EXPLORING FIRST YEAR MEDICAL STUDENTS' USE OF MOBILE LEARNING TO SUPPORT THEIR SELF-REGULATED LEARNING IN A DEVELOPING COUNTRY

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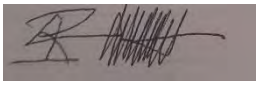
Declaration

I Ishamael Nyirenda (21N2453), declare that this thesis which explored how first year medical students' use of mobile learning to support their self-regulated learning in a developing country, is my own work. All the other sources used or cited have been fully acknowledged and referenced. It is being submitted for the Degree of Doctor of Philosophy at Rhodes University. It has not been submitted elsewhere in any format for a degree or examination at any other university.

Signature:  **Date: 02 January 2024**

Abstract

In order to manage the demands of university studies, research suggests that university students should possess efficient self-regulated learning (SRL) skills. The use of mobile learning is believed to enhance SRL skills. Yet, despite the potential benefits of mobile learning, many first-year students encounter challenges in using mobile devices to foster self-regulated learning skills. It is against this backdrop that this study aimed to examine how first-year medical students utilisee mobile learning to foster self-regulated learning.

This study employed a Explanatory Sequential Study Design , combining both quantitative and qualitative data. It used the interpretativist and pragmatic paradigms to understand how students perceive and use mobile devices for self-regulated learning. The interpretivist paradigm focused on understanding students' perspectives, while the pragmatic paradigm aimed to identify effective ways of using mobile devices to promote self-regulated learning. Participants to this study were first-year medical students. The mixed-methods approach aimed to provide a comprehensive understanding of the research problem by collecting data through various methods. Questionnaires gathered quantitative data, while participatory observation, reflective workshops, and focus group discussions provided qualitative data. The theoretical frameworks that guide the study include the Unified Theory of Acceptance and Use of Technology model (UTAUT) (Venkatesh et al., 2003) and Vygotsky's (1978) socio-cultural theory (SCT).

The study findings revealed that mobile devices were used by first year medical students to manage and control their learning, both inside and outside the classroom. Notably, significant improvements were observed in cognitive learning strategies, metacognitive self-regulation strategies and resource management learning strategies, including time management.

Additionally, the study found that first-year medical students had a positive perception of mobile learning. Furthermore, mobile devices were generally perceived as enablers of self-regulated learning (SRL), providing flexibility, convenience, and access to diverse learning resources. However, distractions and interruptions posed challenges to focus and attention. To mitigate these challenges, strategies such as device management and setting boundaries were suggested. Moreover, first-year medical students expressed the need for support in developing SRL through mobile learning. Guidance in selecting effective mobile applications, opportunities for collaborative learning, and technological skill training were identified as

essential forms of support. The study thus recommends integrating mobile learning into curricula to enhance self-regulated learning skills in higher education students, especially among first-year students. Higher education institutions should establish deliberate policies and initiatives for mobile learning programs, especially for first-year students. Educators should offer guidance and training on using mobile learning tools effectively, including information searching skill. However, students should be cautious about distractions from the use of mobile devices.

Key words: First-year medical students, Self Regulated Learning, Mobile devices, Mobile learning, Developing Country, ICT, Higher Education

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Dedication

My thesis is dedicated to my three children: Little Ishmael, Ivan and Ethiel. I am aware that my study has taken over parts of our life together. I truly appreciate the constant love, support, understanding, time and space you have given me to complete this thesis. I also acknowledge my wife Mary and all my friends for their support during this journery.

Table of Contents

Declaration i

Abstract ii

Acknowledgements iv

Dedication v

List of Tables ix

List of Figures xi

CHAPTER ONE: SITUATING THE STUDY 1

1.1 Introduction 1

1.2 Background of the Study 1

1.3 Situating Myself in the Study 8

1.4 Problem Statement 14

1.5 Goal of the study and research question 15

1.6 Rationale and Significance of the Study 16

1.7 Definitions of key concepts used in the thesis 17

1.8 Thesis Structure 20

CHAPTER TWO: LITERATURE SYNTHESIS 24

2.1 Introduction 24

2.2 Self-Regulated Learning 25

2.3 Cyclical Nature of Self-Regulated Learning 29

2.4 Conceptual Framework for Studying Self-Regulation 36

2.5 Self-Regulated Learning in Higher Education Institutions 39

2.6 Mobile Learning 51

2.7 Using Mobile Learning to develop Self-regulated learning in Higher Education Institutions 62

2.8 Critique of the presented literature 65

CHAPTER THREE: THEORETICAL FRAMEWORKS 68

3.1 Introduction 68

3.2 The Sociocultural Theory 69

3.3 Unified Theory of Acceptance and Use of Technology 76

3.4 How the Extended Unified Theory of Acceptance and Use of Technology(UTAUT) model complements the Socio-cultural Theory 80

3.5 How Extended UTAUT and the Socio-cultural Theory were used as analytical lenses in the study 82

CHAPTER FOUR: RESEARCH METHODOLOGY 86
4.1 Introduction 86
4.2 Research Paradigms 86
4.3 Research Design 89
CHAPTER FIVE: QUANTITATIVE AND QUALITATIVE DATA PRESENTATION 129
5.0 Introduction 129
5.1 Quantitative Data Presentation 130
5.2 Pre-MSQL and Post-MSQL Scores for the 12 participants who participated in the focus group discussion 132
5.3. Qualitative Data Presentation 138
CHAPTER SIX: DISCUSSION OF FINDINGS 155
6.0 Introduction 155
6.1 First-year medical students use of mobile learning to develop self-regulated learning 156
6.2 The perspectives of first-year medical students on using mobile learning to develop self-regulated learning 185
6.3 The enablers and hindrances of using mobile in the development of self-regulated learning 193
6.4 Chapter Summary 197
CHAPTER SEVEN: MOBILE LEARNING FOR SELF-REGULATED LEARNING 200
7.0 Introduction 200
7.1 Supporting first-year university medical students to develop self-regulated learning through the use of mobile learning 200
7.2 Proposed framework for supporting first-year students to develop SRL using mobile learning in developing country context 207
7.3 Chapter Summary 224
CHAPTER 8: SUMMARY OF FINDINGS, RECOMMENDATIONS AND CONCLUSION 225
8.0 Introduction 225
8.1 An Overview of the Study 225
8.2 Key Findings of the Study 226
8.3 Contribution to Knowledge 231
8.4 Research Limitations 233
8.5 My Reflections 234
8.6 Recommendations 236
8.7 Conclusion 236
REFERENCES 238
Appendix A1 267

Appendix A2 269
Appendix A3 272
Appendix B: Pre MSLQ and Post MSLQ 274
Appendix C : Reflective Workshop Guide 276
Appendix D: Self-Regulated Learning (SRL)- Orientation Workshop Guide 277
Appendix E: Focus-Group Interview guide 281
Appendix F: Observation tool 283
Appendix G: Informed Consent form 285

List of Tables

Table 2.1: A comparison of theoretical views regarding specific aspects of Self-Regulated Learning (Zimmerman, 2001, p.9)……...27
Table 2.2: A Conceptual Framework for Studying Self-Regulation…….37
Table 2.3 Strategies that can be used to help t students successful develop (SRL) skills……...41
Table 2.4: Domains and SRLS (Zimmerman and Martinez-Pons 1986; Pintrich et al., 1991; Pintrich 2000)……...42
Table 3.1: A Conceptual Framework for Studying Self-Regulation…….83
Table 4.1: Quantitative variables……..94
Table 4.2: MSLQ Sections and Scales……96
Table 4.3: Coefficient Alphas for the 15 MSLQ Scales……98
Table 4.4: Analysis of quantitative variables……..101
Table 4.5: Inclusion/exclusion criteria……102
Table 4.6: Qualitative variables……..103
Table 4.7: Process for analyzing qualitative data using a six-step approach by Levitt et al. (2018)……114
Table 4.8: Data analysis for both qualitative and quantitative and use of the theoretical framework ……116
Table 4.9 Codebook showing the organisation of code name and description (screenshot from NVivo 12)……..122
Table 5.1: MSLQ pre/post-test comparison on cognitive and metacognitive strategies; Metacognitive self-regulation; and Improvement in resource management strategies for 58 participants……131
Table 5.2:Pre-MSQL and Post-MSQL mean, standard deviation, and mean gain for MSLQ for Cognitive and Metacognitive Strategies……132
Table 5.3: Metacognitive Self-Regulation…….132
Table 5.4: Pre-MSQL and Post-MSQL mean, standard deviation, and mean gain for MSLQ for Resource Management Strategies……..135
Table 5.5: Perspectives of the students on using mobile learning to develop self-regulated learning……...140
Table 5.6: Mobile device as an enabler or distractor to learning……143
Table 5.7: Support students need to develop self-regulated learning through the use of mobile learning……...145

Table 5.8: Result from focus group discussion and fortnight reflective workshop on use of mobile devices inside and outside the classroom ……..147
Table 5.9: Results on observation of participants' usage of mobile learning to manage and control their learning inside the classroom……151
Table 5.10: Challenges and some proposed solutions……152
Table 7.1: Questionnaire for assessing students' mobile learning strategies ……..214
Table 7.2: Proposed mobile learning strategy for improving self-regulation learning……218

List of Figures

Figure 2.1 Cyclical phase modle of self-regulation (Zimmerman & Moylan, 2009, p.305)……...38

Figure 2.2: The Framework for thr rational Analyisis of Mobilr Education (FRAME)(Koole and Ally 2006)……..51

Figure 3.1: Unified Theory of Acceptance and Use of Technology Model (UTAUT) Sources: Venkatesh, et al. (2003, p. 451)……76

Figure 3.2: Extended Unified theory of Acceptance and Use of technology (Alasmari & Zhang, 2019, p.28)……78

Figure 3.3: Applying Socio-cultural Theory and UTAUT in the study……81

Figure 4.1: Procedure of data collection used in the mixed methods explanatory sequential design of this study (Adapted from Creswell et al., 2022, p.121…….92

Figure 5.1: MSLQ pre/post-test comparison on Cognitive and Metacognitive Strategies….134

Figure 5.2: MSLQ pre/post-test comparison on Resource Management Strategies……..137

Figure 5.3:MSLQ pre/post-test comparison on cognitive and metacognitive strategies; metacognitive self-regulation; and Improvement in resource management strategies……138

Figure 7.1: Framework for developing SRL in first-year students using mobile learning …212

CHAPTER ONE: SITUATING THE STUDY

> Educational success lies not only in the acquisition of knowledge, but also in the development of self-regulated learning skills. These skills are essential for managing the demands of university studies, especially for new students. ……..Developing self-regulated learning skills is vital for academic success as it allows students to take ownership of their learning and develop a deep understanding of the materials they learn. (Zimmerman, 2022, p. 12)

1.1 Introduction

In this chapter, I present context of the study. I begin by discussing the background and significance of self-regulated learning for university students, particularly in the first year of study. I also share my experience as an educator at a medical school in Malawi, which inspired my interest in this topic.

I have also provided a detailed account of my journey with technology use in higher education. I refer to my experience during my university studies as well as my current position as an educator. This reflection on my attitude and perception towards technology use helps situate myself in the study. I also outline my positionality and reflexivity, problem statement, rationale and significance of the study, the gap this study sought to fill, the research goal, and questions. Then, I have defined the key concepts used in this thesis, and the thesis outline is provided. The chapter ends with a conclusion.

1.2 Background of the Study

First-year university students in developing countries frequently find themselves in an educational environment that is very different from the one from which they came (Crosling et., 2009; Gikas & Grant, 2013; Kolb & Kolb, 2005). It is within this context that Cho et al. (2017) assert that the preparedness of first-year students for university studies is becoming more diverse as the university student population is growing in most developing and developed countries. In order to manage these demands of university studies, research suggests that university students should possess efficient self-regulated learning (SRL) skills (Jansen et al., 2020; Ping et al., 2015; Sletten, 2017). Self-regulation is “an active, constructive process in which students define learning goals and then seek to monitor, regulate, and control their

cognition, motivation, and behaviour, directed and restricted by their goals and contextual characteristics of the environment" (Pintrich 2000, pp.451-502). It is hoped that such skills can enable university students to self-regulate their learning as independent learners. That is, the students should take charge of their learning and employ appropriate study techniques to help them achieve their academic goals (Zimmerman, 2000).

In this regard, Ping et al. (2015, p.139) further suggest that "as universities in developing countries embrace advanced teaching and learning techniques such as experiential and genuine learning, self-regulated learning strategies are becoming increasingly crucial for university students". Furthermore, in support of this, Lee et al. (2020) emphasises the need to develop SRL in first-year university students to assist them in dealing with the challenges they face as they transition from high school to begin their higher education academic life. It is evident from these studies that the relevance of SRL to university students cannot be overstated.

SRL explains the cognitive, motivational, emotional, and metacognitive processes in learning (Azevedo et al., 2017; Cho & Heron, 2015; Taub et al., 2019; Winne, 2017; Zimmerman, 1989). Based on the aforementioned arguments, SRL is viewed as a systematic process of human behaviour. While SRL skills are a significant predictor of academic achievement, higher education research explores new dimensions of "how students become masters of their learning processes" (Zimmerman, 2008, p.166). This necessitates further research investigating various ways of how university students can regulate and control their learning.

The context of the study is essential to any research. The context of a study informs the reader about 'where', 'who', 'what', and even 'when' of the study (Poulis et al., 2013). In this study, the background is presented to help the reader gain better knowledge of the research's background. Studies suggest that university students develop self-regulated learning skills through appropriate support such as direct teaching, modelling, guided and autonomous practice, reflective, self-observation, and social support (Anand, 2015; Palalas & Wark, 2020; Van Nguyen et al., 2020; Yot-Domínguez & Marcelo, 2017). Although studies recommend these strategies for assisting university students in developing SRL skills, Anand (2015) pointed out a challenge in self-regulated learning skills development programs. He observed that the main problem in most initiatives adopted to develop SRL skills is how best to integrate self-regulation behaviours into students' busy academic lives. Therefore, this calls for finding appropriate ways of developing SRL that can be effective and compatible with the students'

overwhelming academic and life schedules (Palalas & Wark, 2020; Yot-Domínguez & Marcelo, 2017).

In addition to the challenges pointed out by Anand (2015), research has indicated that self-regulated learning can be a useful tool in developing resilience among students, as it teaches them important skills such as goal setting, planning, monitoring progress, and reflecting on their learning experiences (Windle et al. 2011; Zimmerman, 2013). Resilience is a key attribute that enables students to cope with the demands of academic life which includes overwhelming academic schedules (Masten,2018). Resilience, as defined by Masten (2018), is the ability to adapt and recover from adversity, trauma, or stress.

There is a strong positive relationship between self-regulation and resilience (Windle et al. 2011). Individuals with strong self-regulation skills are more likely to exhibit greater resilience in the face of adversity. For instance, Skrove et al. (2013) found that adolescents with strong self-regulation skills were more resilient in response to stressful life events. Similarly, Windle et al. (2011) discovered that individuals with high levels of resilience were better able to regulate their emotions and behaviours in response to stressors. These findings suggest that the ability to regulate emotions and behaviours helps individuals cope with stress and maintain psychological well-being. In other words, individuals who can set goals and stay focused may be more resilient in the face of setbacks, such as overwhelming academic life schedules, as they can maintain a sense of purpose and direction even during challenging times or when working under pressure.

Addiiton, Anand (2015) asserted that the use of mobile learning could be one of the strategies that can be used to develop SRL that can fit into students' overwhelming academic schedules. Busse et al., (2019) define mobile learning as a type of learning that uses mobile devices to support learning. Examples of these devices include smartphones, laptops, tablets, smartwatches, hotspots, mobile gaming consoles, and many more (Busse et al., 2019). According to some studies, adopting mobile learning to foster SRL in learning environments where students have access to mobile devices could be one way of meeting their self-regulated learning needs (Lim et al., 2019; Nan Cenka et al., 2022; Viberg et tal. 2020).

Alphonce and Mwantimwa (2019) further reported that the fast development of smartphones and tablets' technologies and storage capacity have enabled university students, particularly in developing countries, to engage in mobile learning and gain access to Open Educational Resources (OER). OER play a crucial role for students in developing countries, where the luxury of purchasing commercial versions of study resources may not be readily available. These scholars further stated that mobile devices save students the costs of buying physical books and enable them to carry the contents of many heavy volumes on their cell phones, tablets, or laptops.

In addition, studies have revealed a correlation between mobile learning and self-regulated learning (Cho et al., 2017; Palalas &Wark, 2020; Zare et al., 2013). Palalas and Wark (2020) systematically reviewed 38 primary research peer-reviewed articles on the relationship between mobile learning and self-regulated learning, drawn from six databases from January 2007 to January 2019. In their study, they found that mobile learning improved students' SRL Palalas and Wark (2020) study shows how the ubiquity and flexibility of mobile devices facilitated personalized learning experiences, empowering students to take charge of their learning processes. By integrating learning resources into their daily lives, students could cultivate essential SRL skills such as goal-setting, time management, and self-monitoring (Nan Cenka et al., 2022; Conger et al.,2016).

They also found that SRL enhanced other learning factors, such as metacognition, time management and self-efficacy. Self-efficacy is defined as "the perceived ability to implement actions necessary to attain designated performance levels" (Bandura, 1997). As alluded to earlier, universities need to help and guide students to develop the necessary self-regulated learning skills. Jouhari et al. (2015) and Van Nguyen et al. (2020), assert that university students should possess not only academic abilities but also social skills, cooperative learning skills, and self-regulated skills for them to thrive in their academic endeavours.

According to Spaull (2013), research on self-regulated learning, developing SRL is a long-term process. Concurring, Yot-Domínguez and Marcelo (2017) suggest that SRL requires time and opportunity for students in higher education to experience and practice over time. For this reason, SRL needs to be planned and implemented as soon as the students begin the university academic journey (YotDomínguez & Marcelo, 2017; Conger et al.,2016). As suggested by Lee et al. (2020), the best way to foster SRL at an early stage in HEIs is to introduce it during the

early years of their training when academic work is less demanding than in the final years as academic work becomes more demanding. For example, in Medical universities, students should be helped and/or guided to develop self-regulated skills in the early years of their training so that they build on them as they progress into the upper years of their studies.

Over the last two decades, studies on SRL have been conducted (Anand, 2015; Lee et al., 2020, Mellow, 2005). However, the majority of such studies seem to focus on the final years of training rather than the early years of their training, such as first-year (Berkhout et al., 2015; Cho et al., 2017; Jouhari et al., 2015; Lee et al., 2020). In addition, based on the literature that I have come across, I could not find any research published on the use of mobile learning to develop SRL in first-year university students in developing countries like Malawi. Instead, the majority of studies on mobile learning technologies seem to focus on providing access to learning materials through web-enabled mobile devices (Laru & Jarvela, 2008; Mellow, 2005) or the use of mobile technologies to make announcements to students (Cho et al., 2017; Jones et al., 2009; Jouhari et al. 2015). Although these strategies seem to be helpful, the potential of these mobile devices to support first-year university students in developing SRL in developing countries is yet to be realised.

Agreeing with this point, van HoutenSchat et al. (2018) suggested research studies on new approaches to how students use mobile technologies to become masters of their learning processes. This necessitates investigating instructional applications of mobile learning effectiveness in promoting SRL, particularly in developing countries. A knowledge gap warrants research exploring how first-year medical students can make use of mobile learning to develop SRL in a developing country context such as Malawi. Furthermore, the first-year medical curriculum uses an organ system model integrated curriculum that integrates basic sciences and clinical medicine (Haramati, 2015;Nyirenda & Simuja,2023). According to Dominguez and Zumwalt (2020), an organ-integrated curriculum combines independent subjects in an integrated approach, usually organised around an organ/system of the body. For example, the HEI of interest in this study enrol first-year medical students in one integrated course, Musculoskeletal System, in their first semester. Under this single course, the content covers integrated sub-courses treated as topics, such as anatomy, physiology, biochemistry, and microbiology related to the musculoskeletal system.

Haramati (2015) observed that although the integrated curriculum has been adopted by different medical schools in developing countries and offers many benefits, he noted the integrated approach is a departure from the usual curriculum delivery that students experience during secondary schooling. This requires students to possess learning skills that enable them to adapt and adopt new ways of learning. In this regard, Binks et al. (2021) suggest that as students transition from subject-based learning to an integrated curriculum approach, they need to develop skills that enable them to adapt to these changes. Indeed, one such skill they need is self-regulated learning (Berkhout et al., 2017;Shambare & Simuja,2022). In light of the abovementioned, it is evident that first-year medical students should be prepared with the necessary skills to cope with the transition to a new learning style of the integrated curriculum in higher education.

In addition, in my experience as an educator at a medical school in Malawi, , I observed that most first-year students seem to struggle to make the seamless transition into first year. This concurs with Anand's (2015) assertion that although some students do develop this SRL on their own, the majority of them require explicit support and tools to effectively develop SRL. Moreover, I also observed that though most students own or have access to mobile devices, they rarely utilise them to help one another learn to control and manage their learning inside and outside of class. This observation is consistent with Chimpololo's (2019) assertion that academic use of mobile devices correlates strongly with the year of study in Malawian HEI. According to Chimpololo (2019), fewer first-year students use mobile learning to help their academic work than students in other years of study.

Chimpololo (2019) further asserted that in Malawi, 45% of final-year students use mobile devices for academic purposes, compared to only 26 % of first-year students. It could be surmised, therefore, that the low usage of mobile devices in the first year may be due in part to students' inability to recognise the optimal ways to use mobile learning to supplement classroom studies or activities (Chimpololo, 2019;Shambare et al.,2023). This could also be due to the fact that the first-year students are in transit from a secondary school where mobile device use is prohibited in the classroom. Stringent rules in secondary schools might limit students' autonomy in managing their own learning. If students are not given the opportunity to responsibly use mobile devices for educational purposes during their earlier years, they may struggle to integrate these tools effectively when they enter university. Hence, there is a need

for interventions that explore how first-year students could utilise available mobile learning technologies on their mobile devices to manage and control their learning activities.

In this regard, Chimpololo (2019) asserts that in Malawi, only 34% of university students regard academic activities as the most significant function of their mobile devices. Examples of academic activities include conducting an internet search for learning materials, conveying academic messages, storing class notes and other relevant reading materials, and participating in educational discussions with other student-teachers. Although mobile devices seem to provide the ability to explore learning opportunities in higher education, Anand (2015) averred that there is a need to initiate interventions that further show how students could utilise available mobile learning technologies in their mobile devices to manage and control learning activities. This suggests that medical students need support and practical experience using mobile devices to self-regulate their learning.

According to other studies, students' socio-cultural backgrounds (Mavuru & Ramnarain, 2020) and social networks have a significant impact on how they transition to higher education (Mishra, 2020; Schulz et al., 2017; Tilki & Siara, 2008). Socio-cultural backgrounds refer to the diverse cultural and social identities, values, beliefs, and practices that shape individuals' perceptions, behaviours, and interactions within their society (Cushman & Good, 2019; Shiraev & Levy, 2021). It encompasses various factors, such as ethnicity, nationality, language, religion, gender, age, education, socio-economic status, and political ideology (Berry, 2016). A social network is defined as a structure made up of a group of actors, some of whom are linked by one or more relationships (Schulz et al., 2017). Individuals gain access to a variety of resources as a result of their membership in social networks (Portes, 2014; Putnam, 2000; Schulz et al., 2017). Studies have pointed out that culture is one of the most important impacts on behaviour (Chen & Yan, 2016; Mishra, 2020; Schulz et al., 2017), and its importance in use on mobile devices cannot be overstated.

Culture plays a pivotal role in shaping the utilisation of mobile devices in the developing world, particularly in countries like Malawi. Similar to many other developing nations, Malawi places a high value on oral communication and interpersonal relationships. This cultural emphasis on community and extended family networks can significantly impact the popularity of specific communication apps or features. Moreover, in developing countries, mobile device usage is influenced by economic factors and cultural attitudes toward spending money (Chen & Yan, 2016). In the case of Malawi, where a substantial portion of the population have limited

financial resources, the affordability of devices and data plans emerges as a crucial consideration. The cultural perception of the value of technology in relation to its cost plays a pivotal role in influencing adoption rates. As a result, it is critical to understand first-year medical students' socio-cultural backgrounds. Students entering Malawian universities are generally culturally prepared to socialise and acclimate to university life. Because Malawi's rural population is estimated to be over 70% (Profile, 2011),most students come from rural areas.

Additionally, studies suggest that mobile learning has been championed as the next frontier for improving students' study skills in higher education (Boruff & Storie, 2014; Jouhari et al., 2015; Zare et al., 2013). For this reason, students and universities in developing countries should take advantage of mobile learning as a cultural tool that they can use to help them improve self-regulated learning skills. Notably, mobile learning is also gaining ground in most developing countries, as highlighted by Chawinga and Zozie (2016), Chibambo (2009), and Pitchford (2019). Additionally, students entering medical school in developing countries like Malawi also need support in developing SRL skills like their counterparts in developed countries. More so, they live in low-resource nations where institutions face funding cuts that could further limit their ability to provide adequate student support. It is against this backdrop that this study explored how university first-year medical students can make use of mobile learning to develop self-regulated learning in their organ-system model integrated curriculum [1] that integrates basic sciences and clinical medicine.

1.3 Situating Myself in the Study

The advancement of technology has revolutionised the way people interact with one another and has made life easier and more convenient. However, the integration of technology in various aspects of life, including education, has also presented numerous challenges that need to be addressed. My personal experience with technology in the classroom during my tertiary education is a clear example of how technology can be a significant distractor and how it can negatively impact the learning process. In the past, technology was not as widespread as it is

[1] In this curriculum model the delivery is organized around the various organ systems of the human body, such as the cardiovascular system, respiratory system, gastrointestinal system. The curriculum is designed in a way that connects the foundational knowledge of basic sciences with clincal aspects. Instead of teaching basic sciences and clinical medicine as separate and distinct subjects, they are combined in a manner that emphasizes their interconnectedness and relevance to medical practice.

today, and it was not easy to buy a personal computer. During my first year of undergraduate studies, technology use increased in the higher education space, and educators became increasingly excited about its potential to enhance teaching and learning.

As a result, we were asked to submit type-written assignments of five pages or more. However, there were very few computers in the computer laboratory, and the ratio of computers to students was 1:100. This meant that it was almost impossible to get access to a computer unless you spent the whole night in the lab waiting for senior students to complete their work and depart the laboratory. This was my daily routine until I was in my second year.

During my second year, I was priviledged to receive a laptop from my cousin Chrispine. This was one of the most memorable days of my life because the laptop brought an end to my sleepless nights in the computer laboratory. Finally, I could work on my assignments from the comfort of my own room.

Notwithstanding, having a laptop came with its own set of challenges. One of the most significant challenges was being bothered by friends coming to my room late to type their assignments. While I was happy to help my friends, I often had to stay up late until they finished their work.

Another challenge was installing mathematical software called Magma, which is a large, well-supported software package designed for computations in algebra, number theory, algebraic geometry, and algebraic combinatorics. While this software was helpful, it had a negative impact on my mathematical skills. I stopped solving mathematical problems manually and started relying on the software instead. This made me feel like technology robbed me of my mathematical skills and made me question the role of technology in education.

Furthermore, the internet started gaining ground, and our institution started providing 30 minutes of free internet access per day. This was a game-changer because it allowed us to access a wealth of information online. However, I soon realised that finding relevant information on the internet was not as easy as I had initially thought. I often ended up spending half of my study time organising the materials I found, which wasted a lot of my limited time.

While still in university, there were more technological distractions. In my third year of study, for instance, I was introduced to mobile phones, which at the time were still basic and limited

to calling and sending short messages. The thought of having a mobile phone was exciting, and I wanted to have it with me at all times, even in class. However, my lack of familiarity with the device and its operations became an issue in the classroom. I would forget to put my phone on silent mode, and it would ring during class, disrupting the learning process for me and my fellow students.

My experience was not unique, and many of my fellow students were also struggling with the same problem. The ringing of mobile phones in the classroom became the order of the day, with some students even answering phone calls during class. This situation persisted until our fourth year of study, when most of us had become more familiar with mobile phones and their operations. Only then did mobile phone use in the classroom decrease, and we began to appreciate the importance of a distraction-free learning environment. My experience with mobile phones in the classroom left me with a negative attitude towards the integration of technology in educational spaces. I believed that technology was more of a distractor than a tool for learning.

I eventually graduated from university. As a young graduate, I had no clear vision of what the future had in store for me. However, I did have a passion for teaching and knew that I wanted to make a difference in the lives of young people. My first job was as a secondary school teacher in the public service , where I gained invaluable experience working with students of different backgrounds and abilities. I wanted to challenge myself and broaden my experience by taking a more challenging role, resulting in me joining the medical school where I worked as a curriculum specialist.

As a curriculum specialist for the university, I was involved in developing, implementing and evaluating the curricula. I observed the growing use of technology in higher education. Using digital tools and resources was transforming how students were learning. Though it was done on a small scale, I was fascinated by the potential that technology held for the future of education. Around five years ago, I began to get involved in teaching fourth-year students , and this was when I started to see the impact that technology could have on student learning.

At the time, the use of social media technology such as WhatsApp was at its peak, and every course seemed to have its own WhatsApp group for communication. As I observed how these groups were easing communication between students and lecturers, I began to develop a positive attitude towards the use of technology in education. I realised that technology could

be used as a tool to supplement traditional teaching methods and make learning more engaging and accessible for students.

This positive attitude towards technology in education led me to create a WhatsApp discussion forum for my own course. The forum was designed to enable students to discuss what they did not understand in class and ask questions for further discussion. It proved to be an effective tool for supplementing student learning and has been in use ever since.

The forum has evolved over time, and I have experimented with different formats and approaches to maximise its impact on student learning. I have found that the forum works best when students are encouraged to take an active role in the discussions and to share their own thoughts and ideas. By creating an inclusive and collaborative learning environment, students feel more engaged and motivated to learn and can better apply their knowledge in real-world situations.

In addition to the WhatsApp forum, I have also incorporated other digital tools and resources into my teaching, such as online quizzes and interactive forums on our learning management system (COMPASS). These tools have helped to make learning more engaging and interactive for students and enabled me to provide more personalised feedback and support to individual students.

Despite some notable progress I have mentioned above, I have witnessed how some students struggle to use their mobile devices to manage and control their learning. Even in my course, some students who were involved in the WhatsApp discussion forum faced challenges. The most notable challenge was technical know-how, knowing how to effectively use WhatsApp to contribute to the discussions. However, this problem became more visible in 2020 when the Covid-19 pandemic hit and overnight, teaching changed to online. Many students reported facing difficulties in using their mobile devices to manage and control their learning.

Aside from the reported challenges, I also noted that educators were not trained in how to teach during emergency remote teaching. This was combined with the reality that students had no training in remote learning. Everyone assumed they knew how to manage it. As a result, students were left with the task of figuring out how to manage their learning on their own. This realisation prompted me to start thinking about ways to help students learn how to use mobile learning to manage and control their self-regulated learning.

After giving it some thought, I decided to focus on first-year students who were just joining the university. I realised that this group of students was likely to be the most vulnerable, given that they were new to the university and overwhelmed by higher education demands. This led to the inception of this study.

Looking back on my journey as an educator, I believe it is our responsibility to embrace these changes and use them to create a more mobile technology-friendly learning environment for our students by supporting students on how to use mobile learning to manage and control their learning. Moreover, we need to stay open to new ideas and approaches. By doing so, we can continue to innovate and improve the way we educate future generations.

1.4 My Positionality and Reflexivity

According to Holmes (2020, p. 2), positionality refers to a researcher's "choice of position within a given study, which determines how the research is conducted, as well as the consequences and conclusions". Positioning oneself is one key feature of qualitative research (Cohen et al., 2018). This refers to the researcher's role in the study and how it affects interactions with the participants and the overall study.

In this study, I positioned myself as an insider while also acting as a facilitator in line with the interventionist research design. An interventionist study in education research typically refers to a type of research design where researchers actively intervene in a specific educational setting or process to evaluate the effects of their intervention (Bakker, 2018). This could involve implementing a new teaching method, curriculum, technology, or programme and examining its impact on student learning outcomes, behavior, attitudes, or other relevant variables.

While I was part of the research as an insider, I respected participants' autonomy in areas where they require assistance in their mobile learning activities (Holmes, 2020; Shambare et al.,2023). I was considered an insider because I was working as a Learning and Evaluation Officer for the University, and my job requires that I engage with first-year medical students in different ways. Instead of my insider position in the research bringing bias, I strived to interact with the participants ethically, understanding, and meaningfully since they were my co-researchers in this study. The participants came from various ethnic backgrounds, cultures, languages, marital statuses, and age groups, each with their own set of experiences. Therefore,

I navigate and embrace diversity by respecting the dictates of individuals' cultures, considering their ethnic backgrounds, languages, marital statuses, and age groups. My approach ensures that my actions are sensitive to their values, preventing any unintentional insults or offenses. Throughout this process, I prioritize maintaining the credibility of the data and the overall study. Since English is used as a medium for instruction delivery at the selected medical school in Malawi, English was used as the main language in the study. However, during reflective workshops and focus group discussions, the participants were allowed to express themselves in their home languages, which I then translated into English.

