecting; selecting and reflecting on learning in order to illuminate my strengths, weaknesses, needs and progress. It provided our supervisors with the necessary information to see how we think, feel, work, and change over a period of time. It also reflected consistent growth in our ability as readers, writers and novice researchers.

Through constructing the portfolio I discovered that no portfolio is ever done. It will always be a "work-in-progress". As skills develop knowledge expands, and thinking becomes more refined-, so, too will the portfolio. Depending on the purpose and goals, the portfolio changes continuously since it is "living" and subject to modification. Preparing a portfolio is a learning experience as important as the final product. It took me through a process of injecting, rejecting, updating, and reorganizing as needs warranted.

Using the portfolio not only brought concepts into clearer focus, but also was a means to both assesses my own progress as well as to bolster my self-confidence. Looking back, I see mistakes I have made, steps I have taken to address these errors, and I have been given direction for further, even better solutions to problems, I encountered. It also allowed me to highlight some important ideas I learned during this course.

With directions from my tutors I was encouraged to continually ask questions of my own learning and to seek answers in order to become more reflective about, aware of, and in

control of my own learning strategies. It helped me in my relationship with my supervisors by making it easier to talk to them during or after class. I felt comfortable in chatting to the persons "in power" because I came to know them as human beings and not as power figures. This process provided a window of my abilities, attitude, and motivation and made me realize and understand some of my own philosophies.

Lastly, constructing the portfolio I discovered that it became an episode of learning that allowed me to learn from my previous experiences, from where I have been to where I want to go next.

REFLECTION AND LEARNING

It is the portfolio that nurtures reflective thought. The portfolio requires and actually creates situations, in which we must think about our own thinking, allowing us to monitor our progress, and through self-evaluation helps us to take charge of our own learning and encourages ownership, pride, and self-esteem. Such a tool fosters wide-awake, careful, and thoughtful habits of thinking. It made my confidence to grow as I saw my improvement over time. It allows me to obtain a richer and fuller vision of the research process in order to develop a sense of how each piece connects with my past writings. From this, I could discern what patterns or themes have been developed in my writings and how to change it if necessary.

Reflection is the process of looking back on what one has done and asking questions such as what, why, and how learning has taken place. Using writing to encourage reflective thinking is a very effective method. The use of writing in the context of a portfolio promoted self-consciousness about the issue or problem being explored. It is this self-consciousness, this self-knowledge, and this understanding that enabled me to move beyond memorization and repetition to actual thought processes that come into play when one demonstrates what one supposedly has learned.

By reflecting on my work I could gain some insights into my strengths and weaknesses, to plan for professional growth in order to improve my practice. It evoked questions like, "Does this piece of work represent my best writing?" "Have I shown how I incorporated suggestions received from my tutors?" "Do I have examples of how I incorporated these suggestions?" "Does my portfolio represent my values?" "Is it consistent with my vision and mission?" Having weaknesses does not mean that we are bad or foolish; on the contrary, weaknesses provide us with opportunities to learn and to improve.

As life-long learners, we continue to develop at our own pace throughout our lives. Similarly, each one of us develops strengths, and overcomes weaknesses at our own pace. The role of our supervisors in this, is to find each one of our levels of readiness for new learning, to scaffold what each student will be able to learn next in his/her zone of proximal development and take advantage of the window of opportunity when an instructional method will be most potent. This also allows for the improvement of our tutors to understand each student's point of view, from the novice with exceptional potential to pay attention in changes in their behaviour, and to encourage them to take advantage of their abilities.

At first I thought that I would never be able to make it as it seemed to be too much to do at the start of the course, but it helped me tremendously in the following ways:

- I became a more effective, independent, confident and self-directed student.
- It improved my general knowledge and skills for studying and career management.
- It enhanced my ability to articulate my personal goals and evaluate my progress towards achievement.
- It encouraged a positive attitude to learning throughout life.
- It helped me to understand what was going on in order to establish myself as a student and to compare what I am now to what I was two years ago.
- I have been able to see where I was going with more clarity.

- Recording helped me realize what I have learnt throughout these two years in terms of both professional and academic growth.
- To be self-critical by continuously asking myself "How am I doing? Did I really do as intended?"
- Allow room for mistakes. Facing errors, contrasts, and contradictions helped me to gather more information as well as to understand my apparent stumbling blocks and working out ways to overcome them.

I personally think that it was very useful to follow my step-by-step improvement. In addition my portfolio provides me with a record with what I have done which I can refer to at my graduation.

Doing this study I accumulated and assimilated valuable knowledge for myself. Its purpose was twofold: (1) to provide others with an organized, thorough summary of information on my subject, (2) to help me master the basic techniques of research. By doing this paper, I learnt where and how to locate information quickly, how to use the Internet to extract information relevant to my study, built up some useful contacts who could give me a lot of guidance on how to download information from the Internet, how to take fast, accurate notes, how to make footnotes and referencing so others can use my sources, and most important, how to organize my thoughts.

By committing myself to ongoing reflections, I gained a more holistic view of teaching and learning, problem-solving, and curriculum design. It enabled me to see the whole picture of real practice in the classroom. I even became a better role model for my students.

LEARNING THROUGH CONVERSATIONS

Conversations and reflections that affirm students' sense of competence and allow them to differentiate the quality of their present work from prior work are powerful tools for effective learning. Conversations with my colleagues and even my supervisors enabled

me to place my products and performances within a spectrum of evaluation. In doing so I could easily adjust and modify my present work with prior attempts (drafts).

I learnt how to share ideas with my colleagues and solve problems through discussions that helped us to reflect on theories and research methods. Talking to my colleagues made me self-aware of not only what should be learnt, but also how I should do it, in other words, I became more aware of my meta-cognitive processes. In addition, referring to specific pieces of work helped me to understand the concept of evaluation. Such conversations allowed me to notice and follow the learning process in order to perceive the stated benchmarks of improvements.