Aside from my role as an insider in this study, I also found myself occupying the position of an outsider. Since the study aimed to use mobile devices to manage and control learning among first year medical students, I was not one of the participants actively involved in using the mobile device to improve their self-regulated learning skills.

My perspective as an outsider provided a unique vantage point, allowing me to observe the study's progress and outcomes objectively. I had the opportunity to witness the changes and improvements that occurred among the participants without being influenced by personal experiences or biases that may have been present among the first-year medical students who were directly engaged in the intervention.

Being on the periphery of the study, I was able to focus on the broader implications of using mobile devices by medical student to manage and control their learning. Throughout the research, I maintained open communication with the participants. This role allowed me to gain insights into the experiences, challenges, and successes faced by the medical students during the intervention. As an outsider, I was able to assess how mobile learning impacted first-year medical students' self-regulated learning.

In addition, bearing in mind that the dignity and confidentiality of the research participants are critical, I adhered strictly to the University's research principles. To follow the research principles, I obtained participants' consent to participate, discussed research goals with them ahead of time, and agreed with them on the time and day of the fortnightly workshop engagements. Furthermore, I have not disclosed the participants' identities, changed the study's results, or interfered with their concerns during the data presentation. I have respected their wishes regarding identifying their roles and preferred names. I respected the rights of participants to withdraw from the study at any time. Most importantly, as an insider, my

positionality was reflexively engaged throughout the research process as I reflected on my actions throughout the study. This was accomplished through the use of a reflective research journal. I kept a journal of all my encounters with the study participants. I involved a critical friend in the study who constantly gave me feedback on what was transpiring throughout the research process.

1.4 Problem Statement

Limited published research has investigated the use of mobile learning to promote learning in schools in developing countries like Malawi (Lee et al., 2020). The majority of these studies have focused on how mobile technologies provide access to learning materials through web-enabled mobile devices (Andrews et al., 2010; Laru & Jarvela, 2008; Mellow, 2005) or the use of mobile technologies to make announcements to students (Ally et al., 2007; Jones et al., 2009; Leech, 2006). In addition, despite the fact that self-regulated learning (SRL) is heavily emphasised in higher education and in particular medical training, research shows that most medical students are still unprepared to use appropriate SRL strategies in the clinical learning environment (Berkhout et al., 2017; Lee et al., 2020; Marjadi & Langendyk, 2017). Instead, Cho et al. (2017, p.1) posited that "SRL cannot be assumed to develop naturally in the clinical learning environment". They further expressed that medical students often seem to carry forward learning strategies that worked well in the early years, often to their detriment in the light of the aforementioned. It is clear that self-regulated learning is essential for university students. Therefore, every effort should be taken to ensure that suitable and relevant support is provided to students to help them develop self-regulated learning as efficiently as possible in their studies' early years.

Furthermore, higher education institutions are seeing an increase in the number of students owning, accessing and using mobile devices (Al-Emran et al., 2016; Sevillano-Garcia & Vázquez-Cano, 2015). As a result of students' increased use of mobile devices, research into the use of mobile devices for education and learning has expanded (Mondaca-Fernandez, 2019). For instance, studies on mobile learning (Alexander et al., 2019; Johnson et al., 2016; Sevillano-Garcia &Vázquez-Cano, 2015) have shown that mobile devices are effective in enabling students to access learning resources conveniently by enabling them to connect to universities' learning management systems. Moreover, they enable students and lecturers to communicate quickly, implying the possibility of using mobile devices to improve students' self-regulated learning skills. In addition, Alegria et al. (2014, p.3) further suggested that " "in

medical training, technological resources such as mobile devices can further cultivate SRL levels by allowing students to access clinical and educational information" " .

The educational environment that promotes the use of mobile technologies in the development of SRL is imperative, as demonstrated by studies in Europe, North America, and Australasia that illustrate a strong relationship between the use of mobile learning and SRL development (Carter et al., 2020; Kukulska-Hulme & Traxler, 2005; Palalas & Wark, 2020; Pitchford, 2015). However, despite the potential benefits and the overwhelming evidence supporting the efficacy and appropriateness of using mobile devices in learning in the developed world, most developing countries, such as Malawi, are yet to fully pursue the use of mobile learning to support the development of self-regulated learning in particular (Chawinga & Zozie, 2016; Chibambo, 2009; Pitchford, 2015). In light of this backdrop, in this study, I worked with first-year university medical students to use mobile learning to develop self-regulated learning in a developing country. An interventionist study of this nature might be the first of its kind in Malawi.

1.5 Goal of the study and research question

The main goal of this study was to explore how first-year medical students use mobile learning to develop self-regulated learning in their organ-system model integrated curriculum that integrates basic sciences and clinical medicine in a developing country**.** The study addressed the following objectives and research questions to achieve this goal.

1.5.1 Research Objectives

1. Assess the utilisation of mobile learning by first-year medical students to develop self-regulated learning.
2. Investigate first-year medical students' perspectives on using mobile learning to develop self-regulated learning.
3. Assess how mobile learning enables and/or hinders first-year medical students from developing self-regulated learning.
4. Explore how first-year medical students can be supported to use mobile learning to develop self-regulated learning.

1.5.2 Research Questions

1.5.2.1 Main Research Queation

What can we learn from first year medical students about self-regulated skills development that is mediated through mobile technologies in a developing country?

1.5.2.2 Sub Reseaerch Question

1. How do first-year medical students make use of mobile learning to develop self-regulated learning?
2. What are the perspectives of first-year medical students on using mobile learning to develop self-regulated learning?
3. How does mobile learning enable and/or hinder the development of self-regulated learning?
4. How can university first-year medical students be supported to develop self-regulated learning through the use of mobile learning?

1.6 Rationale and Significance of the Study

The rationale of this study was to explore how university first-year medical students can make use of mobile learning to develop self-regulated learning in their organ-system model integrated curriculum that integrates basic sciences and clinical medicine in a developing country with a view to allowing them to become autonomous learners who can manage and control their own learning. The findings from this study have the potential to impact a number of areas. The study has helped study participants (selected students) to participate in the planned intervention to develop self-regulated learning.

Improvements in self-regulated learning in first-year university students might benefit more first-year students adjusting to university studies and achieving early academic success which they can build throughout their medical schooling. SRL skills gained through this study will also help first-year students to manage and control their learning as they transition from secondary school learning approaches to university learning approaches. The study also offered an opportunity for the participants to share their own experiences with using mobile learning to develop SRL and learn from each other.

At a personal level, the study will contribute knowledge and understanding of the concept and aspects of using mobile learning to develop self-regulated learning. It has also improved my

critical thinking and analytical skills as well as the participants' through hands-on learning. Theoretically, the findings from the study have contributed to the development of a theoretical framework for the development of self-regulation using mobile learning in higher education institutions (HEIs) based on the developing country experience. It has also helped experiential understanding of how the interaction between the user and mobile device(s) can influence the development of self-regulated learning.

In terms of policy and practice, this study's findings might provide developing countries with empirical findings that can be relied on in making decisions regarding mobile learning technologies in higher education institutions (HEIs). Furthermore, since most studies are based on developed country experiences, this study is based on developing country experiences and hence will contribute to the literature knowledge base for future studies on self-regulation, mobile learning, and the education developing country.

1.7 Definitions of key concepts used in the thesis

technology field from the perspective of the students in a

In this section, I define the key concepts used in this thesis.

Collaboration

Collaboration in learning can be defined as a process where learners work together in groups to achieve a common learning goal, with each member contributing their unique skills and knowledge to the task (Barkley et al., 2014). Collaborative learning has been shown to have a positive impact on learners' academic achievement, critical thinking skills, and social interaction (Kirschner & Erkens, 2020).

Developing Country

A developing country, also known as a less developed country or a developing economy, is a nation with a less developed industrial base and a low Human Development Index (HDI) relative to other countries (Sanford, 2003).

First-year medical student

First year medical students these are individuals who have recently commenced their medical education at a university or medical school.

Higher education

Higher education refers to tertiary education beyond the secondary level, typically provided by universities, colleges, and vocational institutions. It encompasses undergraduate and postgraduate programs that lead to academic degrees such as bachelor's, master's, and doctoral degrees (Williams, 2016).

Mediation of learning

Mediation of learning refers to the process in which a mediator facilitates learning by guiding and supporting learners in acquiring knowledge and skills (Van der Meijden, 2014).

Mobile devices

“Mobile devices are handheld electronic devices with advanced computing, storage, and networking capabilities” (Li et al., 2021, p. 12). A mobile device is designed to be easily carried around and used on the go. It can include smartphones, tablets, smartwatches, and other wearable technology.

Mobile learning

Mobile learning as a type of learning that uses mobile devices to support learning (Busse et al., 2019). Examples of these devices include smartphones, laptops, tablets, smartwatches, hotspots, mobile gaming consoles, and many more (Busse et al., 2019). The benefits of mobile learning are numerous. For one, it allows learners to access educational materials and resources from anywhere, at any time. Additionally, mobile learning can be more engaging and interactive than traditional forms of learning, as it often incorporates multimedia elements such as videos, images, and interactive games.

Positionality

Positionality refers to a researcher's “choice of position within a given study, which determines how the research is conducted, as well as the consequences and conclusions” (Holmes , 2020, p. 2). Positioning oneself is one key feature of qualitative research (Cohen et al., 2018). This refers to the researcher's role in the study and how it affects interactions with the participants and the overall study.

Reflection

Reflection in learning refers to the process of actively thinking about and analysing one's own learning experiences in order to gain new insights, develop a deeper understanding of oneself, and improve future performance (Moon, 2013; Shambare et al.,2023). It involves considering the outcomes of one's actions, identifying areas for improvement, and developing strategies for continued growth and development.

According to Boud et al. (2013), reflection is a critical component of learning and professional development. Through reflection, learners can gain a better understanding of their strengths and weaknesses, identify areas for improvement, and develop strategies for ongoing learning and growth. This can be done through various means, such as keeping a reflective journal, engaging in peer discussions, or seeking feedback from mentors or supervisors.

Self-regulated learning

Self-regulated learning refers to the process by which learners take control of their own learning through the monitoring, regulating, and controlling of their cognitive, motivational, and behavioural processes (Pintrich, 2000; Shambare et al.,2022). Learners engage in self-regulated learning by setting learning goals, selecting and using learning strategies, monitoring their progress, and adapting their strategies as needed. Self-regulated learners can identify their strengths and weaknesses and have the skills and motivation to manage their own learning experiences.

Social interaction

Social interaction in the context of learning refers to the process of individuals engaging with others to exchange information, ideas, and perspectives in a shared learning environment (Vygotsky, 1978). According to Vygotsky's (1978) sociocultural theory of learning, social interaction is essential for cognitive development as it provides learners with the opportunity to participate in culturally relevant activities, acquire new knowledge, and internalise new concepts through the guidance of more knowledgeable peers or adults (Vygotsky, 1978).

Scaffolding

Scaffolding in education refers to a process where teachers or more knowledgeable peers provide temporary support and guidance to learners as they engage in learning tasks that are

beyond their current level of competence, with the ultimate goal of enabling them to complete these tasks on their own (Wood et al., 1976).

Zone of Proximal Development (ZPD)

This is the difference between a person's real developmental levels as measured by their ability to solve problems on their own and their level of potential development as measured by their ability to solve problems in collaboration with more experienced peers (Vygotsky, 1978).

1.8 Thesis Structure

This thesis consists of eight chapters and is organised as follows.

Chapter One: Situating the study

The introduction section presents the research background, significance of the study, research problem and aim of the study. Research questions and research objectives are formulated in this chapter.

The chapter commences with a brief introduction. Then, a background to the research is presented, outlining the theoretical gaps that necessitated this study. This contextualisation helps establish the research question's importance and contribution to the field.

Subsequently, the chapter focuses on the statement of the problem, clearly outlining the central issue that the research aims to address. The purpose of the study is also presented, outlining the specific goals and objectives of the research and providing clarity on what the study aims to achieve. The significance of the study is then discussed, highlighting the potential impact and contribution of the research to the field and its potential practical implications. The chapter also presents the research questions, which guide the research and help to frame the study.

To enhance understanding of the study, the chapter briefly presents the key concepts relevant to this research. This will ensure that the reader is able to follow and comprehend the research effectively. The thesis outline is also presented, providing the reader with a clear roadmap of the chapters that will follow.

Chapter Two: Literature Synthesis

This chapter presents a literature review of the scholarship of SRL and mobile learning. The literature review provides an overview of the concept of SRL and the different approaches to SRL. It also explores the relationship between SRL and mobile learning, as well as the

perceptions of students on mobile learning and, the theoretical frameworks underpinning SRL. The chapter then delves into the use of mobile learning in higher education and its potential to enhance students' SRL. The literature review concludes by highlighting the research gaps in the SRL and mobile learning field that this study seeks to address.

Chapter Three: Theoretical Frameworks

This chapter will focus on the theoretical framework used in this study. The chapter discusses the theories that have been used as analytical tools to understand the relationship between mobile learning and SRL. The theoretical frameworks that guide the study are the Extended Unified Theory of Acceptance and Use of Technology model (UTAUT) (Venkatesh et al., 2003) and Vygotsky's (1978) socio-cultural theory (SCT). Notably, Alasmari and Zhang (2019), with permission from Venkatesh et al. (2003), modified the UTAUT by introducing two additional constructs: Mobile Learning Technology Characteristics and Self-Management of Mobile Learning. This modification resulted in the version referred to as the Extended UTAUT. Therefore, this study used the Extended UTAUT. SCT and extended UTAUT have been used in this study because they complement each other well in guiding this study to achieve its objectives. For instance, the (SCT) is based on the link between social interactions and human development (Vygotsky, 1978). The Extednded UTAUT describes how people intend to use technology and how they actually utilise it.

Chapter Four: Research Methodology

This chapter will present a comprehensive overview of the methodology utilised in the empirical part of the research. The research design and paradigm that guided the study are discussed in detail to offer a clear understanding of the approach adopted. Additionally, the chapter delves into the data collection methods employed, which included the use of a questionnaire, participatory observation, and focus group discussion to obtain a rich and varied dataset.

The research design used in this study was a mixed-methods approach that integrated both quantitative and qualitative data. The paradigms used were the pragmatic and interpretative paradigms. The interpretive paradigm helped understand how learners perceive and use mobile devices to support their self-regulated learning. On the other hand, the pragmatic paradigm

helped in understanding the most effective ways of using mobile devices to support self-regulated learning.

By employing a mixed-methods approach, the study aimed to provide a more comprehensive and nuanced understanding of the research problem. Data collection was done through various methods to ensure that the study captured a wide range of perspectives and experiences. The questionnaire was used to collect quantitative data, while participatory observation was utilised to obtain qualitative data. Focus group discussions were also held to allow participants to engage in group interactions, allowing them to freely discuss their experiences, perceptions, and opinions.

Data analysis techniques used in this study are descriptive statistics and content analysis. Descriptive statistics were used to summarise the quantitative data collected, T-test was perfomed to check if there were statisticaly significant improvement in participants SRL, while content analysis was used to analyse the qualitative data. This analysis helped to identify common themes, patterns, and trends across the data set.

Overall, this chapter offers an in-depth insight into the methodology used in the empirical part of the research, providing a clear understanding of the approach adopted and the techniques employed to obtain and analyse the data.

Chapter Five: Results

This chapter presents the findings of the study, providing a comprehensive analysis of the data collected through questionnaire, participatory observation and focus group discussions. The chapter offers an in-depth exploration of the relationship between mobile learning and SRL skills, examining how first-year students utilised mobile learning to foster SRL, and evaluating the effectiveness of mobile learning in promoting SRL skills among first-year university students. The quantitative data is presented through tables and figures, while the qualitative data is presented in the form of themes and categories. Overall, the results offer valuable insights into the ways in which mobile learning can be used to the develop SRL skills in first-year students.

Chapter Six: Discussion

This chapter will discuss the findings of the study in detail. The chapter presents a critical analysis of the results and relates them to the research questions 1, 2 and 3. The chapter also

compares the findings of the study with the existing literature and discusses the implications of the study for future research and practice.

Chapter Seven: Framework for Using mobile learning to foster SRL skills

This chapter presents a critical analysis of the results and relates them to the research question four and a framework for using mobile learning to foster SRL skills in first-year university students. The framework incorporates the findings of the study and provides recommendations for the design and implementation of mobile learning interventions for SRL.

To effectively implement this framework, it is crucial to understand the unique learning needs of first-year university students. The proposed framework emphasises the integration of mobile learning tools and strategies that support the development of SRL skills, such as goal-setting, metacognitive reflection, and self-monitoring. The proposed framework provides a practical guide for educators to leverage mobile learning to foster SRL skills in first-year university students, ultimately promoting their academic success and lifelong learning.

Chapter Eight: Synthesis, Implication and Recommendations

This chapter concludes the thesis by summarising the study's main findings and highlighting their significance for enhancing SRL skills in first-year university students. The chapter also provides recommendations for the use of mobile learning to develop SRL skills in higher education. The chapter concludes by emphasising the importance of mobile learning as a tool for enhancing SRL skills and promoting independent learning in students.

CHAPTER TWO: LITERATURE SYNTHESIS

> Synthesizing literature is an essential step in conducting research, as it allows the researcher to gain a comprehensive understanding of the existing knowledge in their field, identify gaps and inconsistencies, and develop new insights and ideas. (Bryman, 2016, p. 82)

2.1 Introduction

This chapter presents a review of the literature on the scholarship of self-regulated learning (SRL) and mobile learning. A literature review chapter is a piece of academic writing that contextualises and demonstrates knowledge of the academic past research on a particular topic (Ridley, 2012). Ridley (2012) further asserted that it is considered a literature review rather than a literature report because it also involves a critical evaluation of the materials. In addition, "synthesizing literature is an essential step in conducting research, as it allows the researcher to gain a comprehensive understanding of the existing knowledge in their field, identify gaps and inconsistencies, and develop new insights and ideas" (Bryman, 2016, p. 82).

A literature review helps the researcher familiarise himself/herself with and understand previous studies in a particular field before carrying out the new research study. Conducting a literature review also enables the researcher to find out what studies have already been done in the field, and this helps the researcher identify what is unknown within the researcher's topic of interest. According to Munn et al. (2018), there are many types of literature review, but the most common ones are narrative literature review, systematic literature review, scoping literature review, argumentative literature review, integrative literature review and theoretical literature review. This section presents a summary and critique of the literature on self-regulated learning (SRL) and mobile learning (M-learning).

This study used narrative literature, the narrative literature review critiques literature and summarises the body of literature. A systematic search for relevant studies was done utilising reputable electronic databases namely Springer, Taylor & Francis Online, Google Scholar, Science Direct, and Web of Science Core Collection, Scopus in order to find the research that met the selection criteria. The following search terms were used: the use of mobile learning by a university student and self-regulated Learning (SRL) among university students. In addition,

terms that included combinations of one mobile Learning and Self-regulated keyword (e.g., “mobile” AND “self-regulated”) were used to find relevant primary studies via the electronic databases.

The chapter begins by discussing self-regulation; then it presents the concepts of SRL, such as strategies to develop the self-regulated learning skills of students in Higher Education Institutions (HEIs); conceptual dimensions of academic self-regulation; use of mobile learning in HEIs; the relationship between SRL skills and mobile learning and, finally the critique of the presented literature on self-regulated learning (SRL) and mobile learning.

2.2 Self-Regulated Learning

The idea of self-regulated learning (SRL) re-emerged in the second half of the 20th century when learning researchers like Zimmerman (1986, 1988) and Toharudin et al.(2019) concluded that learning is a construction of knowledge by the person who learns. Education experts have offered numerous definitions of SRL to give a comprehensive view. Zimmerman (1998) defines SRL as the extent to which a learner demonstrates metacognition, intrinsic motivation, and active involvement in the learning process. According to Pintrich (2000), SRL involves students taking an active and constructive approach to their learning, where they set learning objectives and then regulate, monitor, and manage their cognitive processes, motivation, and behaviour to achieve those objectives within the learning context. Harrison and Pain (2009) defined SRL as the cultivation of independent and self-directed learning abilities.

Zimmerman's (2008) definition emphasises metacognition, intrinsic motivation, and behavioural engagement. Pintrich’s (2000) definition emphasises the active and constructive nature of SRL, focusing on goal setting and the regulation, monitoring, and management of cognition, motivation, and behaviour. Harrison and Pain's (2009) definition centres on the ultimate goal of developing autonomous learning skills. While each definition captures unique aspects, Pintrich's definition stands out as the most comprehensive, offering a deeper understanding of SRL processes. Zimmerman's definition highlights motivational and engagement factors, and Harrison and Pain's definition emphasises the outcome of becoming an autonomous learner. Combining these perspectives can provide a holistic understanding of SRL's significance in education.

From these definitions, it seems that self-regulated learning is crucial in the learning process (Jarvela & Jarvenoja, 2011; Toharudin et al., 2019; Zimmerman, 2008). Moreover, it can assist students in developing better learning habits and study skills (Wolters, 2011), and it helps in implementing learning strategies that will help to improve students' academic outcomes (De Bruin et al., 2011; Harris et al., 2005).

The concept of self-regulated learning has been the subject of extensive research over the past few decades (Boekaerts, 1997; Schunk & Greene, 2017; Toharudin et al., 2019; Zimmerman & Schunk, 2013; Zimmerman & Pons,1986). It has become a crucial topic in education and significantly impacts student learning and accomplishment (Boekaerts, 1997; Boekaerts & Cascallar, 2006; Schunk & Greene, 2017). Various theoretical perspectives that have influenced definitions and comprehension of self-regulated learning and how students develop SRL skills have been considered in the literature (Jarvela & Jarvenoja, 2011; Toharudin et al., 2019; Zimmerman, 2008). Furthermore, several SRL theories sometimes diverge significantly and subtly (Greene & Azevedo, 2007; Toharudin et al., 2019).

For example, Zimmerman and Schunk (2001) presented a thorough overview of the various theoretical views on self-regulated learning, including operant, phenomenological, social cognitive, information processing, volitional, Vygotskian, and constructivist. It must be noted that adopting self-regulation as an explanatory construct and identifying important processes has become more challenging due to researchers using many theoretical paradigms to describe and interpret their findings. Moreover, most process constructs, including metacognition, volition, and planning, seem to conceptually overlap (Zimmerman, 1994). In this section, I present Zimmerman's (2001) comparison of the theoretical viewpoints on key features of SRL in order to provide a complete understanding of SRL from many perspectives, as shown in Table 2.1 below.

Table 2.1: A comparison of theoretical views regarding specific aspects of Self-Regulated Learning (Zimmerman, 2001, p.9)

Theories of learning	Motivation	Self-awareness	Key Processes	Social and Physical Environment	Acquiring Capacity
Operant	Reinforcing stimuli are emphasised	Not recognised except for self-reactivity	Self-monitoring, Self-instruction and Self-evaluation	Modelling and Reinforcement	Shaping behaviour and fading adjunctive stimuli
Phenomenological	Self-actualisation is emphasised	Emphasise the role of self-concept	Self-worth and self-identity	Emphasise the subjective perceptions of the environment	Development of the Self System
Information Processing	Motivation is not emphasised historically	Cognitive self-monitoring	Storage and the transformation of information	Modelling and enactive mastery experiences	Increases through social learning at four successive levels
Social Cognitive	Self-efficacy, outcome expectations, and goals are emphasised	Self-observation and self-recording	Self-observation, self-judgment and self-reactions	Modelling and enactive mastery experiences	Increases through social learning at four successive levels
Volitional	A precondition to volition based on one's expectancy/values	The action controlled rather than the state-controlled	Strategies to control cognition, motivation and emotions	Volitional strategies to control distracting environments	An acquired ability to use volitional control strategies
Vygotskian	Not emphasised historically except for social context effects	The consciousness of learning in the Zone of Proximal development (ZPD)	Egocentric and inner speech	Adult dialogue mediates children's speech	Children acquire inner use of speech in a series of developmental levels
Constructivist	Resolution of cognitive conflict or a curiosity drive is emphasised	Metacognitive monitoring	Constructing schemas, strategies or personal theories	Historically social conflict or discovery learning is stressed	Development constrains children's acquisition of self-regulatory process

Table 2.1 above presents an overview of the diverse theoretical perspectives that researchers have explored concerning self-regulated learning (SRL). This dynamic field has been approached from various angles, each shedding light on different aspects of this important educational concept. Despite the range of viewpoints, several common themes consistently emerge across these perspectives, offering valuable insights into the nature of self-regulated learning.

One of the fundamental themes found in these theories is the significance of metacognitive and cognitive strategies in SRL. Metacognition refers to individuals' awareness and control over their own thinking processes (Flavell, 1976). It involves planning, monitoring, and evaluating one's learning progress. Cognitive strategies, on the other hand, encompass specific techniques and methods learners employ to comprehend, remember, and apply information effectively. Together, metacognitive and cognitive strategies empower learners to become more autonomous and efficient in their learning journeys.

Another integral aspect emphasised by these theoretical perspectives is the role of motivation in learning. Motivation plays a pivotal role in driving learners to engage in the learning process actively and persistently. The level of intrinsic motivation, or the internal desire to learn for its own sake, has been linked to more profound and lasting learning outcomes. In contrast, extrinsic motivation, such as external rewards or fear of punishment, may have limited effects in promoting long-term engagement. Understanding the underlying motivational factors can help educators design learning experiences that foster a genuine thirst for knowledge and personal growth.

Additionally, these theories highlight the influence of social and physical factors on learning experiences. Social interactions, such as peer collaboration, mentoring, and feedback from teachers, can profoundly impact how learners regulate their learning. A supportive and encouraging learning environment can foster positive self-beliefs and increase learners' confidence in their abilities. Moreover, physical factors like the learning environment, resources, and technological tools can either enhance or hinder self-regulation capabilities.

By comprehending the diverse theoretical perspectives and the common themes they encompass, educators and learners can cultivate more effective self-regulated learning practices. Integrating metacognitive and cognitive strategies into teaching approaches can

empower students to take charge of their learning and develop lifelong learning skills. Furthermore, nurturing intrinsic motivation through meaningful and relevant learning experiences can enhance students' engagement and achievement. Finally, creating a conducive and supportive learning environment that considers the interplay of social and physical factors can positively impact learners' overall learning experiences.

This study used the Vygotskian method to explore the development of self-regulated learning (SRL) in first-year medical students. To provide a structured approach, Zimmerman's conceptual framework for studying self-regulation is used to guide the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh et al., 2003) and Vygotsky's sociocultural theory (SCT) (Vygotsky, 1978) as analytical lenses. In the next sections, present Zimmerman's framework (1994) for studying self-regulation and the Cyclical phase of self-regulated learning (Zimmerman & Moylan, 2009), which offer invaluable insights into the concept of SRL.

2.3 Cyclical Nature of Self-Regulated Learning

Self-regulatory processes and accompanying beliefs fall into three cyclical phases: forethought, performance or volitional control, and self-reflection (Zimmerman & Moylan, 2009). Figure 2.1 gives a clear illustration of the learning processes in cyclical phases.

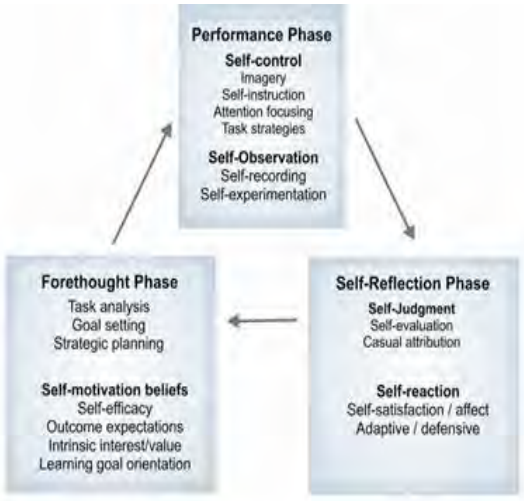

Figure 2.1: Cyclical phase model of Self-regulation (Zimmerman & Moylan, 2009, p.305)

The cyclic process shown in Figure 2.1 shows how self-regulating students monitor the effectiveness of their learning strategies. This cyclic process is also called a self-oriented feedback loop (Zimmerman, 2000). Self-regulating students respond to feedback in a number of ways, such as by switching out one learning technique for another (Zimmerman, 2000). As a result, the information obtained through self-reflection is used to make the necessary adjustments to ensure the task is successfully completed (Schunk, 2001; Shambare et al.,2022).

2.3.1 Forethought phase

On key processes of self-regulation, I will begin by discussing the first phase - the forethought phase - and its two processes: goal setting and social modeling. The forethought phase is a crucial stage in the overall process of achieving success and personal growth. It lays the foundation for the subsequent actions and outcomes. Within this phase, there are two essential processes that play a significant role: goal setting and social modeling.

2.3.1.1 Goal setting

Goals are the aims of action and involve a specific standard and a time limit (Zimmerman & Moylan, 2009). Goal setting is one of the crucial components of the forethought phase. Self-set goals promote student self-efficacy (Zimmerman & Moylan, 2009; Shambare et al.,2022). According to Bandura (1997), proximal goals produce more effective self-regulated practice than general goals. Proximal goals involve breaking long-term goals into short-term goals. For example, when learners intend to improve their weak learning strategy in a particular topic within a semester, they could break the task into sub-task, allocate time for each, and choose a learning strategy that can be used to achieve each sub-task. Learners who achieve these short-term goals increase their self-efficacy and motivation, according to Schunk (2012). Self-efficacy is defined as "the perceived ability to implement actions necessary to attain designated performance levels" (Bandura, 1997), while motivation is defined as the desire to act in service of a goal (Bandura, 1997). Based on the aforementioned, goal setting is a crucial aspect of self-regulated learning (SRL). The significance of goal expectations in influencing motivation and effort during SRL has been widely acknowledged (Schunk, 2012; Shambare et al.,2022).

Schunk (2012) argues that setting high goal expectations can positively impact motivation during self-regulated practice. When students aim for challenging yet achievable goals, they are more likely to stay engaged and motivated to excel. High expectations push students to put in the effort required to meet those expectations. High goal expectations act as a driving force that propels students towards continuous improvement and self-growth. On the contrary,

setting low goal expectations has a detrinetal effect on students' efforts. Studies by Harrison and Pain (2009) and Prosser et al. (2008) have shown that setting low goal expectations can have significant negative effects on student effort. When students set their sights too low, they may become complacent and lack the motivation to strive for excellence. Low goal expectations can lead to a lack of commitment and enthusiasm in pursuing academic tasks.

It is important for students to define realistic goals. To enhance self-regulated learning, it is essential to establish proximate and defined realistic goals with high expectations. Realistic goals are important because they strike a balance between being challenging and achievable. Breaking down larger goals into smaller, manageable ones is an effective strategy to avoid overwhelming the students and foster a sense of accomplishment as they achieve each milestone.

Self-set goals have been shown to increase student commitment to their learning objectives (Broadbent & Poon, 2015;Simuja,2024). When students actively participate in setting their learning goals, they develop a sense of ownership and responsibility. This ownership motivates them to stay focused and determined to attain those goals. Two key aspects play a crucial role in achieving high goal commitment among students. Firstly, students need to believe that the goals they set are important and meaningful. When students understand the relevance and significance of their goals, they are more likely to be committed to achieving them. Secondly, students should have a realistic awareness that the set goals are attainable. Unrealistic or overly difficult goals can lead to demotivation and decreased commitment (English & Kitsantas, 2013).

In addition, it is crucial for educators to encourage students to set specific and well-defined goals. Research by Toharudin et al. (2019) emphasises that setting specific goals helps students meet the required standards within a designated time frame. For example, when using mobile devices to enhance SRL, students with specified goals would strive to establish clear goals and time frames, such as becoming proficient in using their mobile phones for effective time management within a set period (Wolters & Brady, 2021;Sepula & Simuja, 2024). Self-regulated students are more inclined to employ effective time management techniques to ensure timely task completion (Öztürk & Tekdal, 2020). They set ambitious short-term goals that are relevant to their studies (Toharudin et al., 2019; Simuja,2018). Conversely, students with fewer SRL strategies tend to lack clear and challenging goals for themselves (Zimmerman, 2008).

Furthermore, self-regulated learners exhibit a higher level of dedication to their goals and display a strong work ethic in achieving them. This dedication sets them apart from learners who lack self-regulation. The act of setting goals in itself influences other aspects of the three SRL phases, as highlighted by Zimmerman (2008). When self-regulated learners successfully set their goals, they frequently employ additional learning techniques to aid in their goal attainment. These learners actively seek resources, strategies, and support systems to ensure they effectively reach their set goals.

Incorporating goal-setting activities into the learning process can empower students by providing them with a sense of direction and purpose. Students develop a greater sense of ownership and motivation in their academic journey by setting specific and challenging goals (Vosniadou, 2020). Educators can play a pivotal role in guiding students through the process of setting realistic and attainable goals, thereby enhancing their self-regulatory abilities (Öztürk & Tekdal,2020; Moloi et al.,2023). Encouraging students to track their progress towards these goals also fosters a sense of accountability and self-awareness. This self-monitoring aspect of SRL empowers learners to reflect on their performance, identify areas for improvement, and make necessary adjustments to their strategies.

Moreover, by integrating goal-setting practices, educators can help students develop a growth mindset, an understanding that abilities can be developed through dedication and hard work. This mindset shift can lead to increased resilience in the face of challenges as students become more willing to embrace difficulties as learning opportunities.

Overall, incorporating goal-setting practices into education is a powerful tool to nurture self-regulated learners. Educators can equip students with essential skills for effective time management, self-motivation, and goal achievement by promoting specific, challenging, and time-bound goals(McQuirter & Meeussen, 2017; Nyirenda & Simuja,2023). As students cultivate a growth mindset and assume ownership of their learning, they become increasingly adept at navigating diverse learning activities.

Having discussed goal setting in the forethought phase, the following section delves into social modeling. Although social modeling isn't explicitly outlined in Zimmerman's cyclical phase of self-regulation as part of the forethought phase, there exists a significant relationship between them. This relationship relationship lies in how they both contribute to effective self-regulation and goal attainment.

2.3.1.2 Social modelling

Social modelling refers to the acquisition and utilisation of socially transmitted information by students to encourage greater learning (Schunk, 2001; Vosniadou, 2020;Simuja & Silvanus,2023). Vosniadou (2020) asserted that that success is attainable by following a certain approach, this notion if properly utilised by students, can provide them with an added advantage. Schunk (2001) further argues that students who possess knowledge of how to perform a task tend to exhibit higher levels of self-efficacy and motivation to achieve. Consequently, students' determination to perform the assignment directly impacts their achievement, with social modelling significantly enhancing self-efficacy and overall achievement (Vosniadou, 2020).

Social modelling is an effective teaching approach emphasising the acquisition and application of socially transmitted information to promote student learning (Schunk, 2001; Vosniadou, 2020). As highlighted by Schunk (2001) and Vosniadou (2020), social modelling positively impacts students' self-efficacy and motivation, leading to higher levels of achievement.

According to Schunk (2001), when students observe others successfully completing a task, they are more likely to believe in their ability to do the same. This belief, in turn, enhances their self-efficacy or their confidence in their ability to accomplish the task. Social modelling also provides students with a clear understanding of the steps required to complete a task successfully, making the learning process more transparent and less daunting. The resulting increase in self-efficacy, combined with a clearer understanding of the task, motivates students to achieve greater success (Wolters, & Brady, 2021; Simuja & Shisheko,2024).

Vosniadou (2020) asserts that social modelling has the potential to improve learning outcomes by providing students with more effective strategies for tackling new tasks. By observing others' strategies and techniques, students can learn new ways of approaching problems and tasks, which they can then incorporate into their own learning. Furthermore, Vosniadou (2020) points out that social modelling can increase students' motivation to learn by demonstrating the value and relevance of the task at hand. When students see others successfully completing a task, they are more likely to understand its significance and become more motivated to succeed.

Overall, social modelling is an effective teaching approach that can significantly enhance students' self-efficacy, motivation, and learning outcomes. By providing students with clear examples of how to complete a task successfully, social modelling increases their confidence and understanding of the task, leading to greater motivation and success (Alzyoudi et al., 2015). Moreover, by observing others' strategies and techniques, students can learn new approaches to problem-solving and task completion, ultimately resulting in more effective learning experiences(Fıtrıanı et al., 2020).

In this section, I have discussed the forethouht phase,the next section discusses the second stage of self-regulation the performance phase.

2.3.2 Performance phase

The performance phase is the second stage of self-regulation, encompassing various learning processes that occur during learning activities, affecting learners' focus and performance (Zimmerman & Moylan, 2009). It is influenced by the forethought phase (Zimmerman, 2002), during which students define learning goals, gain confidence in their abilities, anticipate positive outcomes, and demonstrate interest in the activity. These procedures support students' task performance and attention span. In the performance phase, two key aspects come into play: self-control and self-observation.

Self-control techniques are strategies that allow students to actively improve their learning process, both overtly and covertly (Zimmerman, 2008, p. 281). Students may choose specific study techniques to support their learning (Zimmerman, 2002). Proactive learners employ the learning strategies they have chosen during the planning phase, while reactive learners approach assignments without prior preparation (Zimmerman, 2002).

Help-seeking is a self-control behaviour that involves managing the social environment to facilitate learning (Zimmerman & Moylan, 2009). This refers to the act of seeking assistance when encountering learning challenges. Self-regulated learners are prepared and willing to seek help from individuals they believe can aid them in problem-solving. However, help-seeking can be either adaptive or non-adaptive (Vanbecelaere et al., 2020). Adaptive help-seekers carefully consider the questions they need to ask and whom they should approach for assistance. In contrast, non-adaptive help-seekers ask unnecessary questions or seek help from individuals who cannot provide appropriate answers. Adaptive help-seeking is considered a strategic aspect of self-regulated learning (SRL). Studies have shown that highly self-regulated

learners tend to be more adaptive in their help-seeking behaviour compared to low self-regulated learners (Newman, 2012; Vanbecelaere et al., 2020; Zimmerman & Schunk, 2001).

Self-observation is another behaviour related to SRL performance. Zimmerman (2002) defines self-observation as the process of students reflecting on their participation and performance in a learning situation and making adjustments or attempting creative strategies accordingly. Self-observation includes both self-recording and metacognitive monitoring. Metacognitive monitoring involves informally tracking one's performance procedures and results (Zimmerman & Moylan, 2009). Self-recording involves creating formal records of learning processes and outcomes, such as documenting performance in logs, charts, and journals (Zimmerman & Moylan, 2009). Proactive students actively engage in self-observation (Zimmerman, 2008), keeping mental and physical records of their time spent on specific tasks. These performance behaviours lead students to react during the phase of self-reflection. Throughout the performance phase, students utilise cognitive (task strategies) and metacognitive (monitoring) strategies to interpret their learning, which also influences personal characteristics during the forethought phase.

Following the performance phase, the final phase is self-reflection, which will be discussed in the next section.

2.3.3 Self-reflection phase

The self-reflection phase involves learning processes that occur after the efforts made in the forethought and performance phases. This phase significantly impacts how learners respond to their learning experiences (Zimmerman & Moylan, 2009). Within the self-reflection phase, two main components come into play: self-evaluation and self-reaction.

2.3.3.1 Self-evaluation

Self-evaluation plays a pivotal role in the process of self-judgment. Self-regulated learners have a desire to assess their performance on a task and how it compares to a standard or others (Zimmerman, 1998b; Zimmerman & Moylan, 2009). This self-evaluation inevitably leads to a form of self-judgment known as causal attribution, which pertains to ideas about the factors contributing to successes or failures (Alderman, 2008; Zimmerman, 2002; Zimmerman, 2011). Alderman (2008) emphasised that causal attributions significantly impact people's expectations and actions. Students with lower achievements often attribute their poorer results to external-stable-uncontrollable factors, leading to lower expectations and confidence, while high-

achieving students typically attribute their outcomes to internal-unstable-controllable causes (Sasai, 2015). According to Zimmerman (2002), attributing poor performance to physical or mental limitations can undermine motivation because it suggests that efforts to improve in the future may not be successful. On the other hand, attributing a poor grade to manageable factors, such as using an effective solution strategy, this keeps students motivated as it implies that a different approach could lead to success and advancement. Therefore, self-regulated learners can maintain a growth mindset, enabling them to learn from mistakes and persevere through challenges. In contrast, learners with a fixed mindset may attribute their successes and failures to their inherent abilities, leading to feelings of helplessness, resignation, or anxiety. Hence, cultivating self-regulation skills in learners can foster a more adaptive and resilient approach to learning while also enhancing academic achievement and motivation.

2.3.3.2 Self-reaction

Key aspects of self-reaction include self-satisfaction and defensive/adaptive responses. Self-satisfaction refers to cognitive and emotional responses to self-evaluation (Zimmerman & Moylan, 2009). An increase in self-satisfaction can boost motivation, while a decline can hinder further learning efforts (Schunk, 2012). Adaptive responses involve changes that students make to their learning processes to improve their effectiveness (Schunk, 2012). On the other hand, defensive responses are characterised by attempts to protect one's self-image by avoiding opportunities to learn and perform (Zimmerman, 2002, p. 68). Learners exhibiting defensive reactions may avoid further learning efforts and may even abandon a challenging course, while those with adaptive reactions willingly engage in a more challenging course by employing various learning techniques.

The three phases of Self-Regulated Learning (SRL) described above constitute a continuous process involving the development of constructive behaviours and learning strategies that significantly influence students' learning experiences. In the next section, I will discuss the SRL phases (Figure 2.1) as a conceptual framework for studying self-regulation (Zimmerman, 1994).

2.4 Conceptual Framework for Studying Self-Regulation

According to Zimmerman (1989), SRL techniques within the context of the social cognitive theory are not solely controlled by personal factors like self-efficacy, it is believed that environmental and behavioural variables play a reciprocal impact on these processes. To Zimmerman (1989), each SRL technique seeks to enhance students' contextual, behavioural,

and personal characteristics. Learner choice is considered a crucial component of SRL from a social cognitive perspective (Zimmerman, 2000) (see Table 2.2). Zimmerman developed the conceptual framework to aid in studying self-regulation, which focuses on the practices and activities accessible to students.

Table 2.2: A Conceptual Framework for Studying Self-Regulation. Adapted from "Dimensions of Academic Self-Regulation" (Zimmerman,1994, p.8)

Scientific Questions	Psychological Dimensions	Task Conditions	Self-Regulatory Attributes	Self-Regulatory Sub-processes
Why	Motive	Choose to participate	Self-motivated	**Goal setting andself-efficacy**
How	Method	Choose method	Planned or automatised	**Task strategies,self-instruction**
When	Time	Choose time limits	Timely and efficient	**Time management**
What	Behaviour	Chooseoutcome behaviour	Self-aware of performance	**Self-observation, self-judgment, self-reaction**
Where	Physical environment	Choose setting	Environmentally sensitive and resourceful	**Environmental structuring**
With whom	**Social**	**Choose a partner, model,or teacher**	**Socially sensitive and resourceful**	**Selective help-seeking**

Zimmerman (1994; 1998) emphasised the interconnections between the components presented in Table 2.3, highlighting the crucial relationship between scientific questions, psychological elements, task condition, self-regulation attributes, and self regulatory sub-processes. This framework elucidates how these components interact to facilitate self-regulated learning (SRL) in learners.

The scientific questions presented in the left column act as the starting point for SRL. These questions prompt learners to inquire about the various aspects of their learning process, such as "Why" or "How" to use a mobile device for learning (see column 1). In response to these questions, the psychological elements in the second column come into play. For instance, when a learner contemplates the question of using a mobile device for learning, their motivation to utilise the device is influenced (see column 2).

The learner's level of motivation then guides their decision-making process in column 3. If the learner is sufficiently motivated to leverage a mobile device to support their learning, they will choose to employ the device for a specific academic task. This decision to utilise the mobile device for learning contributes to the development of self-motivated learners who proactively seek ways to enhance their learning experience (see column 4). This self-motivation aspect is reflected through the implementation of goal-setting and self-efficacy sub-processes of SRL (see column 5). Learners who possess effective self-regulation attributes are more likely to set clear goals for themselves and exhibit confidence in their abilities to complete tasks successfully.

It is important to note that these SRL sub-processes (column 5) are closely connected to the SRL phases depicted in Figure 2.1. As learners progress through the different phases of SRL, they engage in various self-regulatory activities that further enhance their learning experience. This framework also asserts that self-regulated learning can be fully realised when learners have autonomy and control over all components of the learning process (Schunk, 2012). When provided with opportunities to make decisions regarding why, how, when, what, where, and with whom to complete a learning task, learners can actively engage in SRL (Schunk, 2012). Moreover, the degree of choice and control students have over their learning experience can influence the range of their SRL skills, which may vary from low to high (Schunk, 2000). Offering students more choices and decision-making opportunities can foster stronger self-regulatory abilities and a deeper commitment to their learning journey.

Overall, Zimmerman's framework illustrates the intricate relationship between various components, demonstrating how psychological elements and scientific questions impact learners' self-regulation attributes, which, in turn, influence their engagement in SRL sub-processes. By recognising the significance of autonomy and choice in the learning process, educators can empower students to become self-motivated, goal-oriented, and confident learners who actively participate in self-regulated learning practices.

Having discussed Zimmerman's conceptual framework for studying self-regulation (Zimmerman, 1994) and explored the cyclical phase of self-regulated learning (Zimmerman & Moylan, 2009) in this section, the next section will focus on the application of self-regulated learning (SRL) in higher education institutions (HEIs). Understanding how SRL can be

effectively utilised in HEIs is crucial for enhancing students' academic success and fostering their ability to take charge of their learning processes.

2.5 Self-Regulated Learning in Higher Education Institutions

Since its emergence as a prominent area of study, the concept of self-regulated learning (SRL) has become increasingly vital for researchers, academics, and students in Higher Education Institutions (HEIs) (Zimmerman & Schunk, 2011). SRL refers to the ability of individuals to actively control and manage their own learning process, which includes setting goals, planning strategies, monitoring progress, and adjusting their approach based on feedback and challenges encountered.

The growing interest in SRL can be attributed to the prevalence of informal learning contexts within HEIs, which demand strong self-regulatory abilities and greater emphasis on lifelong learning (Beishuizen & Steffens, 2011). In today's fast-paced and ever-evolving world, HEIs across the globe are recognising the importance of nurturing a desire for continuous learning in students. The ultimate goal is to foster the development of independent and autonomous learners (Kingsbury, 2015), making SRL skills an essential component of the education process.

HEIs now recognise that the traditional approach of providing students with knowledge is insufficient. To thrive in a rapidly changing knowledge landscape, students must be equipped with the skills to become proactive learners, capable of taking charge of their own learning journey. SRL is seen as a valuable asset in this endeavour (Kingsbury, 2015).

2.5.1 The Characteristics of Self-Regulated Students

Before considering SRL in HEIs, it is important to understand what a self-regulated learner is and how they differ from other types of learners. The elements of SRL are outlined in Zimmerman and Martinez-Pons' (1989) analysis of the characteristics of self-regulated students. They assert that students could be characterised as self-regulating to the extent that they actively engage in their own learning process on a cognitive, motivational, and behavioural level. According to Zimmerman (2001), self-regulating students are aware of their cognition and themselves as learners. Zimmerman (2001) further pointed out that self-regulated learners are also aware of the potential usefulness of self-regulation processes to

enhance their academic achievement. It is within these views that self-regulation processes is suggested as the self-directed process by which students convert their mental abilities into task-related skills (Zimmerman, 2001). This is the process or approach that learners employ to control and organise their thoughts and transform them into learning-related skills.

In addition, Sasai (2015) asserted that university students are able to demonstrate metacognition when they are aware that the academic demands of the Higher Education Institutions (HEIs) differ from those of secondary school. Galustyan et al. (2018) further asserted that this realisation of the HEIs demand enables self-regulated students to be able to make the required changes to their study methods. This forces self-regulating students to become aware that their learning should correspond to the requirements of the Higher Education institutions' academic activities (such as various test formats and learning approaches) and call for a varying approach to different levels of learning (Sasai, 2015). Students, therefore, need to modify their learning strategies to account for these variations. According to Banarjee and Kumar (2014), students require various SRL skills that may not have been as important during their secondary school years to succeed academically in university.

Furthermore, students who self-regulate their learning should possess the metacognitive skills necessary to know what strategies and approaches to use for various learning activities (Banerjee & Kumar, 2014). The metacognitive student can reflect on and alter his or her thought processes and methods of learning (Broadbent, 2017; Effeney et al., 2013; Toharudin et al., 2019). These metacognitive processes guide the problem-solving process (Broadbent, 2017; Effeney et al., 2013). Thus, self-regulating students should be aware of, plan for, carry out, and have the flexibility to refocus their planning for optimal learning, acting metacognitively in putting the best study techniques into practice. Moreover, students require various SRL skills and metacognitive abilities to academically succeed in HEIs, which may not have been as important when they were in secondary school.

2.5.2 Self-regulated Learning Strategies in HEIs

Students who lack the SRL abilities required to study at an HEI can receive assistance in developing the lacking SRL skills (Zheng et al., 2020). Zheng et al. (2020) further asserted that the self-regulated abilities of students could be developed and reinforced by exposure and practice, ultimately improving their SRL. The student can acquire SRL abilities through

teaching, experience and self-reflection (English & Kitsantas, 2013; Nückles et al., 2020; Zheng et al., 2020). According to Nückles et al. (2020), students can learn specific techniques for developing SRL through instruction and creativity. Thus, a student who does not self-regulate their learning can acquire the skills required for SRL through practical learning activities. According to Broadbent (2017) and Effeney et al. (2013), students develop self-regulated skills when they actively participate in knowledge integration and regulation of their learning. Thus, this study adopted the interventionist approach to allow first-year students to actively participate in the process of helping them develop SRL using mobile learning. However, Anderton (2006, p. 157) outlines various techniques HE educators might employ to help students develop successful self-regulated learning skills(see Table 2.3).

Table 2.3 Strategies that can be used to help students successfully develop (SRL) skills

Startegy	Description
Providing clear and specific learning goals	Students need to have a clear understanding of what they are expected to learn and what they need to achieve. Providing specific and measurable learning goals can help students understand the expectations and focus their efforts
Offering frequent feedback:	Feedback can help students monitor their progress and adjust their learning strategies accordingly. Regular and timely feedback can be beneficial in identifying areas of strength and weakness, and guide students in their learning process.
Encouraging self-reflection	Self-reflection involves critically examining one's own learning process and progress. Encouraging students to reflect on their learning experiences and evaluate their own strengths and weaknesses can help them become more self-aware and develop effective learning strategies
Promoting metacognitive strategies:	Metacognition refers to the ability to think about one's own thinking process. Teaching students to use metacognitive strategies such as planning, monitoring, and evaluating their own learning can enhance their ability to regulate their learning and develop more effective learning strategies.
Fostering a positive learning environment:	Creating a positive and supportive learning environment can enhance students' motivation and engagement. Providing opportunities for students to work collaboratively, receive peer support, and participate in interactive activities can promote a positive learning experience.

By employing these techniques, higher education educators can help their students become more effective self-regulated learners, which can lead to improved academic performance and success.

Additionally, self-regulated learning strategies (SRLS) have been discussed in most literature within the context of social cognitive theory (Banarjee & Kumar, 2014; Broadbent, 2017;

Effeney et al., 2013; Toharudin et al., 2019). The SRLS are divided into four categories: (1) cognitive engagement, (2) metacognitive knowledge, (3) resource management, and (4) motivating belief (Pintrich 1999). The four domains and a set of 14 self-regulated learning strategies are presented in Table 2.4 below.

Table 2.4: Domains and SRLS (Zimmerman and Martinez-Pons 1986; Pintrich et al., 1991; Pintrich 2000)

Domain	Self-regulated learning strategies	Description
Cognitive engagement	Rehearsal	Basic rehearsal strategies involve reciting or naming items from a list to be learned. These strategies are best used for simple tasks and activation of information in working memory rather than acquiring new information in long-term memory. These strategies are assumed to influence the attention and encoding processes, but they do not appear to help students construct internal connections among the information or integrate the information with prior knowledge.
	Elaboration	Elaboration strategies help students store information in long-term memory by building internal connections between items to be learned. Elaboration strategies include paraphrasing, summarising, creating analogies, and generative note-taking. These help the learner integrate and connect new information with prior knowledge.
	Organisation	Organisation strategies help the learner select appropriate information and also construct connections among the information to be learned. Examples of organising strategies are clustering, outlining, and selecting the main idea in reading passages. Organising is an active, effortful endeavour and results in the learner being closely involved in the task. This should result in better performance.
	Critical Thinking	Critical thinking refers to the degree to which students report applying previous knowledge to new situations in order to solve problems, reach decisions, or make critical evaluations with respect to standards of excellence.
Metacognitive Knowledge	Planning	Planning activities such as goal setting and task analysis help to activate, or prime, relevant aspects of prior knowledge that make organising and comprehending the material easier.
	Monitoring	Monitoring activities include tracking one's attention as one reads and self-testing and questioning: these assist the learner in understanding the material and integrating it with prior knowledge.

	Regulating	Regulating refers to the fine-tuning and continuous adjustment of one's cognitive activities. Regulating activities are assumed to improve performance by assisting learners in checking and correcting their behaviour as they proceed on a task.
Resource Management	Time and Study environment	Besides self-regulation of cognition, students must be able to manage and regulate their time and their study environments. Time management involves scheduling, planning, and managing one's study time. This includes setting aside blocks of time to study, effectively using that time, and setting realistic goals. Time management varies in level, from an evening of studying to weekly and monthly scheduling. Study environment management refers to the setting where the student does her coursework. Ideally, the learner's study environment should be organised, quiet, and relatively free of visual and auditory distractions.
	Peer Learning	Collaborating with one's peers has been found to have positive effects on achievement. Dialogue with peers can help a learner clarify course material and reach insights one may not have attained on one's own
	Help-Seeking	Another aspect of the environment that the student must learn to manage is the support of others. This includes both peers and instructors. Good students know when they don't know something and are able to identify someone to provide them with some assistance. There is a large body of research that indicates that peer help, peer tutoring, and individual teacher assistance facilitate student achievement.
	Effort regulation	Self-regulation also includes students' ability to control their effort and attention in the face of distractions and uninteresting tasks. Effort management is self-management and reflects a commitment to completing one's study goals, even when there are difficulties or distractions. Effort management is important to academic success because it signifies goal commitment and regulates the continued use of learning strategies.

Motivational Belief	Self-efficacy	Students' confidence in their ability to control their thoughts, feelings and actions and, therefore, their ability to influence the learning outcome.
	Task Value Belief	Student's perception of the course material in terms of interest, importance and the utility of a course.
	Goal orientation	Goal orientation refers to the type of goals students set before they engage in a task. Goal orientations can facilitate or impede the use of self-regulated learning strategies. There are four main reasons why goal-setting improves performance: a) it directs a student's attention to the particular task; b) it engages effort; c) it increases persistence; and d) it promotes the development of new strategies when old strategies fail.

Cognitive engagement is the level of cognitive effort and openness of students to acquire, retrieve, and retain knowledge and take on a given learning assignment (Pintrich,1999). For instance, a student will persistently study more and more to learn a subject matter. When learners think deeply and are aware of their own cognitive processes, they are said to have metacognitive knowledge. Therefore, students who are aware of their metacognition knowledge will be able to use their knowledge and abilities more effectively in their learning process. An example of metacognitive thinking would be proofreading and double-checking an academic assignment before submission. Resource management entails making sensible use of the resources at hand, such as time management, peer learning, help-seeking, and environmental structuring.

Motivational beliefs are the factors that push students to get involved or work toward a goal. Motivational beliefs play a crucial role in shaping students' behaviour and driving their actions towards achieving academic goals. These beliefs are the internal factors that drive students to get involved, stay committed, and put in the effort required to succeed in their studies(Linnenbrink-Garcia & Patall, 2016). They may be influenced by a range of external and internal factors, such as past experiences, cultural background, personal values, and social norms.

One example of a motivational belief that can drive academic success is the desire to learn and use new technologies. In today's digital age, self-taught use of technologies is increasingly important in many academic disciplines, and students who are motivated to learn and use these tools are more likely to succeed in their studies. Similarly, the motivation to complete academic tasks is also an important driver of success. Students who are driven to complete tasks are more likely to put in the effort required to meet deadlines, stay organised, and achieve their academic goals.

The motivational belief domain deals with students' beliefs about themselves, learning as a whole and specific learning tasks (Garcia & Pintrich, 1995; Pintrich et al., 1991). Particularly, it deals with students' goals, their value beliefs for a course, their belief about their ability to succeed in a course, and their anxiety about tests on a course (Garcia & Pintrich 1995; Kivinen, 2002).

Overall, understanding the motivational beliefs that drive student behaviour is essential for educators and academic institutions to support student success. By identifying and nurturing these

beliefs, educators can help students stay engaged and motivated, leading to better academic outcomes and long-term success. Therefore, by nurturing SRL skills in students, students can better control their learning while becoming more proficient and independent. Additionally, it has been discovered that self-controlled behaviour is a significant predictor of learning and performance (Haron et al., 2015).

Metacognitive knowledge is defined as the knowledge learned of the self as a learner, of task requirements, and of specific techniques that should be applied to achieve desired learning goals (Joseph, 2003). It is important to keep in mind that metacognition involves social interaction among the participating students. In this study, students were offered opportunities to interact as they were using a mobile device to manage and control their learning. Efklides (2008) asserted that students' social interactions impact their affective state, which in turn may impact their capacity for self-regulation. It is essential to consider this consequence because, according to Jeyaraj (2016), both self-regulated learning and self-regulation processes make use of students' metacognitive experiences in a social environment.

Resource management is a crucial aspect of SRL, encompassing the allocation and utilization of various resources such as time, study environment, peer learning, and help-seeking strategies to optimize learning outcomes(Zimmerman, 2002). According to Pintrich (1999), the student should be able to employ the following management strategies: a) manage and regulate their time and study environments; b) monitor effects; c) learn from peers; and d) seek help and support from peers and educators (Pintrich & De Groot, 1990). Other aspects of self-regulated learning include regulating one's physical and social environment and the ability to control one's effort and attention (Effort regulation) (Pintrich, 1995). By developing skills in resource management, individuals can become more autonomous and successful learners Jeyaraj (2016). Details of the self-regulated learning strategies under each of the four domains are presented in Table 2.4 above.

2.5.3 Research on self-regulated learning in higher education institutions

According to Van der Meer et al. (2010) and Blackmore et al. (2021), increased student autonomy and study independence across all learning domains at university can be challenging to master. This makes transitioning of the first-year students from secondary school to university difficult

(Higgins et al., 2021). In this regard, Higgins et al. (2021) and Blackmore et al. (2021) assert that first-year students must be prepared to adjust to the university's autonomous and independent learning environment. However, these researchers noted that most students are frequently unprepared to become autonomous learners as they transition to university education. This unpreparedness of first-year students affects their learning at the university, specifically learning that necessitates the capacity to organise, track, and assess one's work as well as to manage one's motivation and emotions (Vosniadou, 2020). However, Vosniadou (2020) asserted that developing self-regulation skills could help first-year students transition from secondary school to university. Therefore, this calls for research on SRL within the context of higher education, especially for first-year students transitioning from secondary to university (Bai & Wang, 2020; Bartimote-Aufflick et al., 2016; Chen et al., 2019; DiBenedetto & Bembenutty, 2013). However, studies have attempted to explore the learning strategies that constitute independent and autonomous learning that first-year students can adopt as they transition from secondary to university (Bai & Wang, 2020; Bartimote-Aufflick et al., 2016; Higgins et al., 2021).

In addition, studies on SRL in a university setting show that students' SRL is significantly improved by self-efficacy beliefs (Bai & Wang, 2020; Bartimote-Aufflick et al., 2016; Chen et al., 2019). These beliefs also affect students' learning strategies (Chen et al., 2019; DiBenedetto & Bembenutty, 2013; Liao et al., 2014). Other SRL learning strategies such as help-seeking (Bai & Wang, 2020; Geller & Bamberger, 2012), causal attribution (Chen et al., 2019), task value and interest (Bai & Wang, 2020; Bartimote-Aufflick et al., 2016), and goal setting (Chen et al., 2019; DiBenedetto & Bembenutty, 2013), have also been investigated within a university study context. Furthermore, the literature suggests that several studies have been conducted on SRL in HEIs in many parts of the world, particularly in the global north (Bai & Wang, 2020; Chen et al., 2019; DiBenedetto & Bembenutty, 2013; Galustyan et al., 2018; Higgins et al., 2021).

In their study, Broadbent and Poon (2015) evaluated SRL strategies used by online students and their academic progress. Broadbent and Poon (2015) assessed 11 peer-reviewed journal publications published between 2004 and 2014. The findings show that students' academic achievement was related to the SRL constructs of metacognition, time management, effort

management, and critical thinking. Through this review, Broadbent and Poon (2015) concluded that students with access to time management skills became aware of their learning behaviours, engaged in critical thinking about the course material, and persevered in their understanding of the course materials to succeed academically in an online learning environment. Another extensive quantitative research on volition, other ability to stay task-focused and fight off distractions (Guven, 2020), was carried out by Deimann and Bastiaens (2010). Volition is a crucial concept in SRL, and volition is defined as a person's willpower (Deimann & Bastiaens, 2010). To address issues in online education, such as dropout rates, and to show that motivation alone does not fully explain human behaviour, Deimann and Bastiaens emphasised examining students' volitional competence. Deimann and Bastiaens's (2010) research shows that the construct of volition can be divided into distinct components, including volitional self-efficacy, consequence control, emotion control, and meta-cognition, which may enable the development of support systems that are tailored to learners' individual needs.

Furthermore, Baldan and Guven's (2020) study investigated undergraduate students' self-regulated learning (SRL) abilities and how higher education programmes can help foster these abilities. They observed that the SRL abilities of undergraduate students were average. Their study's findings also indicated that a number of factors, such as the curriculum's structure, teaching methods, prior exposure to foreign languages, and the kind of high school students graduated from, significantly impacted first-year students' SRL abilities. A study by Waluyo (2018) used a vocabulary course design that promoted self-regulated learning through a mobile application. The results showed that mobile applications helped to improve students' vocabulary acquisition.

Nikolaki and Koutsouba's (2012) study on promoting and supporting self-regulated learning at the Hellenic Open University in Greece refers. The findings of their study reveal that printed instructional materials significantly support and encourage self-regulated learning because of the university's interactive pedagogical structure. The study by Cebesoy (2013) investigated student perceptions of self-regulated learning in physics among bachelor's in education students at Uşak University in Turkey and revealed that students with higher academic achievement scores in physics had higher self-efficacy for learning beliefs. The cross-sectional study by Stanton et al.

(2019) discovered that third-year science students had a greater understanding of the advantages of SRL and were more inclined to self-evaluate the success of their overall study plans. Similarly, SRL role in academic success has drawn more and more attention in educational research. Data from meta-analyses support the idea that SRL is connected with academic achievement (Richardson et al., 2012; Liao et al., 2014).

Based on these studies, it is fair to conclude that promoting self-regulated learning at the university level is important, not only because students must be responsible for their own education but also because they must apply these abilities to progress knowledge in their particular field of study (Waluyo, 2018). Therefore, universities must develop intentional initiatives to support the development of SRL skills in first-year students as they enrol in higher education.

Incorporating SRL into HEIs offers numerous benefits. Firstly, it empowers students to become more self-reliant, encouraging a deeper sense of responsibility for their academic success. As they learn to set clear goals and devise effective strategies to achieve them, students become more motivated and engaged in their studies. In addition, SRL is not limited to the academic realm alone; it has far-reaching implications in various aspects of life. Individuals who possess strong SRL skills tend to excel in their careers, as they are better equipped to adapt to changing job requirements and continuously improve their skill sets. They also demonstrate higher levels of resilience and problem-solving abilities when faced with challenges.

To cultivate SRL effectively, HEIs need to incorporate it into the curriculum and create an environment that supports its development. This can be achieved through targeted instructional strategies, such as teaching students how to set realistic and achievable learning goals, providing regular feedback and opportunities for reflection, and promoting peer collaboration and discussion.

Additionally, educators and institutions can integrate technology into the learning process to facilitate SRL. Online learning platforms, digital resources, and learning analytics can assist students in tracking their progress, identifying areas of improvement, and accessing personalised learning materials. One emerging technology that HEIs can make use of to foster SRL in students is mobile devices. Hence, the next section discusses mobile learning.

2.6 Mobile Learning

Mobile learning (M-Learning) is an educational approach that leverages mobile technologies to meet the evolving needs of education, incorporating new resources and innovative learning methods (Wai et al., 2018). Pinkwart et al. (2003) define mobile learning as a type of learning that utilises mobile devices to support educational processes. These devices encompass smartphones, laptops, tablets, smartwatches, hotspots, mobile gaming consoles, and more (Busse et al., 2019). In essence, M-learning, as described by Wai et al. (2018), involves learning across diverse contexts through social and content interactions using personal electronic devices. Bikumalla et al. (2017) posit that mobile learning allows students to engage in educational activities anytime and anywhere through their mobile devices. The advent of wireless technologies and mobile computing has propelled the development of mobile learning in education (Carter et al., 2020; Marjadi & Langendyk, 2017; Palalas & Wark, 2020), resulting in the rise of terms like “mobility” and “learning on the go” in the realm of teaching and learning (Bikumalla et al., 2017).

Within the concept of mobile learning, an essential aspect is mobility, which refers to the capacity to connect classroom activities with the outside world, giving students the freedom to learn in various settings (Bikumalla et al., 2017). This concept of mobility aligns well with the idea of “learning on the go” (Brown, 2003). Mobile learning empowers students to learn on the go, granting them access to an extensive array of learning resources both inside and outside the classroom. Furthermore, mobile learning fosters flexible and location-independent learning, facilitating collaborative learning experiences (Bikumalla et al., 2017). According to Stockwell (2010), the effectiveness of mobile learning is contingent on the device's mobility; thus, the device should be the primary focus of mobile learning. However, Sharples et al. (2007) argue that the mobility of learning should be the central focus. Understanding how to transfer information and skills across different contexts can be achieved by prioritising learning mobility (Sharples et al., 2007). Against this backdrop, several researchers have delved into the potential of mobile technology and explored how mobile learning can enhance education by enabling anytime, anywhere learning (Carter et al., 2020; Marjadi & Langendyk, 2017; Palalas & Wark, 2020; Stockwell, 2010).

Additionally, Koole (2009) views mobile learning as an ongoing development emerging from the convergence of mobile technologies, human learning capabilities, and social interaction for educational purposes. The FRAME (Framework for the Rational Analysis of Mobile Education) model, proposed by Koole, emphasises the effectiveness of mobile learning and the underlying technologies. The FRAME model stands as the first comprehensive theoretical model to describe mobile learning as a process resulting from the convergence of mobile technologies, human learning capacities, and social interaction (Koole & Ally, 2006, p1). The ideal mobile learning situation is hypothesised to be the primary intersection and harmonisation of these three aspects (Koole, 2006), as depicted in Figure 2.2.

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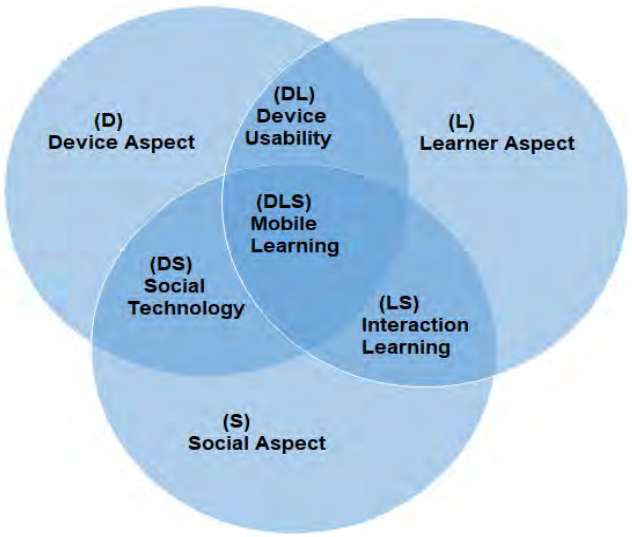

Figure 2.2: The Framework for the Rational Analysis of Mobile Education (FRAME) (Koole and Ally, 2006)

Below are the descriptions of the key aspects of Koole's FRAME model. These include Device Aspect, Learner Aspect, Social Aspect, Device Usability, Interaction Learning and Social Technology.

(D) Device aspect of mobile learning: According to Koole et al. (2010), the hardware and software of mobile devices, which are the mediums utilised by mobile learners, make up the device usability aspect of the mobile learning process. The efficiency of mobile learning, such as the

device's processor speed or storage capacity, affects this aspect of mobile learning (Koole et al., 2010). Effective and well-designed mobile devices would likely improve the learning experience for the learner in mobile learning.

(L) Learner aspect of mobile learning: This part of mobile learning is related to the different elements that influence learners' capacity to "learn," including their cognitive skills, memory, and method of using existing knowledge (Koole et al., 2010). According to Koole et al. (2010), environmental influences such as knowledge transfer and discovery can also impact a learner's cognitive processes. However, the social part of human learning, or the human interaction with other learners, is a significant component of the FRAME model (Koole et al., 2010). Koole et al. (2010) further asserted that the learner aspect is based on the idea that encoding, retaining, and transmitting information are significantly influenced by the learner's past knowledge, intellectual capacity, motivation, and emotional state.

(S) Social aspect of mobile learning: According to Koole et al. (2010), social and cultural factors significantly impact how people learn. Therefore, knowledge of social communication and information exchange is necessary in order to comprehend the social component of mobile aids (Koole et al., 2010). Koole et al. (2010) further asserted that it served as the foundation for the FRAME model. For instance, the whole knowledge a student has acquired via internal or external stimuli in their personal, social, and technological lives makes up their learning environment (Koole et al., 2010).

(DL) Device Usability: The device usability intersection contains elements that belong to both the device (D) and learner (L) aspects. Device Usability suggests the characteristics of mobile devices to cognitive tasks related to manipulating and storing information. Device Usability links mobile device features to cognitive activities, including the manipulation and storing of data. Koole (2009, p32), asserted that "these processes, in turn, can affect the user's sense of psychological comfort and satisfaction by affecting the ability to access information, cognitive load and the ability to physically move to different physical and virtual locations". Psychological comfort describes how intuitive the mobile device is or how quickly a student may understand and start utilising the mobile device (Koole, 2009). This means that in order to be psychologically

comfortable, the user should not spend much time learning how to use or manage the mobile device. Instead, users should quickly learn how to use the mobile device's essential features so that they may get to work on their intended task straight away.

(DS) Social Technology: While the device usability intersection describes the relationship between a student and a mobile technology device, the social technology intersection describes how mobile devices enable communication and collaboration amongst multiple individuals and systems (Koole, 2009). Perhaps the most significant aspect of mobile devices in the social technology intersection is wireless networking (Koole, 2009). Students can participate in a range of community and collaborative situations that would ordinarily be impossible due to distance when they are able to send and receive relevant information at the right times. As a result, the sociocultural context becomes crucial to social-technology interaction. According to Preece, Rogers, and Sharp (2002), as quoted by Koole (2009, p21), when HEIs are introducing mobile learning to students, they should think about offering mobile "media spaces" or computer-mediated communication settings that will help students communicate even while they are physically and temporally separated.

(LS) Interaction Learning: The interaction learning intersection is a synthesis of instructional and learning theories, although it strongly draws on social constructivism as a philosophical framework (Koole, 2009). According to Smith and Ragan (1999), as quoted by Koole (2009, p36), "learning is collaborative with meaning negotiated from multiple aspects". The significance of context and social negotiation of meaning is highlighted and acknowledge by Vygotsky's (1978) Zone of Proximal Development(ZPD). The Zone of proximal growth is the difference between what a student can currently do and what she might be able to do with help from more experienced peers or teachers. Consequently, when the student interacts with others, it offers them a possibly more effective form of learning.

As mobile technology continues to play a significant role in education, researchers and educators need to explore various ways to leverage mobile learning to enhance students' learning experiences. Interventions that encourage self-regulated learning through the use of mobile devices among university students could be a promising area of investigation. Koole's FRAME

model provides a comprehensive understanding of the various factors influencing mobile learning and serves as a valuable framework for designing effective mobile learning experiences. As the digital and real lives of students become increasingly intertwined, frameworks like Koole's FRAME model are essential tools for adapting education to the evolving technological landscape.

(DLS) Mobile learning: The DLS aspect represents the intersection of three key components: Device Aspect (D), Learner Aspect (L), and Social Aspect (S). The DLS aspect represents the intersection of these three dimensions. It examines how the device used for learning interacts with the characteristics of the learner and the social context to shape the learning experience. Understanding the DLS aspect in the FRAME model helps educators and instructional designers consider the interplay between technology, learners, and social dynamics when designing and implementing effective learning environments and experiences (Koole, 2009).

Overall, the interplay between the technological, human, and social aspects of mobile learning seems to be covered by Koole's FRAME model in the same context. It also seems to provide a greater understanding of the process of mobile learning. It is crucial to consider how mobile devices affect education as we appreciate frameworks for mobile learning like Koole's FRAME model (Chen & VázquezCano, 2014). Considering that students' real and digital lives cannot be separated in today's world (Wai et al., 2018). Because mobile technology is likely to continue to have such a significant impact on learning, researchers need to continue exploring various ways in which mobile learning impacts education (Bikumalla et al., 2017; VázquezCano, 2014; Wai et al., 2018). One way could be exploring interventions that work with university students to make use of mobile devices to develop self-regulated learning.

2.6.1 Use of Mobile Learning in Higher Education Institutions (HEIs)

As one of the recent technologies in the developing countries, mobile learning (m-learning) has opened up a world of possibilities for students and academics to facilitate the learning process (Al-Emran & Shaalan, 2015). For example, mobile learning has been used to facilitate learning regardless of location or time zone in higher education. Studies on mobile learning show encouraging results in using mobile devices to support teaching and learning (Cavus et al., 2020; Patil et al., 2016; Taleb et al., 2015). For instance, a study by Patil et al. (2016) found that students

had a positive attitude and perceived the importance of mobile learning. However, when they were afforded an opportunity to use mobile learning, they did not make effective use of m-learning. These results point to the need for more study to help discover better strategies for assisting students in making better use of their mobile devices to support their learning.

Universities across the globe are full of students who are “digital natives” (Evans & Robertson, 2020 ; Yong et al., 2016) with the ability to use mobile devices for their academic work. These digital natives provide the biggest challenge to university education since there is often a gap between their technology experiences and those of the educators (Kirschner & De Bruyckere, 2017). According to Evans & Robertson (2020) digital native refers to students born after 1980 and native speakers of the digital language of computers, video games and the internet. Kirschner and De Bruyckere (2017) and McHale (2005) further asserted that most university educational systems across the globe do not satisfy the students' technological demands on delivery methods and managing administrative information. In addition, universities fail to meet the student’s demands because today's students have different expectations, learning needs, learning styles, and demands of the educational system than those that institutions have previously encountered (Chen et al., 2019; DiBenedetto & Bembenutty, 2013; Liao et al., 2014). This, therefore, calls for universities to comprehensively understand the demands and learning needs of this generation of students, particularly their technological-related learning demands (Devlin & McKay, 2016; Laurillard, 2002; Wai, 2018). In order for universities to make appropriate current and future decisions about technology investment and implementation, universities must understand students' perspectives of technology, particularly mobile technologies, which have become part of their education life (Wai, 2018).

Furthermore, higher education institutions need to examine m-learning holistically and from all angles (Chen et al., 2019; Chen & VázquezCano, 2014; Devlin & McKay, 2018). According to the literature reviewed, many studies seem to focus on how mobile learning may be utilised for information sharing and making announcements. Not many studies intervened at mobile learning, such as supporting students' self-regulated learning (SRL). Since digital native students in higher education institutions have different technological expectations, educators need to be aware of

how they can use mobile learning to support the learning of these digital native students (Chen et al., 2019). Much as technological expectations of university participants (students and educators) may vary in their willingness to adopt mobile devices (Al-Emran et al., 2016; Park et al., 2012) ,one way to support students with mobile learning is to look at how students may manage and control their own learning via mobile learning.

Moreover, studies have been conducted to assess the effectiveness of mobile learning (Hsu et al., 2013; McConatha et al., 2008; Shih et al., 2010; Wu et al., 2012). For instance, Lu's (2008) research on the use of short message services (SMS) on mobile devices to help students acquire English vocabulary phrases refers. The study found that SMS was assisting students in increasing their knowledge of English vocabulary. In the study by Tuttle (2011), Spanish words were translated in context and in real-time using a smartphone app. The findings from the study demonstrated that the students' Spanish-speaking skills improved. Herro and Prunty (2012) compared utilising an iPod Touch flashcard app with the conventional flashcard method for mathematics drills and practice. The study aimed to determine whether mobile technology could enhance traditional methods of learning and improve student outcomes. The results of the study showed that the iPod Touch flashcard app was significantly more effective than the conventional flashcard method for mathematics drills and practice.

The use of the iPod Touch flashcard app enabled students to engage in interactive and personalised learning. The app allowed students to select their own level of difficulty and provided instant feedback on their progress. In contrast, the conventional flashcard method required students to memorise information without any personalised feedback or interaction. The study's findings suggest that technology can be a valuable tool in education, as it can enhance traditional methods of learning and improve student outcomes. The use of interactive and personalised learning tools, such as the iPod Touch flashcard app, can help students develop a deeper understanding of the subject matter and improve their problem-solving skills. Overall, this study highlights the importance of incorporating technology into traditional teaching methods to enhance student learning and engagement. Other examples of studies that evaluated the effectiveness of mobile

learning include Cochrane (2010), Hsu et al. (2013), Kukulska-Hulme and Shield (2008), Santos and Ali (2012), McConatha et al. (2008), and Shih et al. (2010).

Similarly, in their study, by Gikas and Grant (2013) on mobile computing at three universities in the United States of America (USA), mobile computing increased options for connection and cooperation, which enabled students to use social media and Web 2.0 tools for content creation and communication for their academic work. Another study by Chen and Denoyelles (2013) explored students' mobile learning practices in higher education. The study revealed that the most common technology devices brought to class by undergraduate students were tablets and smartphones. This is because of their portability and compact size. In terms of accessing learning materials, 67% of the students reported that they were using cell phones and tablets. Although most students want to use their mobile devices to support their learning in the classroom and online, Farley et al. (2015) noted that carrying out actual coursework on cell phones could be challenging. This is the case because it would be difficult for students to navigate websites and learn management system pages on small devices (Farley et al. (2015). Although the studies show that students were willing to use their mobile devices to support their learning, Chen and deNoyelles (2013) recommend that students' strong desire to use their mobile devices for academic purposes should also be taken into account before introducing mobile learning.

Based on the aforementioned, mobile learning presents exciting possibilities for the HEIs, but a comprehensive understanding of students' needs and expectations is crucial for its successful integration into higher education institutions. Hence, it is important to explore students perspectives on mobile learning hence, the next section discusses students' perspectives of mobile learning.

2.6.2 Students' Perspectives on Mobile Learning

The acceptance of mobile technology in teaching-learning is widespread in Higher Education Institutions(HEIs) worldwide. In fact, it appears to be a recent phenomenon in developing countries and it has enabled students to learn whatever they want at any time or engage in conversations with their peers on a shared subject matter entirely through mobile technologies (Al-Emranet al., 2016). The mobile device also helps in mediated educational activities that enable

students to participate in group, real-world, contextual learning activities (Al-Emran et al., 2016; Park et al., 2012). Students from all around the world do, in fact, participate in cooperative learning activities by exchanging information via computer networks, thanks to international collaboration (Farley et al., 2015)**.**

The researcher is convinced that the key phrase " 'perspectives'"needs to be clarified because one of this study's objectives is to investigate students' perspectives on using mobile learning to develop SRL. According to Mezirow (1985, p. 21), "perspective' is defined as "the structure of cultural and psychological assumptions within which our past experience assimilates and transforms new experience". Additionally, the definition of perspective Perspective depends on the context in which it is used, and the term perspective can have a variety of definitions (Hughes, 2005). The term originates from the Latin perspective arts, which translates as "science of optics." The term refers to the practice of portraying three-dimensional objects on a two-dimensional surface in order to provide the impression of their height, width, depth, and relative proximity (as defined in The Oxford English Dictionary). Other definitions used in more of an interpretative or behavioural sense include a view or prospect, "a particular way of regarding something, or an understanding of the relative importance of things" (Hughes, 2005, p.771). According to the aforementioned definitions and concepts of perception, it can be concluded that Perspective perspective is the way we look at things from our own point of view. In fact, studies on perceptions have repeatedly shown that different people can look at the same thing and interpret and value it in various ways (Al-Emran et al., 2016; Farley et al., 2015; Hughes, 2005). In the context of this study, perspective Perspectiveis used to mean how learners view mobile learning and, in particular, their associations with the uses of the mobile device to assist them in developing SRL. Therefore, how first-year students perceive, understand, or interpret mobile learning in relation to helping them develop SRL is important for this study.

Mobile learning devices (such as tablets and smartphones) are increasingly part of higher education, but there is limited and conflicting literature regarding the impact of such devices in the learning environment (Chase et al., 2018). A number of studies have been conducted, for instance, Chase et al. (2018) on mobile learning in medicine on the evaluation of attitudes and behaviours

of medical students. The findings of the study indicate that mobile learning devices improve students' perceptions of their efficiency, and usage experience not only validated pre-existing positive perceptions of the technology devices but also contradicted some assumptions regarding their potential drawbacks in the clinical workplace. The findings on the student choice for device provision versus supporting a pre-owned device were equivocal. From Chase et al. (2018) study, it is reasonable to infer that M-learning devices could improve the learning opportunities for medical students during their clinical rotations. In addition, as one of the recent technologies in the education sector, several studies have been conducted on student perception of mobile learning (Al-Emran & Shaalan, 2015). For instance, a study by Patil et al. (2016) found that students had a positive attitude and perceived mobile learning as an important tool to support their learning. A study by Hanif (2020) indicated that most students appreciated the mobile learning concept as a helpful learning aid. This was evident in how the students self-regulated learning conditions using m-learning. In addition, the Al-Emran et al. (2016) study demonstrated that m-learning is a better option to help regulate their own learning.

Furthermore, a study by Mo Domnguez and Marcelo (2017) suggests that even though university students frequently utilise digital technology, most students who participated in the study indicate that they do not usually use it to self-regulate their learning. The study by Dominguez, Marcelo, and others (2017) reveals that students lack the necessary training to integrate mobile technologies into their academic learning process. As a result, they occasionally use it to support the development of their SRL skills. By offering learners the chance to learn about the value of digital technologies and encouraging their integration into the learning process, university lecturers can encourage self-regulation of learning (Domnguez & Marcelo, 2017). Therefore, it is necessary to develop deliberate strategies to enable students to utilise mobile technology to promote their self-regulated learning.

Moreover, not all students value mobile devices as effective teaching tools; for others, mobile technology devices lead to more classroom disengagement and distraction incidences (Diliberto-Macaluso & Hughes, 2015). In a study conducted by Selwyn (2016), it was found that while mobile devices have become an integral part of the modern educational landscape, some students feel that their use can be both distracting and frustrating. One of the primary concerns raised by

students was eye fatigue, which can occur from continuously staring at the screens of mobile devices for extended periods of time. A study by Diliberto-Macaluso and Hughes (2015) investigated the prevalence of gadgets among tertiary students in developed nations and how these devices impact their academic success. The study revealed that on average, students owned approximately seven electronic devices, including smartphones, laptops, tablets, and e-readers. Despite owning multiple gadgets, the majority of the students believed that their mobile devices were instrumental in improving their academic performance. They perceived their gadgets as valuable tools for accessing course materials, communicating with professors and classmates, conducting research, and managing their schedules.

Based on the studies on the use of mobile learning in Higher Education Institutions (HEIs) presented in Section 2.5 and the students' perspectives on mobile learning discussed in this section, it is evident that mobile learning has the potential to be an effective tool for developing self-regulated learning in students in HEIs. Therefore, the section discusses the use of mobile learning to develop self-regulated learning in higher education institutions.

2.7 Using Mobile Learning to develop Self-regulated learning in Higher Education Institutions

In this section, I have discussed the relationship between Self-Regulated Learning (SRL) skills and mobile learning. This is followed by a discussion on an overview of the research on the use of mobile learning to develop self-regulation in higher education institutions.

2.7.1 The relationship between SRL skills and mobile learning

Studies suggest that mobile devices can serve as a learning aid (Anshari et al., 2017; Ariel & Elishar-Malka, 2019; Dalvi-Esfahani, 2020; Van Nguyen et al., 2015). Agreeing, Hartley et al. (2020) expressed that certain types of mobile device use, such as multitasking, are related to learner skills such as cognitive resource management. Hartley et al. (2020) further stated that interventions that shift student behaviour while studying towards more effective strategies will lead to better academic outcomes. In addition, Viberg et al. (2020), in their study on the use of the ATLAS software application to improve students' SRL, found that most students developed positive attitudes toward using the effective learning scenarios incorporated in the ATLAS to improve their SRL. In terms of the SRL stages (plan, monitor, and reflect), the findings further revealed that students prefer to engage in effective learning activities during each SRL phase. Furthermore, other studies have demonstrated that there is a relationship between mobile learning and self-regulated learning (Palalas & Wark, 2020; Van Nguyen et al., 2015; Yot-Domínguez; Marcelo, 2017). Palalas and Wark (2020) systematically reviewed 38 primary research peer-reviewed articles on the relation between mobile learning and self-regulated learning, drawn from six databases spanning from January 2007 to January 2019. In their study, they found that mobile learning improved SRL. They also found that SRL enhanced other learning factors such as: Motivation, Metacognition,Time Management, Adaptability: Retention and Transfer of Knowledge. Collaboration and Critical Thinking. Although it is apparent that mobile learning has a positive impact on SRL for the reasons mentioned above, it is equally crucial to understand what research has found regarding student perspectives of mobile learning.

2.7.2 Research on use of mobile learning to develop self-regulation in higher education institutions

The review of the previous studies has revealed a number of ways mobile learning can be used to foster self-regulated learning. Yun et al. (2017) asserted that although it is feasible to train for self-regulated learning, their applicability in other contexts is uncertain and not consistently enforced. Because of this, Yun et al. (2017) proposed a study that used sensor technology for self-regulated learning and learning companion design. They suggested using a mobile device with the technological ability to identify important information about the learning environment, behaviour, cognition, and motivation that can help students develop their potential as individuals and have better learning experiences.

In other studies by Chin-Wen (2019) and Ren'ee et al. (2020), pre-recorded short videos with SRL instruction and study suggestions were used to enhance students' SRL. Students played the short videos on their mobile devices to guide them in the suggested study techniques. The findings from the two studies demonstrated that the intervention positively impacted students' ability to finish their courses. Based on the results of the two studies, it appears fair to believe that coordinating expectations between students and teachers on appropriate mobile device usage can offer the learning environment and enable learners to concentrate on the mobile device's valuable uses as a learning tool (Malka & Ariel1, 2019). Tabuenca et al.'s (2015) study on graduate students from three different online courses who used their mobile devices to track how much time they devoted to learning over four months. The results from this study provide evidence of the benefits of recording learning time and suggest relevant cues on how mobile notifications should be designed and prompted towards self-regulated learning of students in online courses.

In addition, different mobile applications have been used to foster SRL in university students. For example, Xiangming and Song (2018) use a Rain Classroom technology to study English language learning. Rain Classroom encompasses the whole pedagogical and content process, including courseware publication through text and voice in PPT format before class, real-time participant response during class, multi-screen interaction between students and lecturers, and assignment release in PPT format following class (Xiangming & Song, 2018). Complete learning data created and kept automatically on smartphones was another aspect of Rain Classroom that helped students

self-regulate. Another study by Kondo et al. (2012) used mobile-assisted language learning (MALL). MALL learning module designed to improve students' TOEIC listening and reading test results. The findings of their study suggested that, in terms of time spent on learning activities, degrees of satisfaction obtained from the tasks, and self-measured achievement, the MALL learning module encouraged study without teacher assistance to self-study. Jeno (2017) also made use of a mobile app for biology students. Students were more aware of the value of learning about sedge identification due to the mobile application tool used in the study. A group-based intervention app called NUGU (No Use is Good Use) was used in the study of Ko et al. (2015) to encourage self-regulation of smartphone use. Their study revealed that NUGU-Group users' usage decreased significantly, and their perceived level of managing interruptions improved significantly.

Furthermore, the research by Domnguez and Marcelo (2017) surveyed students using technology for self-regulated learning at various universities in the Andalusia area, Spain. The findings show that university students do not often control their learning processes despite frequent use of digital technology. Internet information search and immediate communication tools are the most often utilised of all the technologies analysed. On the other hand, the self-regulation learning strategies related to social support were the most often used by students. However, the study concludes that students vary from one another in terms of their usage and frequency. At the same time, Anshari et al. (2017) studied a set of SRL strategies that university students adopt when using mobile digital technology to support, manage and control their learning. The study found a wide range of techniques, from those with a low level of intentionality and cognitive complexity, including reading, categorising, utilising, or sharing information, to those with a higher level of complexity. Their study discovered that university students were interested in exchanging and sharing their digital content and forming opinions. Anshari et al. (2017) studies prove that students use digital technology to expand their learning well beyond the confines of the traditional classroom and engage in collaborative learning with their peers. The results also reveal a profile of university students who frequently do not see the need for, or do not have the necessary training for, integrating digital technology into their own academic learning process and occasionally use SRL techniques.

Moreover, Bidaki et al.'s (2013) research demonstrates that mobile learning improves academic performance and self-regulated learning. The study found that the delivery of contents in small pieces, rehearsing and repeating at regular intervals, timely feedback, utilising multiple inclusive senses, availability of this device without time or location restrictions, multimedia capabilities of new mobile cell phones, utilising multiple inclusive senses, and facilitating easier communication between the learner and the learning facilitator in comparison to traditional methods are some possible reasons for increased self-regulation. These results concur with studies by Shaw et al. (2012), Moura and Carvalho (2008), Solomon et al. (2011), Power and Shrestha (2009), and Moura and Carvalho (2008). In addition to the mobile learning and SRL study approaches already stated, other approaches were used by some scholars. For instance, in a study on Integrated Longitudinal Clerkships (ILCs) by Alegra et al. (2014), 15 ILC students were given tablet computers with access to the electronic health record (EHR) so they could track their patient cohort and a multiplatform online notebook, record and retrieve their own self-identified clinical learning problems. The results revealed that tablets help medical students learn and use self-regulatory abilities in a clinical setting. According to a study by Goh (2012), SMS intervention helps Maori and Pacific students, who historically score less than the main cohort, perform much better than Maori and Pacific students who did not get any SMS intervention. Studies presented in sections clearly show that mobile learning can foster SRL in students, but some need training or guidance on using mobile devices to manage and control their learning.

2.8 Critique of the presented literature

Based on the definition presented in the literature review, self-regulated learning is learning that is supported by one's metacognition, strategy adaptability, and motivation. Metacognition is the most important of these components because it enables learners to monitor their behaviour, reflect on the effectiveness of their learning strategies, and change strategies as a result of their motivation. Put differently, the techniques and behaviours that enable students to translate their cognitive capacities into task-specific academic skills are collectively referred to as self-regulated learning (SRL). Studies on SRL in higher education have found a relationship between SRL and mobile learning. And studies have demonstrated that there are a number of ways in which mobile

learning is used to foster SRL in university students, although most studies have been conducted in developed countries.

The utilisation of mobile learning has been a key factor in revolutionising the higher education sector in developed countries, and it has had a positive impact on the teaching and learning process. It has been used to foster SRL, mass integration of technology in teaching and learning, and to provide students with the opportunity to learn at their own pace. As a result, mobile learning has become an integral part of the educational landscape in developed countries.

However, the situation is quite different in developing countries where most HEIs are still grappling with massification, and students often lack access to adequate resources to support their learning. The transition from secondary school to higher education can be challenging for students in developing countries, as they often face a wide range of issues, such as language barriers, inadequate study materials, and insufficient academic support. As a result, it is crucial to find ways to support these students and help them develop the necessary SRL skills to succeed in their studies.

The literature presented in this chapter has shown that there is a significant gap in research on the use of mobile learning to improve SRL in developing country contexts. As already pointed out, most of the studies that have been conducted in developed countries and most are subject-specific, focusing on particular subjects such as English, Mathematics, and Sciences. Only a few studies have focused on generic SRL skills required for first-year students and medical students in particular. Against this backdrop, this study aimed to bridge the gap by focusing on generic SRL skills required for first-year medical students in a developing country context. This study has explored how mobile learning can be used to improve the SRL skills of first year medical students in the developing country context.

2.9 Chapter Summary

The chapter provides a comprehensive overview of the literature on Self-Regulated Learning (SRL) and its importance in promoting effective learning outcomes. SRL is a critical aspect of education that helps students take charge of their learning, set goals, monitor their progress, and

reflect on their achievements. The chapter highlights the various components of SRL, including goal-setting, monitoring, and self-evaluation, and how these skills can be developed through instructional practices.

In addition to examining the conceptual dimensions of academic self-regulation, the chapter explores the use of mobile learning in Higher Education Institutions (HEIs) and Students' Perspectives of Mobile Learning. The literature review provides insights into the existing research on SRL and mobile learning in HEIs, as well as literature on using mobile learning to develop self-regulation in higher education institutions.

The chapter emphasises the potential of mobile learning to enhance SRL skills among students. It serves as a valuable resource for educators and researchers interested in promoting the use of mobile learning to promote SRL in HEIs. With the rapid changes in technology and education, it is essential to continue to explore innovative approaches that promote effective SRL in higher education, particularly in developing countries.

The literature review provided in the chapter can guide educators in designing effective mobile learning interventions that promote SRL practices. Educators can use this information to identify effective strategies for integrating mobile learning in their teaching practices. The chapter's insights can also help researchers identify gaps in current knowledge and suggest avenues for future research.

Overall, the chapter underscores the importance of promoting SRL skills among students and highlights the potential of mobile learning to enhance these skills. By providing a comprehensive overview of SRL and mobile learning in HEIs, the chapter offers a valuable resource for educators and researchers interested in promoting effective SRL practices among university students.

CHAPTER THREE: THEORETICAL FRAMEWORKS

> Without a theoretical framework, the data collected may be a meaningless jumble of information, or it may not be relevant to the research question at hand. (Creswell, 2014, p. 69)

3.1 Introduction

A theory is "a collection of interrelated constructs (or variables) constructed into propositions or hypotheses that define the relationship among variables, usually in terms of size or direction" (Creswell, 2009, p.51). Osanloo and Grant (2016) define a theoretical framework as an idea or a group of ideas that provide structure to a theory in a research study. Without a theoretical framework, the data collected may be a meaningless jumble of information, or it may not be relevant to the research question at hand (Creswell, 2014, p 69). According to Collins and Stockton (2018), there are three distinct ways that theory can be used in research: to inform the design and data collecting process, the iterative process of data gathering and analysis, and the conclusion. A theory may be employed in research as an argument, justification, or explanation of the phenomenon (Creswell, 2009).

In addition, the theoretical framework helps direct researchers, explores and analyses new insights, and identifies links between otherwise different concepts (George et al., 2012). Creswell (2009) further states that using an existing theoretical framework is crucial for comprehending and understanding the expected results of this exploratory investigation. Applying theory in interpretative cases like the current study is important as it creates an initial theoretical framework and approach on which initial empirical work is based (Collins & Stockton, 2018). In the current study, the pragmatic paradigm complements the interpretative paradigm well by helping to understand the most effective ways of using mobile devices to support self-regulated learning.

The selection of a theory is mostly subjective, and Walsham (2006) emphasised the researcher's flexibility in selecting a theory they are comfortable using in their study. Walsham (2006) further cautioned against rigidly using theory because it may limit the innovation and inquiry of the

researcher. In view of this, it is important that the researcher uses the chosen theory in their study with an open mind to the changing beliefs and assumptions in light of the evidence gathered in the study. The field of Information and Communications Technology (ICT) in education presently lacks its own theories, resulting in researchers often relying on theories from broader educational and ICT contexts (Kivinen et al., 2016). Thus, this study used the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh et al., 2003) along with Vygotsky's socio-cultural theory (SCT) (1978). Notably, Alasmari and Zhang (2019), with permission from Venkatesh et al. (2003), modified the UTAUT by introducing two additional constructs: Mobile Learning Technology Characteristics and Self-Management of Mobile Learning. This modification resulted in the version referred to as the Extended UTAUT. Therefore, this study used the Extended UTAUT.

SCT and extended UTAUT have been used in this study because they complement each other well in guiding this study to achieve its objectives. For instance, the SCT is based on the link between social interactions and human development (Vygotsky, 1978). The extended UTAUT describes how people intend to use technology and how they actually utilise it. For this reason, I believe that the two theories would help to set the theoretical lenses through which to view the problem under study.

3.2 The Sociocultural Theory

The Russian educator Lev Vygotsky (1896–1934) is accredited with being a pioneer in the field of social learning. He was the first psychologist to investigate how social interactions affect cognitive development. In his view, the interactions with peers, adults, teachers, and other mentors within our communities served as the basis for learning. Vygotsky developed a theory on social learning in an effort to understand better how people learn in a social setting. According to Vygotsky (1978), societal and individual learning processes are dynamically interdependent. Three main elements were underlined in Vygotsky's theory. First, he argued that *social interactions*, which he referred to as tools, serve as a mediator for cognitive growth, including higher-order learning. Second, Vygotsky asserted that these tools are not created in isolation but rather are products of the socio-cultural evolution of an actively involved individual (Vygotsky,

1978). Third, Vygotsky viewed learning as a developmental or genetic process. This general genetic law of cultural development emphasised the importance of concentrating.

One of the main concepts in Vygotsky's work is the Zone of Proximal Development (ZPD). ZPD is the difference between what one can accomplish on their own and what one can accomplish with the assistance of the other, called the more knowledgeable other. According to Vygotsky (1978), humans acquire greater cognitive capacities according to this theory when their deficiencies in reasoning and problem-solving are filled by adults, peers, or people with more capable others. The term given to this support is called *scaffolding* (Wood et al., 1976). According to Nordlof (2014), scaffolding and social environment support help learners to collaborate and build their skills, and what they accomplish by working with more capable others will be accomplished independently by the learners themselves in the future. Vygotsky also emphasised that instruction should focus more on the upper level of the ZPD than the lower level of the zone. This suggests that a learning experience should push the learner to meet high expectations. However, student growth and development are not likely to attain their full potential without the right balance of challenge and support (Shvarts & Bakker 2019). In order for students to grow at their best level, educators must offer the proper support through planned activities that allow them to engage with other students and educators.

Another concept in SCT is *mediation*. According to Vygotsky, human activity on both the interpsychological and intrapsychological plane can only be understood by considering tools and signs that mediate the activity (Wertsch & Tulviste, 1992). This assertion is predicated on the idea that humans can only understand the world via the use of signs and mediatory tools (Wertsch et al., 1995). According to Wertsch et al. (1995), signs and mediatory tools are the products of sociocultural evolution, and individuals have access to them through their participation in social activity. Vygotsky was particularly interested in understanding how these tools and signs served as mediators in human activity (Wertsch et al., 1995). These mediation techniques fundamentally alter and define the activity rather than merely facilitating it. The psychological tool “alters the flow and structure of a new instrumental act by being included in the behaviour process, just as a technical tool alters the process of a natural adaptation by determining the form of labour

operations" (Vygotsky, 1981, p. 137). However, if we neglect the agent's involvement, the mediational means' function in human behaviour loses all significance (Vygotsky, 1978). The best way to understand mediation is as a process incorporating cultural tools and the unique ways in which these tools are used (Wertsch et al., 1995). Action is carried out by a person(s)-operating with mediational means, not by the tool or the individual in isolation (Wertsch & Tulviste, 1992). However, individual(s)-operating-with-mediational-means does not induce uniform cognitive effects (Hatano & Wertsch, 2001). The practice account does not entail any kind of straightforward, mechanical transmission in this sense. Instead, it enables the active participation of unique agents doing unique tasks. However, these particular agents and acts are always affected by shared cultural tools like language, which creates a commonality among group members even when they are not immediately aware of it (Hatano & Wertsch, 2001).

Social interaction is one of the key concepts of SCT. According to Vygotsky (1978), interaction with other people and tools plays an important role in learning and developing the mind. What happens in the learner's microenvironment when interacting with others influences their learning to a larger extent (Hatano & Wertsch, 2001). This, therefore, calls for an understanding of settings or occasions in which the interactions occur. The interaction happens in the culture in which a developing person lives and produces some significant outcome, such as learning a particular thing. Repeated interaction with others enhances the cognitive skills needed to perform well in the activities in which the learner is involved in (Hatano & Wertsch, 2001).

3.2.1 The Sociocultural Theory and Self-Regulated Learning

This study explores how first-year medical students use mobile learning to develop Self-regulated learning (SRL). SRL involves students' active and goal-directed control over their behaviour, motivation, and cognition in their academic learning. According to sociocultural perspectives, self-regulated learning is seen to be intrinsically a social activity (Oxford, 2016). It starts and grows when students interact with various social, cultural, and institutional situations. Through social interactions and the use of cultural or mediational tools, learners internalise objectives, values, knowledge, and methods that support their self-regulation in academic learning within these contexts (Oxford, 2016). The approach places a lot of emphasis on interactions with others with

more experience, including adults and teachers, since they may provide the learner with the "other regulation" they need to complete the task (Vygotsky, 1978). By focusing on the function of the social environment and mediating mechanisms in the formation of SRL, the sociocultural theory offers a distinctive explanation of SRL. For this reason, Vygotsky's sociocultural theory was adopted as one of the theories guiding this study.

Many psychological theories of self-regulation rest on a basic assumption about the nature of agency that actively carries out actions and regulates human activity (Wertsch et al., 1995). A fundamental presumption regarding the nature of agency that actively executes the acts and governs human activity forms the basis of many psychological theories of self-regulation (Wertsch et al., 1993). Vygotsky emphasised that we cannot understand the processes of self-regulated activities without considering an active and purposeful agent. Although most psychological studies concentrate on the social contexts in which human agency operates, they typically conceptualise the individual as an independent cognitive agent and presume that social contexts are added to this pre-existing account of the individual (Wertsch,1981). In other words, the agency is typically seen as a person's property (Wertsch et al., 1993).

3.2.1.1 Agency as a shared property

According to the sociocultural approach, the analysis of agency goes beyond the individual based on two premises: (a) agency is frequently shared by dyads and small groups, and (b) agency involves mediational means (Wertsch et al., 1993). According to Vygotsky's general genetic rule of cultural development, the agency exists both at the intramental level, within the child on the psychological plane and at the intermental level, which is among individuals on the social plane. A group or dyad frequently performs the mental functions as opposed to a lone individual. The following illustration supports this assertion:

> A 6-year-old child has lost a toy and asks her father for help. The father asks where she last saw the toy; the child says, "I can't remember." He asks a series of questions- did you have it in your room? Outside? Next door? To each question, the child answers "no." When he says "in the car?", she says, "I think so", and goes to retrieve the toy (Tharp & Gallimore, 1988, p.14).

In this case, we cannot say that either the child or her father did the remembering. The mechanism that performed the remembering function was the dyad. The socially dispersed cognition in these circumstances is bigger than or at least qualitatively distinct from the sum of the individual cognitive processes that form it (Wertsch et al., 1993). As a result, the collective or dyadic agency is given to them rather than to an individual. Therefore, the agency is attributed to the group or dyads rather than the individual (Tharp & Gallimore, 1988). Additionally, according to Vygotsky (1978), tools and signs, which are products of that sociocultural environment, are used to mediate all human functions. According to this assertion, the agent should be identified as a combination of an individual or a group of individuals along with a method of mediation rather than an individual acting alone (Wertsch et al., 1993). This is the approach that was used in this study; neither the researcher nor the participants had a solution, but both the participants and researcher worked together in the intervention to find out how mobile devices can be used to develop SRL.

3.2.1.2 The role of social interaction in the development of self-regulation

From a sociocultural perspective, the development of self-regulation requires an awareness of socially approved behaviours through social interaction, particularly the interaction between the learner and a more capable(knowledgeable) other, where the more capable other provides the "other regulation" necessary for the learner to perform the task (Wertsch et al., 1995). Within this social interaction, the learner can take over the communicative and regulative responsibility from the adult and develop the capacity for self-regulation. In the context of social activity, the transition from regulation by others to self-regulation highlights the degree of "intersubjectivity" or "consensual interpretation" that exists between the participants of the activity (Henderson & Cunningham, 1994).

To Vygotsky, learners develop their ability to self-regulate by engaging in an activity at a comfortable but somewhat difficult level, or "the zone of proximal development." The learners develop an understanding of the task scenario and the authority to do it independently by actually completing the assignment while being guided by knowledgeable others. In order for advice to be effective, both parties must participate in the activity, with the knowledgeable other guiding the learners through the process. The mediational means used in the activity, which will be covered in

more detail in the next section, significantly impact the learner's progress within the zone of proximal development.

3.2.1.3 The role of mediational means in the development of self-regulation

Vygotsky suggests that learners acquire self-regulatory capacities through the use of tools. Within social interaction, the active use of tools allows the learner to become independent from the stimulus field and increase control over their thought and behaviour (Diaz et al., 1990). Vygotsky clarifies the role of the tool in the development of self-regulation, distinguishing signs and tools in terms of how they impact human behaviour. Mediational means play an important role in planning, organising, monitoring, and reflecting on classroom activities. Particularly, in the transition from other-regulated to self-regulated learning, the verbalisation of goals, plans, and rationales plays an important role.

3.2.2 The application of the Sociocultural Theory to the study

The socio-cultural theory (SCT) is based on the relationship between human development and social interactions (Vygotsky, 1978). According to the SCT, learning is a socially mediated process in which students construct their own understanding of phenomena through interactions with peers and more knowledgeable 'others' such as teachers and parents. In the context of this study, the application of Sociocultural Theory (SCT) offers a valuable lens through which to understand the dynamics of first-year medical students' used mobile learning to foster SRL in a developing country.

Rooted in Vygotsky's seminal work, SCT posits that human development and learning are inherently intertwined with social interactions and cultural contexts (Vygotsky, 1978). This theory emphasizes the significance of collaborative interactions and mentorship in the learning process. SCT suggests that learning occurs through active participation within social communities, where individuals construct knowledge collaboratively. Within the medical education setting, students navigate complex learning environments, drawing on interactions with peers, faculty, and digital resources to construct their understanding of medical concepts.

3.2.2.1 Mediation of learning

Mediation is regarded as a tool for achieving cognitive change (Vygotsky, 1978). In other words, mediation is a pedagogical approach that a teacher can employ to assist a student in progressing to the next level of knowledge. This study utilised the mobile device as a cultural tool to help students mediate their SRL skills. In this study students were expected to use mobile devices inside the classroom. Student's were also supposed to interact with their peers as they using their mobile devices to participate in different learning activities inside the classroom. Extending on Vygotsky's seminal work, Stott (2016) asserted that mediation of learning is the connection between the current state of mental development and the zone of proximal development (ZPD). Furthermore, according to Vygotsky (1978), mediation involves the use of tools such as language, culture, and resources to attain a learning goal. In this study, the interactions between peers in the pair and students' use of mobile devices to manage and control learning inside and outside the classroom.

3.2.2.2 Social interactions

Learning is a social process in which students acquire knowledge through interacting with their peers and more knowledgeable others (Stott & Mozer, 2016; Vygotsky, 1978). As a result, Vygotsky (1978) asserts that social interactions are important in the learning process. In other words, according to Vygotsky (1978), social interactions are the basis for learning and development. Furthermore, he emphasises that learning precedes development. In agreement, Sedlacek and Sedova (2017) emphasise that learners create their own understanding of phenomena through active participation in their surroundings. In addition, according to Lai (2011), learning improves naturally when students collaborate with one another while completing a task. Lai (2011) further asserted that peer learning could help students learn more effectively by allowing them to build knowledge and skills together. Accordingly, students are able to remember what they have learnt from their peers (Dobao, 2016; Lai, 2011; Topping, 2005).

3.2.2.3 Self-regulation

Self-regulation is not a single trait or a combination of traits but rather a critical development signalling the emergence of a uniquely human set of competencies (Vygotsky, 1978). According to Vygotsky (1978), cultural tools are needed for developing these competencies. By using these cultural tools within the social system, learners develop self-regulation. The mobile device was utilised in this study as a cultural tool to help students improve their SRL skills. In addition, Vygotsky (1978) recognised that social settings and learning are closely entwined in student development of SRL skills.

Vygotsky (1978) also emphasised the role of cultural tools in the development of self-regulation. Cultural tools refer to any external aids that can help individuals regulate their behaviour, such as calendars, timers, or checklists. Vygotsky believed that self-regulation is an important aspect of human development that is strongly influenced by social and cultural factors. He believed that as learners engage in increasingly complex social interactions and learn to use language and cultural tools to regulate their behaviour, they develop the ability to regulate their own behaviour, emotions, and thoughts in order to achieve their goals. Therefore, in this study, appropriate mobile learning strategies were identified and implemented to foster SRL according to the social context in which this study was done.

3.3 Unified Theory of Acceptance and Use of Technology

The Unified Theory of Acceptance and Use of Technology (UTAUT) is one of the most used theories in studies on the use of technology. As of 25 August 2022, it had 40609 citations (Google Scholar). Venkatesh et al. (2003) created it after a thorough analysis of eight prevalent theories of technological adoption. These include The theory of Reasoned Action (TRA), Technology of Acceptance Model (TAM & TAM2), Motivational Model (MM), Theory of Planned Behavior (TPB), Combined Theory of Planned Behavior (C-TAM-TPB), Model of PC, Utilisation (MPCU), Innovation Diffusion Theory (IDT), and Social Cognitive Theory (SCT) are the models that were reviewed (Venkatesh et al., 2003). The four constructs that form the UTAUT model are performance expectancy, effort expectancy, social influence, and facilitating conditions, as shown in Figure 3.1 below.

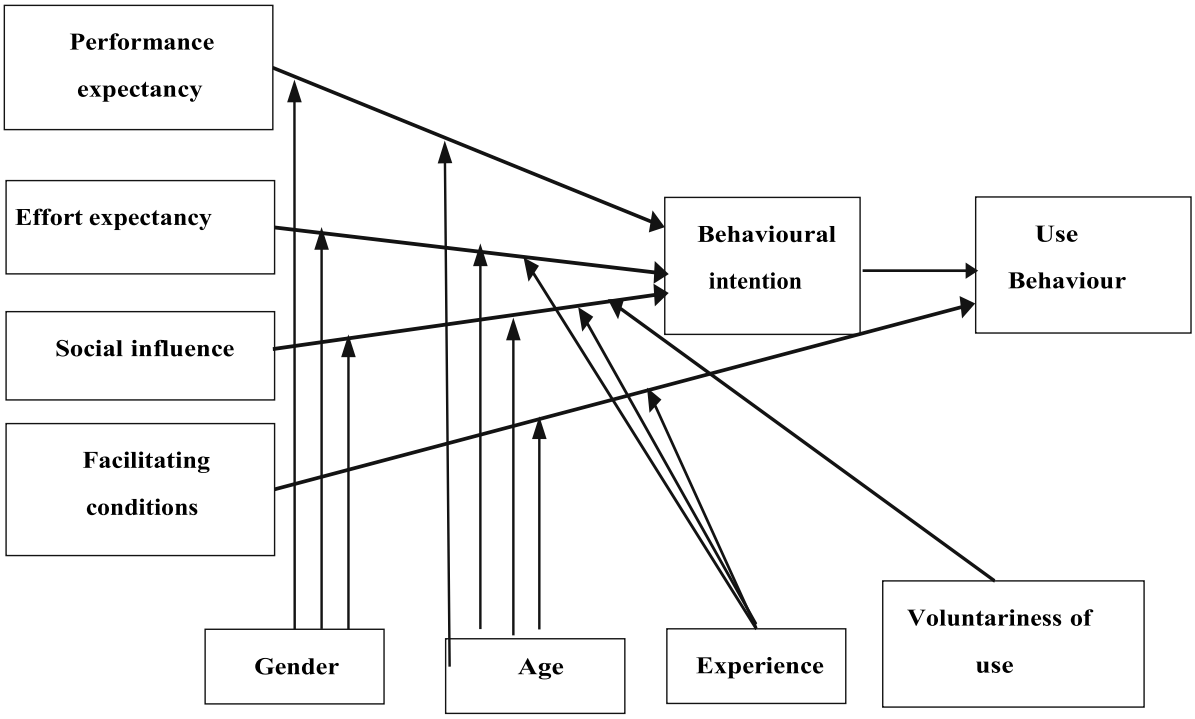

Figure 3.1: Unified Theory of Acceptance and Use of Technology Model (UTAUT) Sources: Venkatesh et al. (2003, p. 451)

In UTAUT, *performance expectation* refers to a person's own conviction on how the use of intended technology would help them accomplish their job tasks (Venkatesh et al., 2003). Performance expectations influence the behavioural intention toward a targeted technology, but it is moderated by the gender and age of the participants. The *effort expectation* construct describes the ease with the desired technology may be used (Venkatesh et al., 2003). Gender, age, and experience all act as moderators of effort expectations. In other words, effort expectancy strongly impacts individual behaviour toward technology, especially people with less technology experience (Venkatesh et al., 2003).

Another construct in the UTAUT model is *social influence*, which describes the degree to which a person believes that other significant individuals in their life value the usage of the technology in question. Gender, age, experience, and voluntariness all act as moderators for the social

influence construct. Social influence strongly influences behavioural intention among people of older ages with low experience in mandatory manners of use of technology (Venkatesh et al., 2003).

The fourth construct is *facilitating conditions*. This measures how much a person thinks his organisation's infrastructure supports his usage of the planned technology. This construct influences the use of behaviour directly rather than behavioural intention in the other three constructs. The facilitating condition constructs considerably impact use behaviour among experienced employees, particularly those with advanced levels of expertise, and it is moderated by age and experience (Venkatesh et al., 2003). To clarify the relationship among elements of the UTAUT model, refer to Figure 3.1, which depicts these relationships and indirect influences on acceptance determinants, behavioural intention and use behaviour.

3.3.1 Extended Unified Theory of Acceptance and Use of Technology

Venkatesh et al. (2003) designed the Unified Theory of Acceptance and Use of Technology model (UTAUT) after thoroughly examining eight popular technology acceptance models. UTAUT is based on the idea that an individual's attitudes and reactions influence their desire to utilise technology and actual usage of that technology (Alasmari & Zhang, 2019). Alasmari and Zhang (2019) further expressed that an individual's perceptions and attitudes toward technology may directly impact their actual usage, even if they do not intend to do so. Due to the momentum of technology that has evolved in the previous decade, the UTAUT model has been used in many research in education (Wong et al., 2013).

Over the years, UTAUT has undergone numerous revisions in mobile learning studies due to the nature of mobile technology, which differs from any other technology, and the local context of each study (Alasmari, 2019). Against this background, Alasmari and Zhang (2019), with permission from Venktash et al. (2003), extended the UTAUT. Alasmari and Zhang (2019) added two new constructs to the UTAUT, hence UTAUT is referred to as Extended UTAUT. These extensions are Mobile Learning Technology Characteristics and Self-Management of Mobile Learning, as shown in Figure 3.2 below.

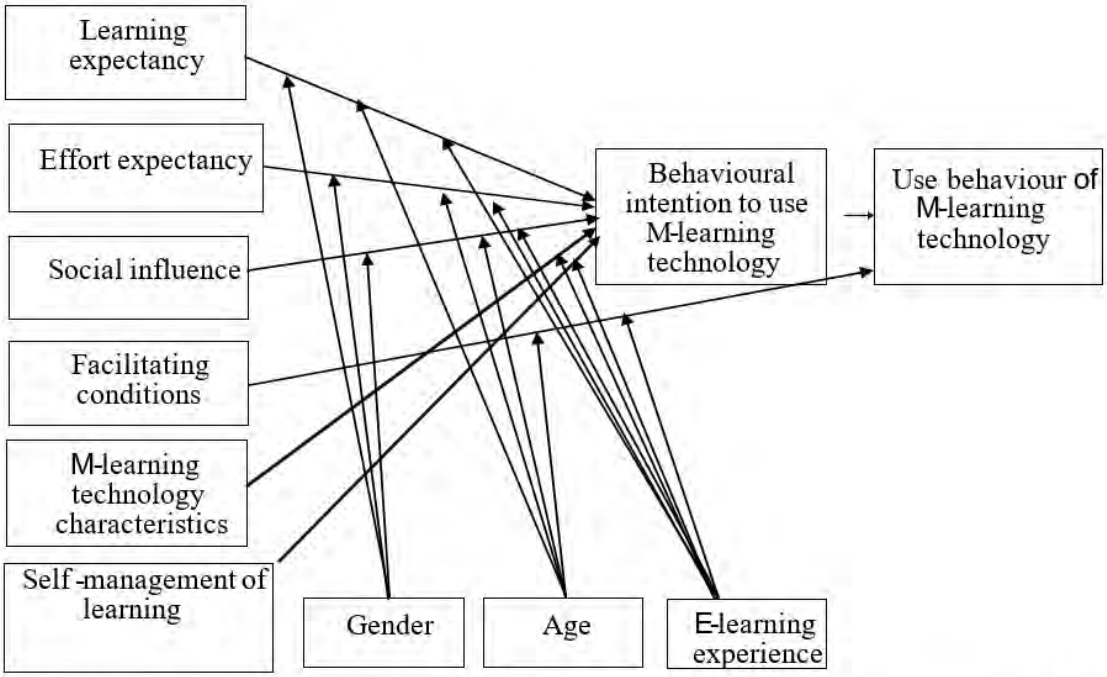

Figure 3.2: Extended Unified Theory of Acceptance and Use of Technology (Alasmari & Zhang, 2019, p. 28)

3.3.2 Application Extended Unified Theory of Acceptance to the Study

This study adopted the three components of UTAUT, viz., mobile-learning technology characteristics, self-management of learning, and social influence. These three components are relevant to this study since it aim to investigate how first-year medical students can make use of mobile learning to improve their self-regulated learning.

Mobile-learning technology characteristics (MLTC) refer to any feature, component, capability, or function that provides users with the technical capacity to support their learning process (Alasmari, 2019, p.26). According to Alasmari (2019), the mobile learning technology characteristics are as follows: the urgency of learning needs, an initiative of knowledge acquisition, mobility of learning settings, interactivity of the learning process, situating instructional activity, and integration of instructional content. The characteristics of Mobile-learning technology focus on mobile technology's capacity to support learning, and they are the potential influencers in behavioural intention to use Mobile-learning technology (Alasmari, 2019). Among these characteristics, this study worked on the assumption that the urgency of learning needs can

potentially influence the participants' behavioural intention to use mobile learning to improve their weak learning strategies. Therefore, it is perceived that the need for the student to improve their weak learning strategies is an urgency learning need. The majority of participants in the study were more eager to take part in the study after learning about their pre-MSQL scores. The pre-MSQL scores revealed their learning strategies' strengths and weaknesses. Based on this, it can be argued that the weak learning strategies were indeed the urgency of learning needs that triggered learners to become interested in using mobile to help them improve their weak learning needs.

Alasmari and Zhang (2019) defined *self-management of learning* (SML) as the degree to which a student is self-regulated and able to engage in learning independently (Alasmari & Zhang, 2019). Alasmari and Zhang (2019) also expressed that students in mobile learning environments are required to have self-management skills to control their learning, especially in the absence of lecturers and peers. The participants in this study used mobile devices to manage and control their learning activities inside and outside the classroom. For these reasons, students need self-management of learning, particularly in and outside the classroom, to manage and control their learning. The third construct of UTAUT that was used in this study is *social influence*. According to Lorenz and Buhtz (2017), social influence significantly impacts behavioural intention to use technology. Alasmari and Zhang (2019) defined social influence as a level of influence from one's peers and other social ties. In this study, students interacted with their peers in pairs as they were using mobile devices to manage and control their learning activities.

3.4 How the Extended Unified Theory of Acceptance and Use of Technology(UTAUT) model complements the Socio-cultural Theory

Socio-cultural theory and Extedned UTAUT complemented each other very well in this study. The socio-cultural theory helped the researcher understand the role social interactions, mediations and tools like mobile learning play in student learning. The extended UTAUT, on the other hand, has aided the study to explore and analyse the meaning in how students use technology and how they actually utilise it. In this study, the first-year medical students interacted with and used mobile devices to manage and control their learning. By interacting with each other, a student shared personal experiences, information, and knowledge about using mobile learning to regulate their learning.

In addition, based on the sociocultural perspective of self-regulation, the study focused on two fundamental claims about self-regulation. First, genetic analysis. Vygotsky's (1978) self-regulation can only be understood by looking at the transformations it has undergone and the factors that have influenced its development. That is, studying self-regulation necessitates the examination of gradual changes in individuals that allow them to exert control over their ideas, feelings, and actions. This study analysed how mobile devices helped first-year students improve their self-regulated learning skills by observing them for one semester. Second, Vygotsky's statements regarding the social origins of higher mental functions and the importance of mediated learning suggest that understanding self-regulation entails understanding the role of socialisation processes and mediational means in developing self-regulation.

Furthermore, Vygotsky's (1978) claim that any human function is mediated by cultural tools and signs, which are the products of that sociocultural milieu, refers. This conception implies that the appropriate designation of the agent is not the individual in isolation but the combination of an individual or a group of individuals together with mediational means. In this study, neither I, as the researcher, nor the research participants had prior knowledge and experience on how mobile learning could be utilised to build SRL; instead, the research participants and I collaborated through an intervention to experience how mobile learning can be used to develop SRL.

In this study, the mobile device was used as a cultural tool to mediate the change as the students interacted with others. The social influence component of extended UTAUT complemented this by helping the researcher analyse the activity. Furthermore, students engaged in different learning activities using mobile devices. They engaged with their peers in developing and using specific mobile learning strategies to regulate their learning. During the planned fortnight reflective workshops, they were given an opportunity to reflect and give feedback on the successes and challenges they were encountering with the mobile learning strategies as they were using mobile devices to manage and control their learning. Figure 3.3 shows how extended UTAUT complements the Socio-cultural Theory to meet the research objectives.

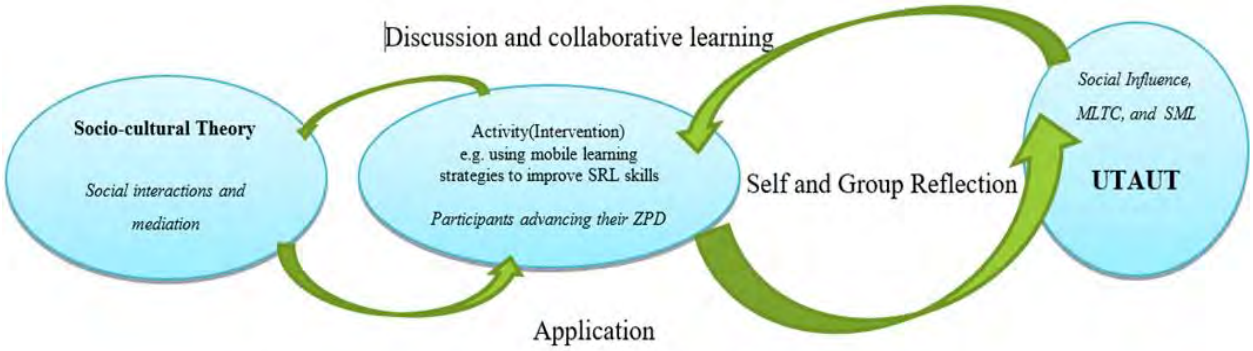

Figure 3.3: Applying Socio-Cultural Theory and Extended UTAUT in the study

As indicated in Figure 3.3 the participants and I discussed and applied the mobile learning strategies in developing self-regulated learning. This helped the researcher analyse and understand how mobile learning can be used to improve SRL skills. In addition, this approach resonates with Vygotsky's Zone of Proximal Development (ZPD), which played an essential role in determining how mobile learning was used to advance the participants' ZPD in terms of SRL skills. Furthermore, the internalisation of external operations postulates an important aspect in the development of self-regulation, namely, that a new mode of functioning is attained with the use of a mediating tool and becomes a part of the learner's internal organisation (Özdemir, 2011). The learner's new relationship with their environment, which occurs as a result of the usage of external mediators, in this case, a mobile device, becomes an intrapsychological property of the learner. As asserted by Vygotsky (1978), learning takes place under two levels: firstly, through interaction with others (interpsychological level); and then integrated into the individual's mental structure (intrapsychological level).

3.5 How Extended UTAUT and the Socio-cultural Theory were used as analytical lenses in the study

As the learners self-regulate learning, it is suggested by Pintrich (1995) that they develop three primary characteristics: control, goal, and individual study. According to Zimmerman (1994), self-regulated learners begin by exercising control over their own behaviour, motivation, affect, and

cognition. Second, they achieve their own goals. Third, they take charge of their own actions rather than having their behaviours controlled by others. Self-regulated learners aim to control their behaviour and environment to achieve their goals. In addition, students self-regulate when actively involved in choosing or creating a learning environment that best supports their learning (Schunk, 2012).

This study used the extended UTAUT and the Socio-cultural Theory (SCT) as analytical lenses to examine how learners self-regulate their learning while using mobile devices. The extended UTAUT was used to examine what influenced the acceptance and use of a particular mobile learning strategy to improve the weak learning strategy. SCT, on the other hand, was used to explore the socio-cultural context in which self-regulated learning takes place. SCT emphasises the role of the environment and social interactions in shaping individuals' learning and development. The sociocultural context of mobile device use, such as peer influence, researcher support, and reflections, played a crucial role in fostering self-regulated learning.

As explained in Chapter 2, Zimmerman's conceptual framework for studying self-regulation(see Table 3.1 below) was used to guide the analysis, which emphasises the choices available to learners. This framework suggests that the concept of self-regulated learning is entirely possible when all aspects of the learning task are not controlled by others and students actively engage in selecting or creating a learning environment that best supports their learning.

Table 3.1: A Conceptual Framework for Studying Self-Regulation

Scientific Questions	Psychological Dimensions	Task Conditions	Self-Regulatory Attributes	Self-Regulatory Sub-processes
Why	Motive	Choose to participate	Self-motivated	**Goal setting and self-efficacy**
How	Method	Choose method	Planned or automatized	**Task strategies, self-instruction**
When	Time	Choose time limits	Timely and efficient	**Time management**
What	Behavior	Choose outcome behavior	Self-aware of performance	**Self-observation, self-judgment, self-reaction**
Where	Physical environment	Choose setting	Environmentally sensitive and resourceful	**Environmental structuring**
With whom	**Social**	**Choose a partner, model, or teacher**	**Socially sensitive and resourceful**	**Selective help-seeking**

Adapted from "Dimensions of Academic Self-Regulation" (Zimmerman, 1994, p.8)

As discussed in Chapter 2, Zimmerman (1998) pointed out that all elements in the framework presented in Table 3.1 are related. The scientific questions in the first column are linked to the psychological dimensions in the second column, and these are then reflected on to the learner to decide on the task in the third column. The consequences of these three columns lead to self-regulation attributes in the fourth column and the related sub-processes of SRL in the fifth column. Zimmerman (1998) pointed out that all the elements: why, how, when, what, where, and with whom, are related and essential in SRL. This study concentrated on all the elements: why, how, when, what, where, and with whom, but has put particular emphasis on how, when, what, where, and with whom while bearing in mind the role of why on SRL.

3.6 Chapter Summary

In this chapter, I discussed the theoretical frameworks that guided this study on how first-year medical students use mobile learning to develop self-regulated learning in their organ-system model integrated curriculum that integrates basic sciences and clinical medicine in a developing country. I used the Extended Unified Theory of Acceptance and Use of Technology (UTAUT) and Socio-cultural Theory (SCT) as analytical lenses to explore this phenomenon.

To guide analysis of the data, I used Zimmerman (1994) conceptual framework for studying self-regulation. I believe that this framework provided a comprehensive and structured approach to analysing how first-year students used mobile learning to self-regulate their learning.

Overall, this chapter has highlighted the usefulness of Extended UTAUT and SCT as analytical lenses in studying self-regulated learning. I believe that by using these theoretical frameworks in conjunction with Zimmerman's conceptual framework, I have gained a deeper understanding of how first-year medcial students use mobile learning to foster SRL.

CHAPTER FOUR: RESEARCH METHODOLOGY

> Research methodology is a critical aspect of conducting research studies, as it involves a systematic approach that comprises two main components: research paradigms and research design. (Creswell, 2014, p. 18)

4.1 Introduction

Research Methodology is a crucial component of any research study, as it outlines the systematic approach and techniques used to gather data, analyse information, and draw conclusions. It provides a roadmap for conducting the research and ensures that the study is conducted in a reliable, valid, and ethical manner. The primary purpose of research methodology is to address the research objectives and answer the research questions effectively. Considering what Creswell (2014) asserted in the above epigraph, this chapter briefly discusses and justifies the research paradigm underpinning the study and the research design used in this study. The chapter also discusses data presentation and analysis as well as the validity and ethical considerations undertaken in conducting this research. It starts by briefly discussing the research paradigms that underpinned the study before moving to the research design.

4.2 Research Paradigms

According to Denzin and Lincoln (2008), a research paradigm is a fundamental framework that guides research philosophy and practice. It encompasses the researcher's fundamental beliefs, assumptions, and values that shape how they understand and interpret the world. In other words, a paradigm is like a pair of glasses that researchers wear while exploring their research questions, which influences how they view and interpret their findings.

As Tracy (2019, p.38) aptly puts it, the “type of glasses you wear affects the way you see the world.” This statement underscores the significance of the researcher's philosophical assumptions and how they shape the research process and outcomes. It emphasises that the researcher's perception of reality is influenced by the paradigm they subscribe to and the beliefs they hold.

Consequently, a research paradigm determines the type of research questions that the researcher asks and the methodology they use to answer these questions. For example, researchers subscribing to the positivist paradigm seek to uncover causal relationships between variables and use quantitative data to test hypotheses. On the other hand, those in the interpretive paradigm seek to understand the subjective experiences and meanings of participants, using qualitative data to analyse their findings.

However, some researchers use multiple paradigms, drawing from different perspectives to comprehensively address the research questions. For this reason, this study employed insights from the interpretive paradigm, which emphasises understanding the subjective experiences of participants, and the pragmatic paradigm, which emphasises practical solutions to problems. By using these two paradigms, the study gained a comprehensive understanding of the research questions at hand and offered practical solutions to the problems under investigation.

Overall, research paradigms are vital frameworks that shape the research process and outcomes. Researchers should be aware of the philosophical assumptions that underpin their work and how they affect their perception of reality. By doing so, they can conduct rigorous research that is informed by multiple perspectives and offers practical solutions to the research questions under investigation.

4.2.1 Interpretivist Paradigm

This study explored how first year medical students' use of mobile learning to support their self-regulated learning in a developing country. An interpretivist paradigm was employed in this study to enable a deeper understanding of the perspectives and experiences of first-year medical students regarding mobile learning and its impact on their self-regulation learning skills. Through interpretive research, the meanings, perceptions, and reflections of participants were explored in-depth, providing valuable insights into their thoughts and perspectives.

While the study primarily relied on qualitative data, it also incorporated quantitative data to enhance the precision and understanding of the phenomenon being studied. As Antwi and Hamza (2015) suggested, the use of mixed-method designs can lead to unique insights that are not possible

with a purely qualitative or quantitative approach.This study's use of the interpretivist paradigm was complemented by the pragmatic paradigm. This combination is because interpretivism focuses on understanding and interpreting the subjective meanings, experiences, and social constructions of individuals and groups. It emphasises the importance of context and the role of the researcher in the research process. Pragmatism, on the other hand, is concerned with practicality, problem-solving, and action-oriented research. It values the application of knowledge and seeks solutions to real-world problems. In addition, mixed-method designs allowed for a comprehensive exploration of the experiences and perspectives of first-year medical students regarding mobile learning and its impact on their self-regulation learning skills. The insights gained from this study can inform the development of mobile learning tools that better support students in developing their self-regulation learning skills, ultimately leading to improved academic performance and success.

4.2.2 Pragmatic Paradigm

This study drew insights from the pragmatic paradigm. The pragmatic paradigm is a research philosophy that focuses on solving practical problems and addressing real-world issues (Kaushik & Walsh, 2019). In the context of education, this paradigm is often used to investigate the effectiveness of educational interventions in real-world settings (Kaushik & Walsh, 2019). The pragmatic paradigm emphasises the importance of practicality, relevance, and usefulness in research, which was particularly relevant in the context of this study, where mobile learning is becoming increasingly popular as a means of learning in resource-limited settings such as Malawi as the country advocates for massification in higher education.

From a pragmatic perspective, the study focused on understanding how mobile learning was used by first-year medical students in a developing country to support their learning and examined the support they can be given for them to optimise the use of mobile learning to improve their self-regulated learning. This involved examining the specific mobile learning strategies that they used by participants to improve their self-regulated learning (SRL) skills.

In addition, a pragmatic approach helped the researcher to understand the unique contextual situations that influenced how medical students used mobile learning in a developing country. For example, issues related to access to mobile devices and cultural factors play a role in shaping how mobile learning is being adopted and used by students in a developing country context.

Furthermore, a pragmatic approach helped the researcher gain insights that are both theoretically sound and practically useful, helping to inform the development of effective and sustainable mobile learning interventions in medical education.

Overall, the interpretivist and pragmatic paradigms used together in this study have provided a comprehensive understanding of how mobile learning can be used to improve self-regulated learning skills.

4.3 Research Design

Creswell and Poth (2016) describe a research design as a plan or approach for generating data for analysis. Agreeing with this, George (2019) expressed that deciding on the most appropriate research design is critical when investigating a research problem. In addition, Saldaña (2021) asserted that a research design is a logic that links the data to be collected to the research questions. This study adopted a mixed-method approach to understand how first-year students can use mobile learning to develop self-regulation learning. A mixed-method approach is a research methodology that combines both quantitative and qualitative data collection and analysis techniques in a single study. "Mixed methods research is an approach to inquiry that combines or associates both qualitative and quantitative forms" (Creswell & Creswell , 2018 p. 204).

According to Creswell (2014 p. 4), a quantitative research approach is an inquiry into a social or human problem based on testing a theory composed of variables, measured with numbers, and analysed with statistical procedures in order to determine whether the predictive generalisations of the theory hold true. In other words, a quantitative approach seeks to measure and quantify the relationship between variables using numerical data and statistical analysis. On the other hand, a qualitative research approach is defined by Creswell (2014, p. 4) as an inquiry process of understanding a social or human problem based on building a complex, holistic picture formed

with words, reporting detailed views of informants, and conducted in a natural setting. In this approach, the researcher seeks to understand the lived experiences of individuals or groups and to explore their perceptions, attitudes, and beliefs using qualitative data such as interviews, observations, and written or visual materials. Creswell (2014) further asserted that mixed methods approach allow researchers to explore complex research questions by using multiple methods to collect data and gain a more comprehensive understanding of the phenomenon under study.

In addition, mixed methods research designs have advanced significantly since the 1980's. According to Creswell and Poth (2016), Leech and Onwuegbuzie (2010), and Onwuegbuzie et al. (2009), mixed-methods research was developed to combine the various methodologies and research methods of both quantitative and qualitative approaches in order to:

a) address different research questions;
b) use one approach to confirm the results obtained by the other and
c) alleviate the shortcomings of the other method.

This study used a Explanatory Sequential mixed method study design was used in this study to adopt quantitative and qualitative research methods that aid in addressing the study objectives. However, more qualitative methods were used compared to quantitative methods. An Explanatory Sequential mixed method study design is a research approach that involves collecting and analyzing quantitative data first, followed by collecting and analyzing qualitative data to further explain or elaborate on the quantitative findings (Creswell et al., 2017). This methodological design allows researchers to gain a deeper understanding of a phenomenon by integrating both quantitative and qualitative approaches in a sequential manner (Creswell & Creswell, 2018).

4.3.0 Research Study Sites

This study was conducted at medical school in Malawi. Malawi is a landlocked country located in southeastern Africa. It is bordered by Tanzania to the northeast, Mozambique to the east, south, and west, and Zambia to the northwest. The capital city is Lilongwe, while other major cities include Blantyre and Mzuzu. Malawi has a diverse population with various ethnic groups, including the Chewa, Yao, Lomwe, and Ngoni, among others. The official languages are English and Chichewa. Malawi's population is estimated to be around 19 million people. The population is relatively young, with a significant percentage under the age of 25.

Malawi's economy is predominantly agrarian, with a significant portion of the population engaged in subsistence farming. The country heavily depends on agricultural exports, particularly tobacco, tea, and sugar. However, Malawi faces economic challenges, including poverty, limited infrastructure, and vulnerability to external shocks. Malawi's Gross Domestic Product (GDP) has been characterized by fluctuations and challenges. The economy relies on agriculture, which can be susceptible to weather conditions. The GDP per capita is lower compared to many other countries, indicating economic challenges and disparities in wealth distribution. GDP) in Malawi was worth 13.16 billion US dollars in 2022, according to official data from the World Bank. The GDP value of Malawi represents 0.01 percent of the world economy.

4.3.1 Understanding the Research Participants in this Study

In conducting this study, it was important to understand the background and experiences of the participants.There were 58 first-year medical students who participated in the study. Out of the 58 participants, 30(51.7%) were male and 28(48.3%) were female. Thirty-nine (39) (67.3%) participants were aged 18-20, 17(29.3%) participants were aged 21-23, and 2(3.4%) participants were aged above 24 years. 7(12.1%) were Indians, 9(15.5%) were Zimbabweans and 42(72.4%) were Malawians. Out of the 42 Malawians, (18)42.9% were from the Southern region, 16(38.1%) from the Central region, and 8(19%) from the Northern region. Majority (69%) of those who participated in the study were primarily from poor rural backgrounds, which often meant the had a background of limited access to mobile devices while in secondary school. Many of these students received their first smartphone as a gift for making it into medical school, and they were eager to learn how to use these devices to manage and control their learning.

During my initial meeting with the students, they asked many interesting questions about the study and were enthusiastic about the idea of using their phones to manage and control their learning. To these students, a smartphone was primarily seen as a communication device, and the idea of using it for educational purposes was a new concept. This was especially true for the majority of the participants who came from secondary schools where they were not allowed to use phones for educational purposes. In fact, they were not allowed to bring any phones to school premises.

Given the unique backgrounds and experiences of these students, it was important to take into account their backgrounds and needs when designing the study. This helped ensure that the study was relevant and accessible to all participants and that the findings were meaningful and useful for improving their educational experiences, particularly the use of mobile devices to manage and control their learning.

4.3.2 Unit of analysis

Choosing the unit of analysis, which entails defining the case's characteristics and choosing which issues to emphasise, is an essential step in the case researchers' design process (Gonzalez & Poast 2022). Before looking for study sites, the researcher needs to decide which unit of analysis is the most relevant (Barany et al.,2021). There may be multiple units of analysis, and identifying them clarifies the focus of the analysis (Gonzalez & Post, 2022). This study has one unit of analysis, use of mobile learning inside and outside the classroom to develop SRL.

4.3.3 Mixed method approach

As pointed out in Section 4.3 above , the research questions in this study were answered through a mixed-method approach. . That is, qualitative and quantitative methods or tools were used to gather data that answered the research questions. A mixed-methods research design was adopted in this study to gather, analyse, and' mix quantitative and qualitative data and methods in one study to better understand a research problem. According to Creswell and Creswell (2018), quantitative methods were used to check if there was an improvement of SRL through statistical analysis, such as t-tests, while qualitative methods were used to provide insight on the impact of mobile learning on SRL. The qualitative data also offered the study's significant contribution of how mobile learning was used to develop self-regulated learning in first-year medical students at the chosen university.

Moreover, Explanatory Sequential Study Design was used in this study since data sets were collected and analysed in sequence: the results of the first phase (pre-MSLQ) provide the basis for how the participants could paired based on their strengths and weaknesses on the nine learning strategies of MSLQ (see Figure 4.1). According to Creswell and Plano Clark (2011), the sequential design is normally presented as a two-phase study. This design was revised in this study to a three-

phase study to include a quantitative component of Post-MSLQ toward the end of the study in order to gather quantitative data that was used to calculate the t-test. A T-test was used to check the improvement of participants' SRL after the intervention.

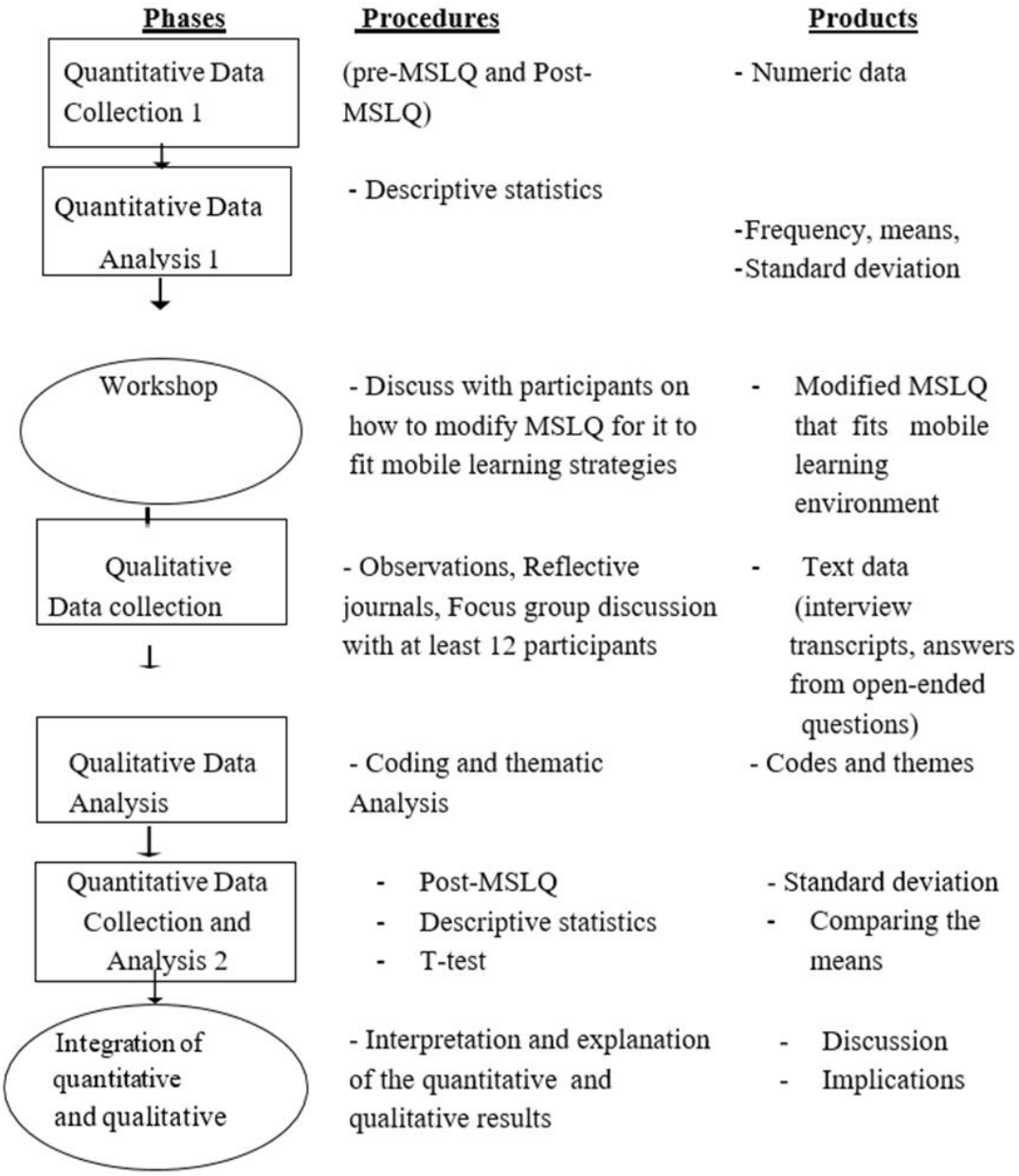

Figure 4.1: Procedure of data collection used in the mixed methods explanatory sequential design of this study(Adapted from Creswell et al., 2011, p.121)

4.3.4 The Quantitative Part of the Research

This section presents the sample size used for the quantitative part of this research study, followed by a discussion of the quantitative variables. It then provides details on the data collection process, including information about the measuring instrument used. Finally, the section covers data management and analysis procedures.

4.3.4.1 Sample size for the quantitative part of the research

Quantitative methods involve the processes of collecting, analysing, interpreting, and writing the results of a study (Creswell & Creswell, 2018). The population size for the quantitative part of the research consisted of first-year medical students (n=92). This sample was calculated as shown below based on the population size of 120 first-year medical students from the selected university in Malawi. The study population and participants were selected on the grounds of a purposeful convenience sample because the study population and participants were conveniently and easily available.

Sample size calculation for the quantitative part of the research

Sample size (n)= $N * \frac{\frac{Z^2 * p * (1-p)}{e^2}}{\left[N-1+\frac{Z^2 * p * (1-p)}{e^2}\right]}$

Where,

- N = Population size,
- Z = Critical value of the normal distribution at the required confidence level,
- p = Sample proportion,
- e = Margin of error

For first-year medical students at the selected University in Malawi, the total number of the student is 120

- Population size, N = 120
- Critical value at 95% confidence level, Z = 1.96
- Margin of error, e = 5% or 0.05
- Sample proportion p = 0.5

Sample size (n)= $N * \frac{\frac{Z^2 * p * (1-p)}{e^2}}{\left[N-1+\frac{Z^2 * p * (1-p)}{e^2}\right]}$

Sample size (n)= $120 * \frac{\frac{1.96^2 * 0.5 * (1-0.5)}{0.05^2}}{\left[120-1+\frac{1.96^2 * 0.5 * (1-0.5)}{1.96^2}\right]}$= 91,61936561≈92

Therefore, the sample size for quantitative data is 92.

Out of the 120 students, the study reached out to 118 (98.3%) participants. Out of 118 students who were reached out to participate in the study, only 71 (60.2%) expressed interest in participating in the study by signing the consent form. Out of 71 participants who expressed interest to participate in the study, 67 (94.45%) completed the Pre-MSLQ. Only 58 (85.6%) participants of the 67 who completed the pre-MSLQ completed Post-MSLQ tests representing 63% of the sample (92). Out of the 58 participants 30 (51.7% were male and 28 (48.3%) were female.

4.3.4.2 The variables

The analysis of this study focused on six quantitative variables. Table 4.1 provides the details for each variable.

Table 4.1: Quantitative variables

No.	Variable	Variable Description
1	Pre-MSQL Score	The participants' MSQL score before the intervention
2	Post-MSQL Score	The participants' MSQL score after the intervention
3	Improvement in cognitive and metacognitive strategies	Students' improvement on each item under the cognitive and metacognitive strategies subscale of MSLQ
4	Improvement in metacognitive self-regulation subscale	Students' improvement on each item under the metacognitive self-regulation subscale of MSLQ
5	Improvement in resource management strategies subscale	Students' improvement on each item under the resource management strategies subscale of MSLQ
6	Age	Age of the participants (18-20, 20-21, 22 & above)

4.3.4.3 Data collection

A researcher can collect data through methods that directly or indirectly gather the data (Creswell, 2014). In quantitative research, direct data is also known as primary data (Creswell, 2014). Primary data is gathered through the use of tests and/or standardised questionnaires. The quantitative data was gathered using the Motivational Strategy Learning Questionnaire (MSLQ) (see Section 4.3.1.1). At the start of the study, the MSLQ adopted from Pintrich et al. (1991) was used to collect data used to pre-identify each student's strengths and weaknesses on each of the nine cognitive learning strategies sub-scales of self-regulated learning. The researcher collected data through an online MSLQ (see Appendix B). This data gave each student a baseline score showing their individual strengths and weaknesses in each of the nine self-regulated learning strategies. At the end of the study, students completed another online MSLQ to post-identify each student's strengths and weaknesses on each of the nine cognitive learning strategies sub-scales of self-regulated learning. The difference in the MSLQ score at the start and the MSLQ score at the end of the study was used to assess if students' self-regulation learning has improved.

4.3.4.4 The measuring instrument

The MSLQ is a measure that is mostly based on a generic social cognitive understanding of motivation and learning techniques (Pintrich, 1988, 1989; Weinstein, 1986). The adopted MSLQ was developed over the period of three years, during which time it was validated by reliability and factor analyses, as well as through correlation with achievement indicators (Pintrich et al., 1991, 1993; Wine & Perry, 2000). The MSLQ's final version results from 12 years of work, mostly at the University of Michigan, on several phases of data gathering (Pintrich et al., 1991; Pintrich, P. 2004). One of the advantages of MSQL is that it has been used and validated at both secondary and higher educational levels (McManus, 2000).

MSQL lists nine components of learning strategies: rehearsal, elaboration, organisation, critical thinking, metacognitive self-regulation, time and study environment management, effort regulation, peer learning, and help-seeking (Kumar & Bhalla, 2020; Soemantri et al., 2018; Tock & Moxley, 2017). The MSLQ is a self-report Likert-type questionnaire in which students rate statements about their motivational orientation and use of different learning strategies for a specific

course. MSQL uses a 7-point Likert scale from "1" (not at all true of me) to "7" (very true of me) (Pintrich et al., 1991; Van Zile-Tamsen & Livingston, 1999). The MSLQ, which is scored positively, consists of fifteen different summative scales divided into two main sections: a Motivation Section and a Learning Strategy Section. The two sections that comprise the MSLQ are presented in Table 4.2.

Table 4.2: MSLQ Sections and Scales

MOTIVATION SECTION		**LEARNING STRATEGY SECTION**	
COMPONENTS	**SCALES**	**STRATEGIES**	**SCALES**
Value Component	Intrinsic Goal Orientation	***Cognitive and Metacognitive Strategies***	Rehearsal
			Elaboration
	Extrinsic Goal Orientation		Organisation
			Critical Thinking
	Task Value		
			Metacognitive Self-Regulation
Expectancy Component	Control of Learning Beliefs		
	Self-Efficacy for Learning and Performance		
Affective Component	Test Anxiety	***Resource Management Strategies***	Time and Study Environment Management
			Effort Regulation
			Peer Learning
			Help-Seeking

Out of the 81 questions in MSQL, 31 are linked to the motivational portion and 50 to learning strategies (Pintrich et al., 1991). Since this study explores how first-year medical students can use mobile learning to develop self-regulated learning, the researchers chose to focus only on the learning strategies section of the MSLQ. Out of the 50 items in the learning strategies section, the researchers selected only 25 for the study. The selection was based on careful consideration and discussion between the researchers and participants to ensure that the questions were applicable to mobile learning.

By narrowing down the focus to the learning strategies section and selecting the relevant items, I was able to obtain a more targeted understanding of the specific learning strategies that are most applicable to mobile learning. This approach allowed me to explore the potential of mobile learning in promoting self-regulated learning more effectively and efficiently.

The learning strategies consist of nine summative scales divided into two main sections: cognitive, metacognitive, and resource management strategies. Cognitive and metacognitive strategies has five scales: rehearsal, elaboration, organisation, critical thinking, and metacognitive self-regulation. The resource management strategies have four scales: time and study environment management, effort regulation, peer learning, and help-seeking. Students' ability to use these learning techniques varies; for example, some students excel at Meta-cognition but struggle with organisation. For this reason, students were paired based on strengths and weaknesses in the learning strategies.

4.3.4.5 The validity and reliability of the MSLQ

It is necessary to determine the psychometric qualities before constructing any psychological evaluation instrument (Foxcroft & Roodt, 2001). Standard statistical and psychometric analyses of the concept validity, reliability, and predictive validity of the MSLQ were conducted. This section summarises the validity and reliability of the MSLQ.

a) Construct and Predictive Validity

Pintrich (1993) and his colleagues collected 380 responses from Midwestern College students across 14 courses and five disciplines as part of their investigation into the reliability and validity of the MSLQ. They used these responses to test the effectiveness of the theoretical model of the MSLQ and its operationalisation using two confirmatory factor analyses, one for the set of Motivation items and another for the set of Learning Strategy items. The nine scales in the Learning Strategy section and the six in the Motivation section offered a coherent conceptual and empirically proven framework for evaluating students' use of learning strategies and motivation, respectively (Pintrich et al., 1993). Several research studies have supported the factor structure of

the MSLQ and the stability of the fifteen scales (Garcia & Pintrich, 1995; Jacobson et al., 2000; 1996; Pintrich et al., 1993).

Pintrich and his colleagues (1993) used this measure in a study to investigate its predictive validity in terms of higher education academic achievement. The study's findings revealed a connection between a measure of academic achievement and the student's final grade for the course they were enrolled in when they took the MSLQ (Pintrich et al., 1993). More precisely, the measures in the motivation section demonstrated substantial connections with final course grades, except for the Extrinsic Goal Orientation scale. The scales of the Learning Strategy Section likewise showed a strong correlation with final course grades, except for the Rehearsal, Peer Learning, and Help-Seeking scores (Pintrich et al., 1993).

b) Reliability

Pintrich, Smith, Garcia and McKeachie (1993) were the first to demonstrate the MSLQ as a reliable measure of self-regulated learning, followed by Barker and Olsen(1995). Table 4.3 compares the coefficient alphas from the Pintrich et al. (1993) study and the results obtained by Barker and Olsen(1995).

Table 4.3: Coefficient Alphas for the 15 MSLQ Scales

Motivation Scales	Pintrich et al. (1993)	Barker and Olsen (1995)
Intrinsic Goal Orientation	0.74	0.72
Extrinsic Goal Orientation	0.62	0.71
Task Value	0.90	0.79
Control of Learning Beliefs	0.68	0.48
Self-Efficacy for Learning and Performance	0.93	0.92
Test Anxiety	0.80	0.70
Rehearsal	0.69	0.66
Elaboration	0.76	0.75
Organisation	0.64	0.70
Critical Thinking	0.80	0.83

Metacognitive Self-Regulation	0.79	0.78
Time and Study Environment Management	0.76	0.81
Effort Regulation	0.69	0.71
Peer Learning	0.76	0.73
Help-Seeking	0.52	0.65

The MSLQ has been validated and found to be reliable in various studies (Barker & Olsen, 2002; Garcia & Pintrich, 1995; Garcia et al., 1995; Pintrich et al., 1993), making it, in the words of Pintrich et al. (1994), a reliable and useful tool that can be adapted to a variety of different purposes for researchers, instructors, and students. For this reason, MSQL was adopted in the study as one of the measuring instruments to measure participant SRL.

4.3.4.6 The administration of MSQL

The students started filling out the online MSQL in the first week of the study, soon after the orientation workshop. It took one week before 67 of the 92 sampled students filled in the online MSLQ. At the end of the study, soon after the last reflective feedback work, participants filled another online MSQL; this time, only 58 filled the MSQL.

4.3.4.7 Scoring of the MSQL

Students rated themselves on a seven-point Likert scale from “not at all true of me” to “very true of me.” (see Appendix B). Scales were constructed by taking the mean of the items that make up that scale. For example, rehearsal (see Appendix D) has three items. An individual's score for rehearsal was computed by summing the three items and taking the average. Items marked as “reversed” are reverse-coded items and were reflected before scale construction. These negatively worded items and the ratings were reversed before an individual's score was computed. For reversal, a participant who had circled 1 for that item was given a score of 7 and so on. Accordingly, a one becomes a 7, a 2 becomes a 6, a 3 becomes a 5, a 4 remains a 4, a 5 becomes a 3, a 6 becomes a 2, and a 7 becomes a 1. The simplest way to reflect a reverse-coded item is to subtract the original score from 8. For example, if the original score was 2 to the negatively worded

item, it was computed as follows 8 - 2 = 6, 6 being the score for the positively worded version of that question. The statistics are reported in Chapter 5.

4.3.4.8 Data Management and Analysis

All the collected data were put in password-protected files, securely kept in my Google Drive, and always accessed from Google Drive during the analysis. The data was kept in Google Drive until the completion of the study.

For data collected through online MSLQ (see Appendix B), the data was exported as an Excel file from the Google form after being completed. The MSLQ scores were calculated as described in Section 4.3.4.7. The statistical analysis on MSLQ was computed. In all statistical tests, such as the T-test, p-values (probability values) smaller than 0.05 were accepted as indicators of statistical significance. Excel was used to compute individual scores, create bar graphs of the participant's scores, and compute means and standard deviation. Finally, a statistical t-test was computed to determine if there was a significance difference between the pre-MSLQ scores and post-MSLQ scores (See Table 4.4) for the description of the analysis conducted on each variable.

Table 4.4: Analysis of quantitative variables

No.	Variable	Variable Description	Analysis
1	Pre-MSQL Score	The participants' MSQL score before the intervention	Means and Standard Deviations were computed
2	Post-MSQL Score	The participants' MSQL score after the intervention	Means and Standard Deviations were computed
3	Improvement in cognitive and metacognitive strategies	Student's improvement on each item under the cognitive and metacognitive strategies subscale of MSLQ	The analysis focused on evaluating the change in each item on the MSLQ's subscale for cognitive and metacognitive techniques. The T-test was used to compare the Pre-MSQL and Post-MSQL Scores in order to determine if there was an improvement in SRL as a result of the intervention. The statistical significance of the difference between the scores was used to determine the change.
4	Improvement in metacognitive self-regulation subscale	Student's improvement on each item under the metacognitive self-regulation subscale of MSLQ	The analysis focused on evaluating the change in each item on the MSLQ's subscale for metacognitive self-regulation. The T-test was used to compare the Pre-MSQL and Post-MSQL Scores to determine if there was an improvement in SRL due to the intervention. The statistical significance of the difference between the scores was used to determine the change.
5	Improvement in resource management strategies subscale	Student's improvement on each item under the resource management strategies subscale of MSLQ	The analysis focused on evaluating the change in each item on the MSLQ's subscale for resource management strategies. The T-test was used to compare the Pre-MSQL and Post-MSQL Scores to determine if there was an improvement in SRL due to the intervention. The statistical significance of the difference between the scores was used to determine the change.
6	Age	Age of the participants (18-20, 20-21, 22 & above)	Age was analysed using frequencies to see how many participants in each age group participated in the study.

4.3.5 The qualitative part of the research

The primary aim of this study was to investigate how first-year students in a medical make use of mobile learning to develop SRL skills. In order to gain a complete picture of how first-year medical students can use mobile learning to develop SRL skills, a reflective journal, reflective workshop, participatory observation, and focus group discussion were necessary.

4.3.5.1 Sample Size for the qualitative part of the research

For qualitative data, 12 participants were purposively selected to participate in focus-group interviews. Cohen et al. (2018, p.218) define "purposive sampling involving researchers as handpicking the case to be included in the sample based on certain criteria". According to Gray (2021, p. 218), "purposive sampling is commonly employed in qualitative research in choosing and identifying information-rich cases related to the phenomena of interest". He further asserted that the researcher puts together the sample to suit their needs. The participants were selected according to specific criteria (see Table 4.5).

4.3.5.2 Inclusion/exclusion criteria

The participants that were selected to be among the 12 participants who participated in the focus group had to meet the criteria presented in Table 4.5:

Table 4.5: Inclusion/exclusion criteria

No	Inclusion criteria	Exclusion criteria
1	Who had both Pre-MSLQ and Post-MSLQ Scores	Did not have both Pre-MSLQ and Post-MSLQ Scores or do not have one of these
2	Participants who actively participated in all research activities, such as writing a reflective journal, sharing their reflections during fortnight reflective workshops, and working with a peer in the pair for the whole research period	Not having a reflective journal, not actively participated in the fortnight reflective workshops, and not actively working with a peer in the pair during the research period

3	Frequently attended the fortnightly reflective workshops	Not frequently participated in the fortnightly reflective workshops,
4	Had access to mobile devices throughout the study	Not having access to mobile devices for the most part of the study period
5	Willing to share their experiences with using mobile learning to develop self-regulation learning	Not willing to share their experiences with using mobile learning to develop self-regulation learning

4.3.5.3 The variables

The analysis of this study focused on six qualitative variables. Table 4.6 provide the details for each variable.

Table 4.6: Qualitative variables

No.	**Behaviour-Environment**	**Variable**	**Variable Description**
1	Personal	Academic mobile device use	Student use of the mobile device(s) for academic purposes when in a personal leisure environment (e.g., relaxing at home/hostel); Informal learning environment
2	Outside Classroom	Academic mobile device use	The student uses the mobile device(s) for academic purposes outside classroom but studying for academic purposes (e.g., library, studying at home/hostel); outside the classroom.
3	Inside Classroom	Academic mobile device use	The student uses tech device(s) for academic purposes when in a classroom (e.g., MBBS 1 class); Formal learning environment.
	Variable		**Variable Description**
4	Learning environment		Formal & Informal Learning Environments/settings (Personal leisure time, Study time, and Class time)
5	Type of the device		Three mobile devices (Smart Phone, Tablet/iPad, Laptop Computer)
6	Gender		Gender(Male, Female)

4.3.5.4 Data Collection

Like quantitative data, qualitative methods can be collected through direct or indirect data collection (Creswell, 2014). In qualitative research, direct data is also known as primary data (Creswell, 2014). This study collected only primary data. The data was gathered in the following ways.

a) Reflective journal and reflective workshop

Reflection helps bring the unconscious into consciousness and make it available, thus, open for inspection (Ortlipp, 2008). In the research context, reflective journals offer an opportunity for participants and researchers to reflect on their experiences, ideas, beliefs, and feelings about research. Similarly to Mayana's (2020) study conducted in South Africa, in this study, participants were encouraged to reflect on the mobile learning process in managing and controlling their learning inside and outside the classroom.

In this study, participants recorded personal reflections in their reflective journals. The reflections were shared with other participants during each fortnight's reflective workshop. Reflective journals are a powerful tool for increasing metacognition and self-regulation skills. Recording of personal reflections in their journals provided participants with an opportunity to reflect on their learning experiences on the use of mobile learning to improve their SRL skills, monitor their progress, and identify areas for improvement. Writing in a reflective journal encouraged students to connect their self-regulation cycle to their learning goals, helping them achieve those goals more effectively (Nückles et al., 2020).

Reflections have been widely utilised in various studies (Brockbank et al., 2017; Campbell, 2020; Griggs et al., 2018). Nhase (2020) conducted a study involving grade 3 foundation phase teachers, where group reflections were used. These reflections served two main objectives: first, to validate the research processes, and second, to gain insights into the participants' perspectives throughout the entire study. Brodie (2016) refers to this approach as a professional learning community, while Ngcoza and Southwood (2019) term it a professional learning network. Campbell's (2020) study on "Creating Reflective Space for Reflective and 'Unreflective' Medical Students," it was found

that reflection is a critical skill for all physicians, and it significantly helped medical students in reflecting on their clinical experiences. The studies all employ a reflective approach with a shared focus on learning.

In addition, Griggs et al. (2018) emphasised the significance of reflective learning, aiming to guide students from simple or instrumental reflection towards a more complex and critical perspective. Likewise, Brockbank et al. (2017) highlighted that reflective learning provides a space to acknowledge and contextualise learning experiences. These valuable insights informed the decision to adopt the reflective approach in this study.

In this study, I conducted reflective workshops every two weeks on Wednesday afternoons, from 2 pm to 4 pm, for a period of 16 weeks. A total of eight physical meetings at Lecture Theater 2, which was agreed upon as our designated location for these sessions. As the researcher, my primary role was to facilitate the process (Campbell, 2020). I achieved this by posing thought-provoking questions aimed at initiating the reflection process. These carefully crafted questions offered participants a valuable opportunity to contemplate the mobile learning strategies they were using and how they were addressing the challenges they faced in improving their weak learning strategies. Some examples of the questions asked during the workshops were:

i. What mobile learning approaches worked for you in the past two weeks, and why?
ii. Did you encounter any challenges while using some of the mobile learning strategies? If yes, how did you deal with these challenges?
iii. Kindly share any recorded experiences in your reflective journal that others have not shared today.

Through these interactions, the fortnightly reflective workshops proved to be beneficial in enabling participants to deepen their thinking and reflection skills. The sharing of reflections among the participants allowed them to learn from each other's experiences, offer support and advice, and gain insights that they might not have gained on their own. However, I observed an issue during the third fortnightly reflective workshop. It was evident that introverted students were more reluctant to share their experiences, leading to extroverted students dominating the discussions.

The dominance of extroverted students in the discussion left little room for other students to share their experiences. This created an environment where students were not comfortable expressing themselves, particularly when it came to sharing their failures with a larger audience. Participants argued that although the purpose of the workshops was to learn from each other, it was not fair to expect them to share their failures with everyone. They felt that it was more appropriate to share such personal experiences with individuals they could trust, who would keep their failures confidential.

Recognising the validity of these concerns, we collectively agreed to introduce a more inclusive approach to sharing experiences. We decided that individuals would be free to share their experiences anonymously if they felt uncomfortable sharing them openly. This would allow them to maintain their privacy and avoid potential judgment or embarrassment. Furthermore, we implemented an approach where students could choose a peer who would share their experiences with the whole group while maintaining anonymity.

This approach created a safer and more supportive environment for students to express themselves without fear of negative consequences. By offering the option of sharing anonymously, students could choose to participate at their own comfort level. The peer-sharing mechanism ensured that experiences were still shared with the larger group but without revealing the identity of the original storyteller.

These adjustments encouraged more equitable participation in the reflective workshops, providing opportunities for both introverted and extroverted students to contribute and learn from each other. It fostered a sense of trust among participants, allowing them to explore their failures and challenges in a supportive community. By respecting individual boundaries and preferences, we created a more inclusive and empathetic space for personal growth and development.

It is worth noting that, initially, I had planned to solely conduct face-to-face reflective workshops every two weeks to facilitate the study on mobile learning and self-regulated learning (SRL). However, the participants suggested using a blended approach, which included the creation of a WhatsApp group forum for discussions. The primary reason behind this suggestion was that

WhatsApp is the most popular mobile application that they use daily, making it convenient for them to utilise it for this study's purpose. As a result, we conducted the reflective workshop discussions both in person and on WhatsApp. We had a physical meeting every two weeks, but the WhatsApp group was used to discuss the successes and challenges that the participants encountered while using mobile devices to manage and control their learning in between the physical meetings.

It was observed that the WhatsApp platform offers a more comfortable space for introverted students to express themselves. This is attributed to the platform allowing them time to compose their thoughts and respond without the immediate pressure of face-to-face interactions. In addition, the use of pseudonyms on WhatsApp encouraged more students to participate compared to face-to-face reflective feedback workshops. This suggests that the anonymity provided by WhatsApp enables introverted students to express their opinions without the fear of judgment or interruption. Furthermore, there were instances where statement such as "in our group, we discussed that..." were produced in the main WhatsApp discussion. This indicates that WhatsApp facilitates parallel conversations, enabling introverted students to engage in smaller, more manageable interactions within the larger group.

Overall, both WhatsApp discussions and face-to-face interactions come with unique advantages and challenges. The choice of platform significantly impacts the inclusivity of discussions, especially for introverted students. A thoughtful approach to facilitating discussions, whether online or in-person, is crucial to creating an environment where all students feel comfortable expressing their ideas. Combining both approaches strategically may also prove beneficial, leveraging the strengths of each platform.

As a researcher, I also kept a reflective journal which provided an invaluable tool for self-reflection. By constantly reflecting on my actions and conduct, I could identify any biases or assumptions I may have had during the study. This helped me better understand my own behaviour and reactions during the study. This ultimately helped me to become a more effective researcher. Through my reflective journal, I was able to identify that some extroverted students were

dominating the first three fortnightly reflective workshops, allowing me to take action and ensure that every participant had a fair opportunity to share their experiences.

In addition, the fortnight reflective workshops played a crucial role in providing a deeper understanding of the challenges and success that first-year students encountered in using mobile devices to improve their self-regulated learning (SRL) skills. These workshops provided a platform for the researcher and participants to reflect on the data collected from the students' reflective journals and identify specific challenges that the students were facing in using their mobile devices to enhance their SRL skills, as well as successes to build on as the participants were continuing in the study.

Through the sharing of experiences, the participants and I were able to propose and discuss various mobile learning strategies that could help address the identified challenges. The workshops also revealed several key areas where students needed support to enhance their SRL skills, such as time management, goal setting, self-evaluation, and technical skills to use mobile devices to improve their SRL.

The fortnightly reflective workshops were not only beneficial in identifying challenges and proposing strategies but also provided data that helped to understand how the proposed strategies were working. After each reflective workshop, the participants were encouraged to try out the identified mobile learning strategies and reflect on their experiences in their journals. These reflections helped the researcher and participants evaluate the strategies' effectiveness and make necessary adjustments in to the mobile learniing learning approache used.

Furthermore, even though the reflective journals were initially planned to serve as a catalyst for discussion during the reflective workshops, they provided valuable data that contributed significantly to the study. As such, the journals of the 12 participants selected for focus group discussion were included in the analysis as part of the primary dataset that has been used to discuss the findings in Chapter 6. For example , the reflective journals provided data on the specific activities that the participants engaged in to improve their SRL skills.

The fortnightly reflective workshops were instrumental in the success of the study. They facilitated collaboration between the peers in their pair, the researcher and participants in the reflective workshops , leading to a deeper understanding of how mobile learning can be used to improve first-year students' SRL skills. The insights gained from these workshops were critical in developing effective mobile learning strategies to help students improve and enhance their SRL skills. As such, the workshops proved to be an invaluable component of the study and highlighted the importance of reflective practice in enhancing the learning on using mobile devices to improve their SRL skills.

Throughout the reflective workshops, it became clear that reflections and shared experiences sparked profound insights and meaningful discussions. Participants' stories offered unique perspectives and lessons, inspiring critical thinking about their growth and learning processes. Referencing their reflective journals and invoking shared memories created a cohesive and enriching atmosphere where participants felt comfortable sharing challenges and triumphs. Trust within the group nurtured open dialogue and constructive feedback, fostering mutual encouragement and empathy.

The use of reflective journals and collective recollection elevated discussions to a profound level of self-awareness and discovery. Participants unearthed fresh perspectives and novel solutions to challenges they faced in using different mobile learning strategies to improve their weak learning strategies.

At the end of the study, it was evident that participants had enriched their growth and forged strong bonds with their peers. The ongoing practice of reflective journaling and shared experiences continued to fuel personal and interpersonal development, empowering them to navigate their learning journeys with confidence and resilience. This experience reaffirmed that collective reflection and support are indispensable for individual growth, transformation, and overall learning.

Based on the aforementioned, it is not a surprise that some participants indicated that they were to adopt reflective journals as a formal method of reflecting on their learning after the study,

indicating that the approach used in the study had a lasting impact on their learning practices. Overall, the blended approach utilised in the study proved to be effective, as it not only helped participants learn how to use mobile relearning to self-regulate their learning but also provided valuable data for analysis.

b) Participatory Observation

According to Sikhakhane et al. (2020), an observation technique allows a researcher to observe how events evolve over time in a study. Since the study participants were using mobile devices to manage and control their learning activities inside and outside the classroom, the researcher observed how the participants (first-year medical students) were using mobile devices to manage and control their learning activities inside the classroom for one semester. The study used participatory-participant observation to gather data that responded to research questions 2, 3, and 4 (see Appendix F).

Observation as a data collection method was beneficial in this study in obtaining authentic and reliable data because it follows the interpretive paradigm and qualitative research (Rahi, 2017). Rahi (2017) further asserted that observations objectively measure what the participants are doing rather than what they recall or believe they are doing. This is the case because observations reported in this study are based on what the students were really doing rather than what they recollect or assume they did.

In order to gather valuable insights, I employed participatory observation to collect data within a classroom setting. For me to participate in the lessons, I coordinated with the lecturers to secure permission to attend their classes. Throughout the observation process, my primary focus was directed towards identifying what the students used mobile devices on and when they did so.

I observed four lessons taught by three different lecturers. Among these lessons, three lessons were for an hour each, while one was for two hours. To ensure minimal disruption during the lessons, I arranged with the lecturers to be present in the classroom before the lesson starting time. This

allowed me to avoid disturbing the lesson as the lecturer was finding me in class like any other participants (first-year medical students).

During the classroom sessions, I carefully observed the students behaviours and interactions with their mobile devices. I noted instances when they reached for their phones, engaged in activities such as browsing the internet or using educational applications, and also paid attention to the duration and frequency of their mobile device usage. This enabled me to gain a comprehensive understanding of the students' mobile phone usage inside the classroom.

However, despite my efforts, there were limitations encountered during the data collection process. Out of the originally planned eight observations, only four were successfully conducted. This was due to the discomfort expressed by two lecturers who were teaching the classes. They *voiced* concerns regarding my presence as a researcher within their teaching environment, which hindered my ability to carry out the desired number of observations.

Nonetheless, the data collected from the four observations provided valuable insights into student mobile device usage patterns within the classroom. Although the number of observation were less than anticipated, the observations still yielded meaningful observations and trends that can contribute to understanding the use of mobile devices by student to manage and control their learning inside the classroom. Much as the study was about first-year medical students, however, in order to conduct a more extensive and comprehensive study on the usage of mobile devices inside the classroom, it was important to incorporate lecturers as part of the research alongside first-year medical students.

c) Focus group discussions

I used focus group discussions in this study to gather qualitative data on students' mobile learning experiences to improve their weak learning strategies. A small group of twelve students was chosen for this study based on specific criteria stipulated in Table 4.5 in Section 4.3.5.2. After the last fortnight's reflective workshops, the participants selected for the focus group discussion were interviewed to collect data used to answer research questions 1, 2, 3, and 4. The twelve participants were divided into two focus group discussions of six students each. Each group discussion took

two hours, resulting in approximately four hours of discussion from the two groups. The researcher piloted the interview questions with a group of three first-year medical students to ensure that the instruments proposed were valid and addressed the stated research questions.

Focus group discussions were adopted in this study because they offer the following four benefits, according to Pickard (2007): they allow exploration of the topic, give room for significant debate/discussion on the topic, provide useful data-collecting guidance, and provide in-depth topic inquiry. The questions for focus group discussions were semi-structured (see Appendix E: Focus-Group Interview guide). Hofisi et al. (2014) asserted that semi-structured questions give the researcher freedom to investigate the respondents while adhering to the core interview structure. They further asserted that even if it is a guided interaction between researchers and interviewees, the researchers are given many leeways. While keeping the structure in mind, I took a creative approach to the entire interview to ask follow-up questions to clarify some issues. Focus group discussions were recorded using a tape recorder and were transcribed verbatim for analysis. In addition, participants used identifiers and not their real names in the focus group discussion.

During the focus group discussions, I organised the venue and time in agreement with the participants, ensuring a convenient setting for everyone involved. Inspired by the traditional way of gathering in circles around a fire in villages, we arranged the seating in a similar fashion, creating an atmosphere conducive to open and comfortable dialogue. This arrangement proved to be highly effective in fostering engaging discussions.

During the engaging and insightful discussion, I observed participants actively delving into the contents of their individual reflective journals, using them as valuable resources to contribute to the conversation. The use of reflective journals notes during the focus group discussion demonstrates that reflective journals served as powerful tools for introspection and personal growth, enabling the participants to revisit past experiences, thoughts, and emotions, thus fostering a deeper understanding of their own development journeys.

Moreover, the participants demonstrated remarkable camaraderie and a strong sense of collaboration by reminding each other of significant incidents that had occurred during the

fortnightly reflective workshops. This collective recollection not only reinforced the value of the discussion but also highlighted the genuine interest and support the participants had for one another's progress.

As the facilitator of the focus group discussions, my primary role was to pose questions and follow-up queries to stimulate meaningful conversation. Participants also felt comfortable seeking clarifications from me as we delved into each question. Drawing from my experience during the fortnight reflective feedback workshop, I implemented strategies to address the issue of extroverted individuals attempting to dominate the conversation, thereby overshadowing the less assertive participants.

To mitigate this imbalance, I ensured that each of the six participants had an equal opportunity to contribute to every discussion point. By actively managing the dynamics of the group, I created an inclusive environment where everyone felt valued and heard. This approach helped to maintain a balanced and respectful discussion, allowing all participants to share their perspectives and insights freely.

4.3.5.5 Data Management and Analysis

Qualitative data was analysed by using content analysis. The researcher coded and organised the data acquired from various methods and instruments (semi-structured questionnaires, reflections, observation, focus group discussions) into main categories during the content analysis. The categories were formed based on the objectives and research questions of the study. Mediation of learning, social interactions, self-regulation and zone of proximal development of the Socio-cultural Theory (SCT) theory; and mobile-learning technology characteristics, self-management of learning, and social influence of Unified Theory of Acceptance and Use of Technology UTAUT provided a mirror for analysing how first-year medical students interacted with the mobile devices and their peer-to-develop SRL skills. UTAUT provided the lens for analysing specific components of how the participant made use of the mobile devices to develop SRL, and SCT helped in analysing specific components that helped to understand how the participants developed self-regulation learning skills.

First-level data coding and overall data were pattern-coded using the six steps for qualitative data analysis outlined in Levitt et al. (2018) (See Table 4.7).

Table 4.7: Process for analysing qualitative data using a six-step approach by Levitt et al. (2018)

No.	Step	Description
Step 1	Familiarise yourself with the data	This step involves reading and re-reading the data to get a sense of the overall content and to identify any key themes or patterns.
Step 2	Generate initial codes	In this step, involves identifying and labelling specific segments of data with short, descriptive codes that capture the essence of the content
Step 3	Search for patterns	Once intial code are generated, in this step codes are grouped together inorder to indentify larger patterns or themes that emerge across the data.
Step 4	Review themes:	In this step involves examining the patterns and themes identified to ensure they are consistent with the data and are meaningful
Step 5	Define and name themes	Once you have reviewed and validated your themes, you can refine and define them more clearly, and assign them meaningful names.
Step 6	Produce the report	Finally, you can use your defined and named themes to produce a report or summary of your findings.

Both focus group discussions and fortnightly reflective workshops were recorded. All recordings were transcribed verbatim, with [inaudible] indicating unclear portions. NVivo software facilitated the categorization of text chunks into specific codes or themes (Wong, 2008). Additionally, data from reflective journals were direct analysed via content analysis methodology without coding. Content analysis systematically examines various forms of communication, such as written text, audio recordings, video, images, and social media posts, to identify patterns, themes, and meanings (Drisko & Maschi, 2016). The analysis of the data from reflective journals focused on understanding the types of learning activities and mobile resources mentioned in the reflections.

The researcher develops summaries of these established patterns based on his observations of the collective students' responses. Table 4.7 provides details on how extended UTAUT and the Socio-

cultural Theory are used as analytical lenses in the study guided by Zimmerman's conceptual framework for studying self-regulation Table 2.3 in Section 2.4. The analysis for the qualitative variables has focused on seven qualitative variables presented in Table 4.8 on the next page.

Table 4.8: Data analysis for both qualitative and quantitative and use of the theoretical framework

No.	Behaviour-Environment	Variable	Variable Description	Variable Type	Scientific Questions	Analysis
1	Personal	Academic mobile device use	Student use of the mobile device(s) for academic purposes when in a personal leisure environment (e.g., relaxing at home/hostel); Informal learning environment	Qualitative Variable	Why	Self-management of learning in UTAUT was used to understand why the participant chose to use mobile learning to manage and control their learning in a personal environment (home/hostel).
					Where	The study used self-management of learning in UTAUT to understand how the participants used the mobile device to structure their learning environment in their informal learning environment.
					How	Mediation of learning and social interactions in SCT was used to understand how the mobile device was used in chosen learning setting to manage and control their learning.
					Why	Mobile-learning technology characteristics component of UTAUT, particularly the urgency of learning needs, was used to understand what influenced participants to use the mobile device in their informal learning environment.
2	Outside the classroom.	Academic mobile	The student uses the mobile device(s) for academic purposes	Qualitative Variable	What	At the beginning of the study, MSLQ was used to identify the participant's weak learning strategies .Mobile-learning technology characteristics component of UTAUT,

		device use	when not in a classroom but studying for academic purposes (e.g., library, studying at home/hostel); outside the classroom.			particularly the urgency of learning need which in this case was assumed to be the need to improve the weak learning strategies, was used to understand what influenced participants on whether to use the mobile device to improve the weak learning strategies while studying outside the classroom.
					Why	Self-management of learning in UTAUT was used to understand why the participant chose to use mobile learning to manage and control their learning while studying at outside the classroom.
					How	Self-management of learning in UTAUT was used to understand how the participant used mobile learning to manage and control their learning during study outside classroom. Mediation of learning and social interactions in SCT used to understand how the mobile device was used in chosen learning setting to manage and control their learning.
					Where	Self-management of learning in UTAUT was used to understand how the participants used the mobile device to structure their learning environment. Mediation of learning and social interactions in SCT used to understand how the mobile device was used in chosen learning setting to manage and control their learning.

					with whom	ZPD in SCT was used to understand how the interactions with their peer and mobile device outside the classroom help the participants to transition from learning regulated by others to learning regulated by themselves, or self-regulated learning.
3	Inside the Classroom	Academic mobile device use	The student uses mobile device(s) for academic purposes when in a classroom (e.g., Biochemistry class); Formal learning environment.	Qualitative Variable	What	At the beginning of the study, MSLQ used to identify the participant's weak learning strategies (see Appendix B). Mobile-learning technology characteristics component of UTAUT, particularly the urgency of learning need which in this case was assumed to be the need to improve the weak learning strategies, was used to understand what influenced participants on whether to use the mobile device to improve the weak learning strategies while studying inside the classroom.
					Why	Self-management of learning in UTAUT used to understand why the participant chose to use mobile learning to manage and control their learning in a classroom.
					How	Self-management of learning in UTAUT was used to understand how the participant used mobile learning to manage and control their learning inside the classroom. Mediation of learning and social interactions in SCT was used to understand how the mobile device was used in

						chosen learning setting to manage and control their learning.
					Where	Self-management of learning in UTAUT was used to understand how the participants used the mobile device to structure their learning environment. Mediation of learning and social interactions in SCT was used to understand how the mobile device was used in chosen learning setting to manage and control their learning.
					with whom	ZPD in SCT was used to understand how the interactions with their peer and mobile device inside the classroom help the participants to transition from learning regulated by others to learning regulated by themselves, or self-regulated learning.
No.	**Variable**		**Variable Description**	**Variable Type**	**Analysis**	
4	Self-regulation support		Self-regulation support(peer pairing, reflective journal, reflective feedback workshop)	Qualitative Variable	The analysis focused on determining how support such as peer pairing, keeping reflective journals, and reflective feedback workshops can help students develop SRL.	
5	Gender		Gender(Male, Female)	Qualitative Variable	This was analysed using frequencies to see how many males and females took part in the study.	

6	Students perspectives	Perspectives of the students in using mobile learning to develop self-regulated learning	Qualitative Variable	The analysis focus on how learners view mobile learning in particular, their associations with the uses of the mobile device to assist them in develop SRL.
7	Type of the device	Three mobile devices (Smart Phone, Tablet/iPad, Laptop Computer)	Qualitative Variable	This analysis focused on the type of device they used to manage and control their learning inside and outside the classroom

4.3.6 Transcribing the Discusisons

Two focus group discussion were audio recorded. The naturalistic approach of transcribing all interviews was employed. This involves transcribing all interviews exactly as they were narrated by the participants (Kelly et al., 2010). As a result, every pause, interruption, and inaudible sentence or word within the interviews was transcribed. Additionally, the researcher added memos to the transcripts of each interview to record any interpretations or points of view expressed during the interview.

During the recording of interviews, additional notes were taken for each transcript. These notes were stored separately from the interview transcripts in a different folder. Furthermore, after each interview, the researcher made manual notes to capture their observations, as well as the key points and arguments emphasised by the participants. These notes served as a useful reference for the researcher to recall the participants' personalities and backgrounds, which, in some cases, provided context to better understand their stories.

To delve deeper into the data, the researcher immersed themselves in the transcription process. They carefully listened to the interviews again, paying close attention to the participants' voices, tones, and emotions, while typing the content. This approach facilitated a more comprehensive understanding of the data.

4.3.7 Coding Data

Coding is a critical starting point for any qualitative data analysis (Bell et al., 2018). Data coding involved the production of initial codes that emerged from the data with specific attention to striking features relevant to answering the research questions (Johnson, 2018; Smith et al., 2020). During this phase, Nvivo software was used in the data coding process. The two transcripts in Word files, were imported into the software. One file contained the transcripts from the two focus group discussions, while the other file comprised the transcripts from the 8 fortnightly reflective workshops. Each interview transcript received a specific code (or node) for easy access and viewing on the computer screen. It's worth noting that data from reflective journals, as outlined in section 4.3.5.5, was directly analysed through content analysis methodology without coding. The researcher maintained a consistent definition of the code throughout the process to ensure the study's reliability in the data analysis. During the coding process list of codes was produced, as shown in Figure 4.9.

Table 4.9 Codebook showing the organisation of code name and description (screenshot from NVivo 12)

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SRL Codebook

Name	Description	Number Of Files Coded	Number Of Coding References
Challenges and Solutions on use of mobile device as a learning tool	Challenges and Solutions on use of mobile device as a learning tool	2	4
Exprience of using mobile device(s) inside classroom	Use mobile device in side classrrom	2	6
Is mobile device an enabler or disctrator to leanring	Checking if mobile device helps in learning or not	2	11
Mobile device as a means for collaborative learning	How a mobile device can act as a means for collaborative learning	2	6
Mobile device as a means for development of new ideas	How a mobile device act as a means for development of new	2	3
Mobile Device as a medium for maganing and control of learning materials	Mobile device act as a medium for maganing and control of learning materials	2	3
Mobile device as a tool for effective learning	Mobile devcie act as a tool for effective learning	2	5
Mobile device as medium for communication	Mobile device act as medium for communication	2	4
Mobile device usage outside classroom	How a mobile devcie is used outside classroom	2	15
student perspectives of mobile learning	How learners view mobile learning and, in particular, their associations with the uses of the mobile device to assist them in developing SRL.	2	4
Support needed when using mobile device to develp SRL	Support that studenst need to help them use mobile device to develop SRL	2	7
Unplanned use mobile device	How studnet use mobile device without plan or unintended use of mobile on academic work	2	4

4.3.8 Validity, Reliability, and Trustworthiness

Validity in qualitative analysis is addressed in a variety of ways. According to Cohen et al. (2018, p 246), these include "honesty, depth, authenticity, richness, trustworthiness, dependability, integrity, and scope of the data achieved, the participants approached, the level of triangulation, and the researcher's disinterestedness or objectivity" . The term "triangulation of data" refers to the use of multiple data collection techniques to view information from many perspectives in order to reduce researcher bias. Cohen et al. (2018) further stated that gathering data methods like interviews, focus group discussions, observations, and reflections are used to gain access to in-depth understandings within the interpretive paradigm.

In addition, triangulation is a widely recognised and effective method used in research to enhance the reliability and validity of collected data. It involves the integration of multiple data collection techniques and sources to offer a comprehensive and nuanced understanding of the subject being investigated (Collins, 2016). By triangulating data, researchers can cross-

reference information and validate their findings, thereby strengthening the overall credibility of their study.

Through the triangulation, analyzed the data collected from observations, focus group discussions, and reflective journals in this study. This approach allowed me to not only identify converging patterns and corroborating evidence but also to delve deeper into the intricacies of the subject matter. By juxtaposing and comparing disparate data sets, I was able to discern common threads and gain a more profound understanding of the phenomenon under investigation.

The rigorous application of triangulation not only strengthened the credibility of my research but also ensured the reliability and validity of the findings. This approach instilled confidence in both the results obtained and the conclusions drawn, thereby enhancing the overall robustness of the study. By incorporating multiple data collection methods within the qualitative paradigm, including observations, focus group discussions, and reflective journals, I sought to maximise the validity, comprehensiveness, and confirmation of the findings through the convergence of diverse perspectives.

In addition, in order to increase authenticity during the focus group discussion, I recording the conversations for me to gather a full record of the discussion. Cohen et al. (2018) suggest that enhancing credibility in qualitative research can be achieved through thorough validation of raw data in collaboration with participants. This may involve, for instance, providing interview transcripts to participants for their review and comments to ensure the accuracy and authenticity of the recorded information. In this study, the 12 participants were given the transcript of their responses to confirm if the transcript reflected their responses. In cases where the participant did not agree with the transcripts the changes were made to reflect their views. Cohen et al. (2018) proposed that credibility in qualitative research can be enhanced by rigorously validating raw data through collaboration with the participants. This may involve, for instance, providing interview transcripts to participants for their review and comments to ensure the accuracy and authenticity of the recorded information. In the current study, all 12 participants were provided with transcripts of their responses to verify if the transcripts accurately captured their input. In instances where participants disagreed with the transcripts, necessary corrections were implemented to accurately reflect their views.

To maintain the study's legitimacy, I regularly reflected on my various biases, opinions, and positions. Because these factors have the potential to influence the study's outcomes, I took a reflective approach throughout the study, analysing how my own views, judgments, and behaviours could affect the study and its outcomes.

Furthermore, an investigation of this kind should be careful to avoid offering a biased perspective on a particular phenomenon. Thus, triangulation provides a compelling argument in favour of a mixed-methods approach. Triangulation is the use of several data-collecting methods (Creswell & Creswell, 2018; Heale & Forbes, 2013). Observations, focus group discussions, and reflective journals were the multiple data-gathering methods that were used in this study. I employed these different methods of data gathering within the qualitative paradigm to increase the validity, comprehensiveness, and confirmation of findings through the convergence of various perspectives. Several sources and data-gathering methods supported the results, and it is clear that the triangulation used in this study enhanced the research's reliability, rigour, and quality.

The scale, rich data, and in-depth discussion of participants in the fortnightly reflective workshop for one semester provided adequate data required for the study. In order to increase authenticity during the focus group discussion, I recorded the conversations in order to gather a full record of the discussion. I regularly reflected on my various biases, opinions, and positions to maintain the study's legitimacy. Because these factors had the potential to influence the study's outcomes, I took a reflective approach throughout the study, analysing how my views, judgments, and behaviours could have affected the study and its outcomes.

Moreover, I also had the opportunity to present the findings of my research at the Southern African Association for Research in Mathematics, Science and Technology Education (SAARMSTE) Eastern Cape Chapter Colloquium. This academic gathering provided a platform for researchers and scholars to share their work, exchange ideas, and receive valuable feedback from peers and experts in the field. Presenting my study at this colloquium not only allowed me to contribute to the scholarly discourse but also offered me the chance to engage in fruitful discussions and gain insights from fellow researchers.

The feedback and discussions that followed my presentation at the colloquium were invaluable. Engaging with fellow researchers and receiving input from experts in the field provided me with fresh perspectives, alternative interpretations, and suggestions for future directions. The

interactive nature of the colloquium not only enriched my own understanding of my study but also deepened my knowledge of research in general.

4.3.9 Ethical Considerations

Cohen et al. (2011) emphasise the importance of regarding research participants as subjects rather than objects, recognizing their inherent dignity and worth. Invernizzi and Williams (2016) further emphasise the critical role of ethics in all research endeavours. They highlight the complex and changeable nature of the researcher-participant relationship, underscoring its potential influence on the research process and implications for various study components.

This study adhered strictly to the ethical norms of respect and dignity, transparency and honesty, accountability and responsibility, and integrity and academic professionalism. To ensure these principles were upheld, I engaged in thorough discussions with participants regarding their roles and rights in participating in the study. These discussions provided an opportunity for participants to ask questions about their responsibilities, the ethical considerations involved, and their overall involvement in the research. Informed consent was obtained from each participant through the signing of an informed consent form (see Appendix G).

In seeking to maintain ethical standards, the study obtained approval from the Rhodes University Ethical Standards Committee, as my PhD is registered there, and from the College of Medicine Research and Ethics Committee (COMREC) in Malawi, where the study was conducted. These committees reviewed the study's ethical implications, ensuring that participant welfare, privacy, and confidentiality were safeguarded throughout the research process.

Respecting the dignity of participants was of utmost importance. To uphold this principle, steps were taken to ensure their anonymity and confidentiality. Identifying information such as names, contact details, and personal identifiers were removed or replaced with pseudonyms in the reporting and analysis of data. Participants were assured that their responses would be treated with strict confidentiality and that their identities would not be revealed in any publications or presentations resulting from the study.

Transparency and honesty were integral to maintaining the trust and cooperation of participants. Throughout the research process, I strived to provide clear and accurate information about the purpose, procedures, and potential risks and benefits of participation.

Participants were made aware of their right to withdraw from the study at any time without repercussions, emphasising their autonomy and freedom of choice.

Accountability and responsibility were upheld by adhering to rigorous research practices. Data collection, storage, and analysis were conducted in a manner that ensured the protection of participant information and maintained data integrity. Proper protocols were followed to ensure data security, including password-protected electronic files and restricted access to physical records. Any potential conflicts of interest were acknowledged and managed appropriately, ensuring the objectivity and impartiality of the research.

Maintaining the integrity and academic professionalism involved in conducting the research with rigour and honesty, I strived to minimise bias in data collection, analysis, and interpretation. Findings were reported accurately, acknowledging the limitations and potential sources of error. The contributions of participants were duly acknowledged and attributed.

4.4 Chapter Summary

This chapter has provided a comprehensive overview of the methodology utilised in the empirical part of the research. The research design and paradigm that guided the study are discussed in detail to offer a clear understanding of the approach adopted. Additionally, the chapter delves into the data collection methods employed, which included the use of a questionnaire, participatory observation, and focus group discussion, to obtain a rich and varied dataset.

The research design used in this study was a mixed-methods approach that integrated both quantitative and qualitative data. The paradigms used were the pragmatic and interpretative paradigms. The interpretive paradigm helped to understand how learners themselves perceive and use mobile devices to support their self-regulated learning. On the other hand, the pragmatic paradigm helped in understanding the most effective ways of using mobile devices to support self-regulated learning.

Data analysis techniques used in this study included descriptive statistics and content analysis. Descriptive statistics were used to summarise the quantitative data collected, while content analysis was used to analyse the qualitative data. This analysis helped to identify common themes, patterns, and trends across the data set.

Overall, this chapter offers an in-depth insight into the methodology used in the empirical part of the research, providing a clear understanding of the approach adopted and the techniques employed to obtain and analyse the data.

CHAPTER FIVE: QUANTITATIVE AND QUALITATIVE DATA PRESENTATION

> Self-regulated learning is critical for success in school and beyond because it enables individuals to take control of their own learning and become more effective learners. Self-regulated learners are able to set goals, plan and monitor their learning progress, and adjust their strategies when faced with challenges or obstacles. (Pintrich & De Groot, 1990, p. 5)

5.0 Introduction

The findings of the quantitative and qualitative research are presented in this chapter. The chapter presents the findings of the study by reporting the answers to all four research questions. However, discussion of the findings on research questions 1, 2 and 3 is presented in chapter 6, and research question 4 is discussed in chapter 7.

Answering these research questions was essential to achieving the study's purpose, which aimed to investigate how first-year medical students use mobile learning to develop SRL in an organ-system module integrated curriculum that incorporates both basic sciences and clinical medicine. This study investigated the following four research questions:

1. How do first-year medical students make use of mobile learning to develop SRL?
2. What are the perspectives of first-year medical students in using mobile learning to develop self-regulated learning?
3. How does mobile learning enable and/or hinder the development of self-regulated learning?
4. How can first-year medical students be supported to develop self-regulated learning through the use of mobile learning?

This study used a mixed-method approach to explore how first-year medical students use mobile learning to develop self-regulated learning in their organ-system model integrated curriculum that integrates basic sciences and clinical medicine in a developing country. The chapter starts by presenting the quantitative data and t-test that was performed on pre-MSLQ scores and post-MSLQ scores for the 58 participants who participated in the study and the 12 participants who participated in the focus group discussion (see Section 4.3.5.4). On quantitative data, there are also results on the comparison of the improvement in cognitive and metacognitive strategies, metacognitive self-regulation, and resource management strategies for the 12 participants who participated in the focus group discussion. Additionally, I present

the qualitative data, which has been presented based on the variables that are linked to each of the four research questions.

5.1 Quantitative Data Presentation

This section presents findings on the biographical information about the study population. It also presents the findings on T-test analysis conducted on the Pre-MSQL and Post-MSQL Scores for the 58 participants who took part in the study. Under this finding on a comparison of MSLQ pre/post-test results focusing on cognitive and metacognitive strategies, examination of metacognitive self-regulation, and assessment of improvement in resource management strategies for the 58 participants are presented.

5.1.1 Biographical information about the study population

As previously mentioned in Chapter 4 (see Section 4.3.4), the MSLQ was administered to a group of first-year medical students (n= 118) who registered for Bachelor of Medicine and Bachelor of Surgery (MBBS) at the chosen university in Malawi in the 2021/2022 academic year. Pre-MSLQ and Post-MSLQ scores were used to compare the overall improvement in SRL for the participants who participated in the study. Although 118 students registered for their first year of study at the selected university in the 2022/20223 academic year, only 71(60.2%) expressed interest in participating in the study by signing the consent form. Out of 71 participants who expressed interest in the study, 67(94.45%) completed the Pre-MSLQ. An average of 59(88%) of the 67 who completed the pre-MSLQ were consistently attending the fortnightly reflective workshop. Only 58(85.6%) participants of the 67 who completed the pre-MSLQ completed the post-MSLQ tests, representing 63% of the sample (92).

Out of the 58 participants, 30(51.7%) were male and 28(48.3%) were female. Thirty-nine (39) (67.3%) participants were aged 18-20, 17(29.3%) participants were aged 21-23, and 2(3.4%) participants were aged above 24 years. 7(12.1%) were Indians, 9(15.5%) were Zimbabweans and 42(72.4%) were Malawians. Out of the 42 Malawians, (18)42.9% were from the Southern region, 16(38.1%) from the Central region, and 8(19%) from the Northern region.

5.1.2 T-test on Pre-MSQL and Post-MSQL Scores for the 58 participants who participated in the study

As presented in Chapter 4, the participants in this study were selected by inclusion/exclusion criteria. The data were analysed to determine whether there was a change in the SRL of first-year medical students following the intervention. A paired samples t-test was performed to compare the MSQL scores of the students before the intervention and the MSQL scores after the intervention.

Descriptively, the mean gain of MSLQ score of the students in post-MSLQ is (121.4- 109.8) = 11.6. It was determined that there was a significant difference in MSQL scores between the pre-MSQL means to score and post-MSLQ mean score P(T<=t) =0.00, which is less than the significance level, alpha, of 0.05. By comparing the mean gain of the MSLQ score of the students' pre-MSLQ scores and post-MSLQ scores, the overall results of the t-test indicated that the intervention significantly helped the students improve their SRL. This suggests that the intervention had a positive influence manifested by the significant improvement in post-MSLQ scores, as shown by the difference in pre-MSLQ and post-MSLQ. The category of each strategy's changes shown on Table 5.1, which provides a pre-and post-MSLQ test comparison of cognitive and metacognitive strategies, metacognitive self-regulation, and improvement in resource management strategies for 58 participants.

5.1.3 MSLQ pre/post-test comparison on learning strategies

As presented in Table 5.1 descriptively, the mean gain of MSLQ score of the students in post-MSLQ for cognitive and metacognitive strategies is 3.1. It was determined that there was a significant difference in MSQL scores between the Pre-MSQL means to score and post-MSLQ mean score P(T<=t) =0.02, which is less than the significance level, alpha of 0.05. For metacognitive self-regulation, the mean gain is 3.2, and there was a significant difference in MSQL scores between the pre-MSQL means to score and post-MSLQ mean score P(T<=t) =0.00 < 0.05. The same is the case for resource management strategies whose mean gain is 3.3, and there was a significant difference in MSQL scores between the pre-MSQL means to score and post-MSLQ mean score P(T<=t) =0.00< 0.05. As shown by the t-test results in Table 5.1 below, the was a improvement at a significant level in students' SRL(P(T<=t) =0.00) as already stated in Section 5.1.3 above.

Table 5.1: MSLQ pre/post-test comparison on cognitive and metacognitive strategies; Metacognitive self-regulation; and Improvement in resource management strategies for 58 participants.

Learning Strategy	Means			Standard Deviation		T-test results
	Pre-MSQL	Post-MSQL	Mean gain of MSLQ score	Pre-MSQL	Post-MSQL	
Cognitive and metacognitive strategies	2.7	5.8	3.1	1.8	**1.2**	P(T<=t) =0.02
Metacognitive self-regulation	3.0	6.2	3.2	1.1	**0.9**	P(T<=t) =0.00
Resource management strategies	2.8	6.1	3.3	1.8	**1.0**	(P(T<=t) =0.04
Overall SRL improvement	**2.8**	**6.0**	**3.2**	**1.6**	**1.0**	P(T<=t) =0.00

5.2 Pre-MSQL and Post-MSQL Scores for the 12 participants who participated in the focus group discussion

This section presents the findings on the mean and standard deviation of pre-MSLQ (Motivated Strategies for Learning Questionnaire) scores and post-MSLQ scores, as well as the mean gain for each subscale related to Cognitive and Metacognitive Strategies, Resource Management Strategies, and Metacognitive Self-Regulation. Additionally, it also present a comparison of the MSLQ scores before and after the intervention for Cognitive and Metacognitive Strategies, Cognitive Self-Regulation, and Improvement in Resource Management Strategies for the 12 participants who took part in the focus group discussion.

5.2.1 Pre-MSQL and Post-MSQL mean, standard deviation, mean gain for MSLQ score for Cognitive and Metacognitive Strategies

Table 5.2 presents the pre-MSQL and post-MSQL mean, standard deviation, and mean gain for MSLQ score for Cognitive and Metacognitive Strategies (rehearsal, elaboration, organisation and critical Thinking). In all the learning strategies, there is a positive again in

the mean MSLQ mean, with a minimum mean gain of 0.2 and a maximum gain of 3.4 (see Table 5.2).

Table 5.2: Pre-MSQL and Post-MSQL mean, standard deviation, and mean gain for MSLQ for Cognitive and Metacognitive Strategies

Learning Strategy	Means			Standard Deviation		T-test results
	Pre-MSQL	Post-MSQL	Mean gain of MSLQ score	Pre-MSQL	Post-MSQL	
Rehearsal	2.4	5.8	3.4	1.6	**1.3**	P(T<=t) =0.00
Elaboration	3.1	6.4	3.3	1.9	**0.9**	P(T<=t) =0.03
Organisation	2.8	6.1	3.3	2.2	**0.8**	P(T<=t) =0.00
Critical Thinking	2.4	2.6	0.2	1.5	**1.4**	(P(T<=t) =0.56
Pre-MSQL and Post MSQL mean and standard for Cognitive and Metacognitive Strategies	**2.7**	**5.2**	**2.5**	**1.8**	**1.1**	P(T<=t) =0.00

As shown in Table 5.2, descriptively, the mean gain of MSLQ score of the students in post-MSLQ for rehearsal is 3.4. It was determined that there was a significant difference in MSQL scores between the pre-MSQL means to score and post-MSLQ mean score P(T<=t) =0.00, which is less than the significance level, alpha, of 0.05. For elaboration, the mean gain is 3.3, and there was a significant difference in MSQL scores between the pre-MSQL means to score and post-MSLQ mean score P(T<=t) =0.03 < 0.05. The same is the case for organisations - the mean gain is 3.3, and there was a significant difference in MSQL scores between the pre-MSQL means to score and post-MSLQ mean score P(T<=t) =0.00< 0.05.

By comparing the mean gain of MSLQ score of the students' pre-MSLQ scores and post-MSLQ scores, the results of the t-test for rehearsal, elaboration and organisation indicated that the intervention significantly helped the students improve their learning strategies on these three SRL strategies. This means the intervention had a positive impact, as evidenced by the significant increase in post-MSLQ scores. However, the results of the change in mean for

critical thinking is 0.2, and the T-test shows that there is no significant difference in pre-MSLQ and post-MSLQ score for critical thinking (P(T<=t) =0.56, which is greater than the significance level, alpha, of 0.05. This means the intervention had no impact on critical thinking.

Although the t-test for critical thinking indicates no significant difference between the pre-MSLQ and post-MSLQ scores, when comparing the mean gain of MSLQ scores for cognitive and metacognitive learning strategies between the pre-MSLQ and post-MSLQ scores (M=2.5), the t-test results show a significant improvement in overall cognitive and metacognitive learning strategies (P(T<=t) =0.00). It was determined that the intervention significantly helped the students improve their cognitive and metacognitive learning strategies.

5.2.2 MSLQ pre/post-test Comparison on Cognitive and Metacognitive Strategies

Figure 5.2 shows that there is a increase in the average means scores for post-MSQL scores after the intervention for the following learning strategies: rehearsal, elaboration, and organisation. The highest mean increase is for elaboration, and the lowest is for critical thinking. Although critical thinking shows an increase in MSLQ mean scores, there is no difference in pre and post-MSLQ.

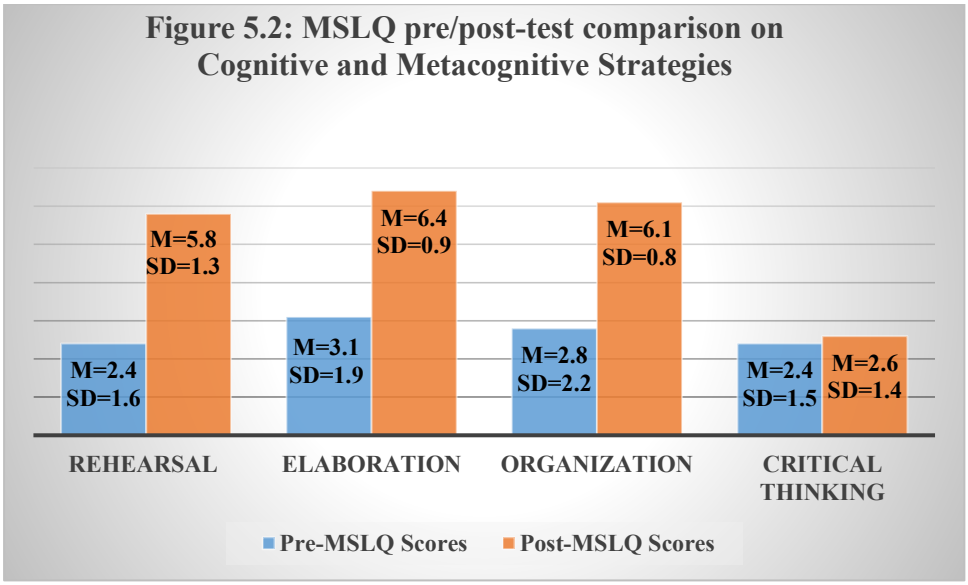

Figure 5.1 : MSLQ pre/post-test comparison on Cognitive and Metacognitive Strategies

5.2.2 Pre-MSQL and Post-MSQL mean, standard deviation, and mean gain for MSLQ score for Metacognitive Self-Regulation

Table 5.3 presents the pre-MSQL and post-MSQL mean and standard for Metacognitive Self-Regulation: rehearsal, elaboration, organisation and critical thinking.

Table 5.3: Metacognitive Self-Regulation

Learning Strategies	**Mean**			**Standard Deviation**		**T-test results**
Metacognitive Self-Regulation	**Pre-MSQL**	**Post-MSQL**	**Mean gain for MSLQ score**	**Pre-MSQL**	**Post-MSQL**	
Pre-MSQL and Post MSQL mean and standard for Metacognitive Self-Regulation	2.9	6.2	3.3	1.7	0.9	P(T<=t) =0.00

As shown in Table 5.3, descriptively, the mean gain of MSLQ score of the students in post-MSLQ for Metacognitive Self-Regulation is 3.3. It was determined that there was a significant difference in MSQL scores between the pre-MSQL means score and post-MSLQ mean score P(T<=t) =0.00, which is less than the significance level, alpha, of 0.05. By comparing the mean gain of MSLQ score of the students' pre-MSLQ scores and post-MSLQ scores, the results of the t-test Metacognitive Self-Regulation indicated that the intervention significantly helped the students improve their metacognitive self-regulation learning strategies. It could be hypothesised, therefore, that these results suggest that the intervention had a positive impact on the students' self-regulated learning, as evidenced by the significant increase in post-MSLQ scores.

5.2.3 Pre-MSQL and Post-MSQL mean, standard deviation, and mean gain for MSLQ for Resource Management Strategies

Table 5.4 presents the pre-MSQL and post-MSQL mean, standard deviation and mean gain for MSLQ for Resource Management Strategies (time and study environment, effort regulation, peer learning, and help-seeking). In all the learning strategies, there is a positive gain in the

mean MSLQ mean, with a minimum mean gain of 0.3 and a maximum gain of 3.6 (see Table 5.4).

Table 5.4: Pre-MSQL and Post-MSQL mean, standard deviation, and mean gain for MSLQ for Resource Management Strategies

Learning Strategy	Means			Standard Deviation		T-test results
	Pre-MSQL	**Post-MSQL**	**Mean gain of MSLQ score**	**Pre-MSQL**	**Post-MSQL**	
Time and Study Environment	2.5	6.1	3.6	1.6	**0.8**	P(T<=t) =0.00
Effort Regulation	2.8	3.1	0.3	1.5	**1.9**	P(T<=t) =0.06
Peer Learning	3.1	6.1	3.0	2.0	**0.9**	P(T<=t) =0.04
Seeking-Assistance	3.1	6.5	3.0	2.0	**0.6**	(P(T<=t) =0.00
Pre-MSQL and Post MSQL mean, Standard Deviation, and mean gain for Resource Management Strategies	**2.9**	**5.5**	**2.6**	**1.8**	**1.1**	P(T<=t) =0.00

As shown in Table 5.4, descriptively, the mean gain of MSLQ score of the students in post-MSLQ for time and study environment is 3.6. It was determined that there was a significant difference in MSQL scores between the pre-MSQL means to score and post-MSLQ mean score P(T<=t) =0.04, which is less than the significance level, alpha of 0.05. For peer learning, the mean gain was 3.0, and there was a significant difference in MSQL scores between the Pre-MSQL means scores and Post-MSLQ mean scores P(T<=t) =0.00 < 0.05. The same is the case for seeking assistance, with a mean gain of 3.0. There was a significant difference in MSQL scores between the pre-MSQL mean score and post-MSLQ mean score P(T<=t) =0.00< 0.05. By comparing the mean gain of MSLQ score of the students' pre-MSLQ scores and post-MSLQ scores, the results of the t-test for time and study environment, peer learning, and seeking assistance indicated that the intervention significantly helped the students improve their learning strategies on these three SRL strategies. This means that the intervention positively impacted students' SRL, as evidenced by the significant increase in post-MSLQ scores. However, the results of the change in mean for effort regulation is 0.3, and the T-test shows no significant difference in the pre-MSLQ score for effort regulation (P(T<=t) =0.06, which is

greater than the significance level, alpha, of 0.05. This means the intervention did not affect the effort regulation learning strategy.

Although the t-test for the effort regulation learning strategy shows no significant difference between pre-MSLQ and post-MSLQ scores, when comparing the mean gain of MSLQ scores for resource management learning strategies between the pre-MSLQ and post-MSLQ scores (M=2.6), the t-test results indicate a significant improvement in overall cognitive and metacognitive learning strategies (P(T<=t) =0.00). It was determined that the intervention at a level of significance helped the students improve their resource management and learning strategies.

MSLQ pre/post-test comparison on Resource Management Strategies

Figure 5.3 shows a notable increase in the average means scores for post-MSQL scores after the intervention for the following learning strategies: time and study environment, help-seeking, and peer learning. The highest mean increase is in peer learning, and the lowest is in effort regulation. Although effort regulation shows an increase in MSLQ mean scores, there is no notable difference in pre and post-MSLQ.

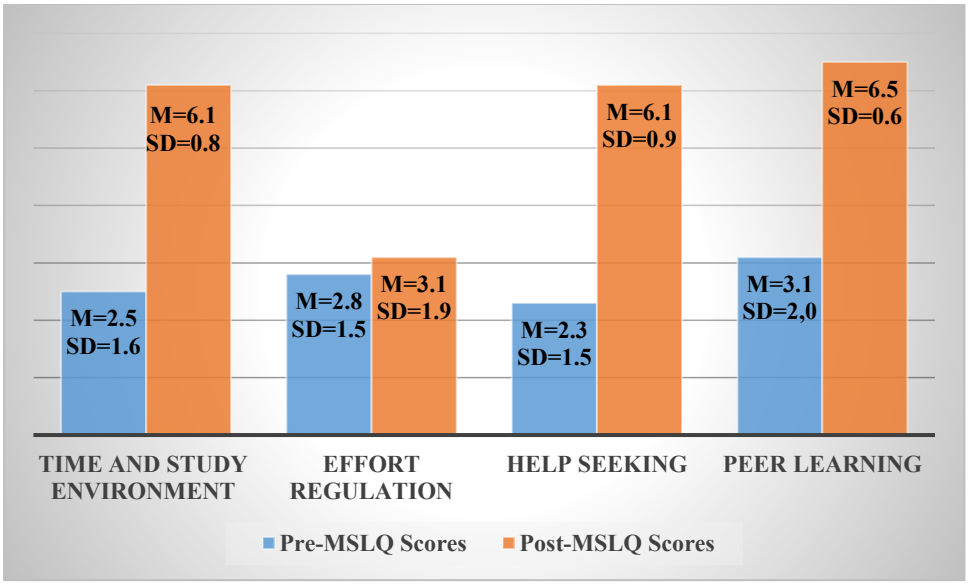

Figure 5.3: MSLQ pre/post-test comparison on Resource Management Strategies

5.2.4 MSLQ pre/post-test comparison on cognitive and metacognitive strategies; metacognitive self-regulation; and Improvement in resource management strategies

As shown in Figure 5.4, there is a notable increase in post-MSLQ mean scores for cognitive and metacognitive strategies; metacognitive self-regulation, and resource management

strategies, with the highest increase in cognitive and metacognitive strategies and the lowest increase in resource management strategies.

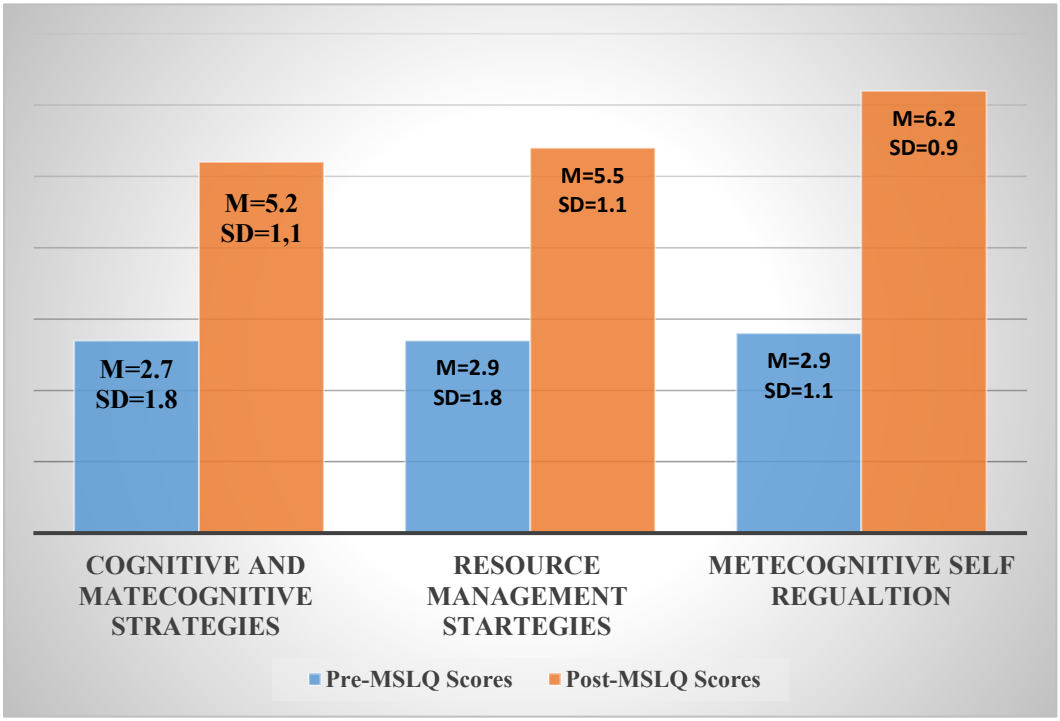

Figure 5.3: MSLQ pre/post-test comparison on cognitive and metacognitive strategies; metacognitive self-regulation; and Improvement in resource management strategies

5.3. Qualitative Data Presentation

The qualitative data was largely collected through focus group discussions. Twelve (12) participants participated in the focus group discussion and out of these 5(41.7%) were female and 7(58.3%) were male. These participants were selected based on the inclusion/exclusion criteria, as explained in Section 4.3.5.2. The researcher conducted two focus group discussions each with six participants. Participants in the focus group discussion 1 were pseudo named S1 to S2 and participants in the focus group discussion two pseudo named S7 to S12. Although large quantities of qualitative data were collected through focus group discussions, some of the data were collected through lesson observations, reflective feedback workshops, and reflective journals.

5.3.1 Qualitative Data Presentation

This section presents the findings on the perspectives of first-year medical students regarding the use of mobile learning to foster self-regulated learning. It also presents the results on the roles of a mobile device as an enabler and/or constraint to learning as well as the results on support required by first-year medical students in using mobile learning to develop self-regulated learning. Additionally, the section also includes results from focus group discussions and fortnightly reflective workshops conducted to assess the usage of mobile devices inside and outside the classroom. Furthermore, it presents results from observations that were made regarding participants' utilisation of mobile learning to manage and regulate their learning activities within the classroom.

5.3.1.1 The perspectives of the first-year medical students on the use of mobile learning to develop self-regulated Learning

The results from this study revealed that students perceive a mobile device as a medium for communication, a tool for collaborative learning, a tool that makes their learning easier compared to other forms of learning, a tool that helps them develop new ideas, and a tool for managing and controlling learning materials. Moreover, students consider the mobile device as a tool that helps them save time for their learning. However, some students consider mobile devices as distractors since certain applications, such as social networking, can be distracting to them while they are studying. Based on these results, generally, students positively perceive mobile devices as an effective learning tool. Table 5.5 presents a summary of the findings on students' perspectives on the use of mobile learning to develop self-regulated learning.

Table 5.5: Perspectives of the students on using mobile learning to develop self-regulated learning

No	Key findings	Extract from the interview supporting the findings
1	Students regard the mobile device as a medium for communication	***S3****: Mobile device is a major communication agent, in our class, all communications are done on the class WhatsApp group, Handouts are shared on the WhatsApp group*
		S6*: I communicate with my friends and ask for help with different academic issues such as asking them questions, lending me a handout, books etc. In addition, it has broadened the way we interact.*
2	Students consider the mobile device as a tool for collaborative learning	***S5:*** *We use the Class WhatsApp for a lot of educational conversations. We also have WhatsApp discussion groups where we discuss many educational things that could not have been possible if we only relied on meeting physically to discuss such things. In so doing mobile learning help our learning in ways that physical interaction could have not made possible.*
3	Students regard mobile learning as a tool that makes their learning easier compared to other forms of learning	***S3:*** *The mobile device has made my learning easier when I compare it to my life at secondary school where I had everything in hard copy and it was difficult to always find all I want to study at one point, unlike here at the varsity I can have all the notes in my phoned or laptop and I can access them anywhere and anytime I want to do so.*
		S2*: I use my phone to download tutorials that help us learn new things. Sometimes you find abbreviations in handouts like FRS and I do not know what it means then I google it and get the full meaning, thereby learning new things.*
4	Students consider the mobile device as a tool that helps them develop new Ideas	***S11****. When you are searching for some term/concept you missed in class, you get some related concepts that the teacher did not mention in class but it very relevant to the concept you wanted to learn about.*
		S4*: If I want to ask something from some professor outside Malawi I can easily reach him via email as most of the people who put their content on YouTube include their emails. This is not that very possible with hard-copy books.*
5	Students consider mobile devices as a tool for managing and controlling learning materials e.g. a storage device for their learning materials, and a tool to manage their handouts and class notes.	***S3****: I create folders for a different handout for specific content e.g. I create folders for biochemistry, anatomy, Physiology etc. and also create a folder for a semester i.e. First half of semester 1, and the second half of semester 2. I also use to organize the handouts I will rename handouts e.g. for anatomy I will rename the first handout anatomy 1, the second handout anatomy 2, etc.*
6	Using a mobile device to study written text/notes is better than using YouTube because of the destruction	***S4****: or you might notice that I have been emphasizing notes most as opposed to YouTube videos. I do not like YouTube videos because when I search for something educational it comes with some suggested non-educational videos which*

	associated with YouTube or videos	*purely entertaining and I spend most of my time washing these videos, so they distract me. Through this study, I have learned how to manage the web browser*
7	Students consider the mobile device as a tool that helps them save time for their learning	***S2**: My phone helps me to save time for my studies, hard copy book takes longer for someone to learn some concepts since books are usually not summarized there are detailed, but online tutorials or electronic handouts are usually summarized and straight to point so there help you save time and helped someone learn faster and effectively.*
8	Students consider the mobile device a distractor because some applications such as social networking are distractive to them when they're studying	***S11**: Before I joint this study, for me YouTube and WhatsApp were distractors but now there are not. For WhatsApp, if I want to use my phone for searching supplementary material online, I disable WhatsApp because I was always distracted by messages from WhatsApp. For YouTube, through this study, I have trained myself to focus, when I am on YouTube so I just concentrate on the things I want to listen to/watch no more trying suggested videos that are not part of my need at the time I am on YouTube.*
		S5: I want to support what my colleague has just said, for me, the major problem is WhatsApp I easily get distracted with WhatsApp, so if I want to concentrate when studying I disable my WhatsApp

5.3.3.2 Mobile device as an enabler and/or constraint to learning

Based on the study data presented in Table 5.6, participants' responses were analysed regarding their perspectives on mobile devices as distractors or enablers of learning. Some participants pointed out the positive aspects, such as using mobile devices to access diverse online learning resources that complement their studies uniquely through this medium. Additionally, students leveraged various mobile applications like WhatsApp to establish discussion groups, facilitating conversations about study materials and questions. Other uses were observed in students employing mobile devices to condense and synthesise multiple handouts into easily digestible summaries. Furthermore, participants utilised mobile devices to explore a broader range of topics aligned with their interests, utilising online resources for questions and answers Table 5.6 presents a summary of the findings on whether a mobile device is an enabler and/or constraint to learning.

Table 5.6: Mobile device as an enabler or distractor to learning

No.	Key findings	Extract for the interview supporting the findings
1.	Mobile learning is an enabler for learning through mobile devices students access different learning resources from the internet to complement learning in ways that are only possible through the mobile device.	***S7:*** *If I fail to understand something in class, I use my phone to download a tutorial or videos to listen to in my free time. These tutorials help me to understand things I fail to understand in class and this happens more often to me. In this case, my phone is helping me learn in a way that was not possible otherwise, in fact, if it was not for my phone that has access to the internet maybe I could have been weeded by now*
2	Mobile learning is an enabler for learning through the use of mobile devices students use different mobile applications such as WhatsApp to create discussion groups where they discuss questions and other materials related to their study	***S9****: We use the Class WhatsApp for a lot of educational conversations. We also have WhatsApp discussion groups where we discuss many educational things that could not have been possible if we were to only rely on meeting physically to discuss such things. In so doing mobile learning help our learning in ways that physical interaction could have not made possible.*
		S5*; The mobile device has made my learning easier when I compare my life at secondary school where I had everything in hard copy and it was difficult to always find all I want to study at one point, unlike here at the varsity I can have all the notes in my phoned or laptop and I can access them anywhere and anytime I want to do so.*
3	Mobile learning is an enabler for learning through the use of mobile devices students can compress or synthesise different handouts into one summarised easily to ready handout	***S5:*** *In terms of revisions, the mobile devices help me compress notes. For example, I may have 5 handouts each with 5 pages for a particular topic. Since they give us electronic hands out, I easily summarise these hands out using my laptop into six pages by taking notes of the key concepts. This helps me learn more as I am summering the notes and reduces my time of study on such topics and this gives me time to study topics more often.*
4	Mobile learning is an enabler for learning through the use of mobile devices students can search for	***S12****: The mobile device helps us in revision by helping us to search for questions and answer on the internet, of course, some books have some question and*

	questions and answers covering the broader area of their interest as opposed to doing the same using a hard copy book.	*answers but in most cases are not diverse or not many on a particular topic as we can find online. Some books do not even have model answers some do have answers to odd or even number questions only. This makes it difficult for me to use the revision as opposed to online questions that provide answers.*
5	Mobile learning can enable self-regulated learning by providing students with access to resources and tools that they can use to monitor their learning progress and adjust as needed.	***S10:*** *I use the flashcard app on my phone to help me organize and recall information more effectively*
		S7*: I use concept mapping apps, and organize some concepts when reading*
6	Mobile learning can create distractions and interruptions that can disrupt learners' focus and attention	***S6****: For me when a teacher asked us a question in class I like googling it, but most of the time when I switched on my data on my phone then I find that some WhatsApp messages from my friend start popping up then instead of concentrating on what I want to do I start reading the messages.*

5.3.3.3 Support first-year students need to develop self-regulated learning through the use of mobile learning

The results in Table 5.7 reveal that students need different types of support for developing self-regulated learning skills with mobile learning. One aspect of support is providing guidance on effective mobile applications that can aid in self-regulated learning. Collaborative learning is another crucial form of support, allowing students to share experiences, encourage each other, and learn from one another's experiences with mobile learning and self-regulation.

Additionally, students require basic technological skill training, including internet information searching and the effective use of proven mobile applications. These various forms of support contribute to the development of self-regulated learning skills in students through using mobile learning.

Table 5.7: Presents a summary of the finding on support first-year students need to develop self-regulated learning through the use of mobile learning.

No.	Key findings	Extract for the interview supporting the findings
1	Students need collaborative learning for them to appropriately use the mobile device as a tool to support SRL skills development. Through collaborative learning, students support each other by sharing experiences, encouraging one another, and learning from one another's experiences through the use of mobile learning to develop SRL.	***S7:*** *For us to properly use mobile devices to manage and control our learning we need to work with other students to share experiences and encourage each other as we have been doing in this study. Most of us found this helpful as we learned a lot from each other's experiences.*
2	Students need to be guided on which mobile application can be effective in helping them appropriately self-regulate their learning considering that several available mobile applications can be useful but some are time-consuming and complex to use.	***S3****: Given that there are numerous applications available, some of which can be helpful to us but are time-consuming and complex to use which may end up consuming our time for studying instead of assisting us. We need guidance on how we can use mobile apps to manage and control our learning. To be very honest, the support offered during the fortnight reflective workshops by our friends who were proficient in using mobile devices or specific applications was very beneficial. I was able to focus on a few well-known effective applications instead of wasting time trying out several applications.*
3	For students to effectively use the mobile device as a learning tool need some equip students with basic technological skill training such as searching for information on the internet and how use some mobile applications that have been proven to be effective	***S5****: One major need for us students is the need for supplementary learning resources to complement our class ……. for me my colleague I was working with this in the study helped me to learn some skills on how to quickly find information on the internet such as the use of '+', "when typing the keyword for search.*
		S5: *We requires help on how to use some application we can use to control and manage our learning. This could be done by teachers or our fellow students if they know how to use them as my friends pointed out that in this study we were learning from our fellow students how to use some mobile applications*

5.3.3.4 Use of mobile devices inside and outside the classroom

Table 5.8 presents the results from the focus group discussions, reflective journals and fortnightly reflective workshops on the use of mobile devices inside and outside the classroom. The responses from the participants show that there is low usage of mobile learning inside the classroom, and students seem to mostly use mobile devices outside class. During class, for instance, students primarily use laptops to take notes, and sometimes use smartphones to search for information on the questions posed by lecturers. Outside of class, students use mobile devices to help manage their learning, such as by using applications to organise their classes, assignments, and tests. They also revisit what was covered in class during their free time, manage study time by following a study timetable, access learning resources to store information in long-term memory and manage their learning by using an application to schedule their study sessions. Additionally, students use mobile devices to learn with their peers, seek assistance from other students, and manage their notes from class using a dedicated application.

The results from the fortnightly reflective workshop, RW, RJ and FG denote reflective journal and focus group discussions at the end respectively see Table 5.8 .

Table 5.8: Result from focus group discussion and fortnight reflective workshop on use of mobile devices inside and outside the classroom

No.	Behaviour-Environment	Variable	Variable Description	Learning Strategy	Key findings	Extract for the interview supporting the Findings
1	Use outside class	Academic mobile device use	Student use of the mobile device(s) for academic purposes when in a personal leisure environment (e.g., relaxing at home/hostel); Informal learning environment	Time and Study Environment Organisation Rehearsal	Students use a mobile device to help them manage their learning by using an application to manage their classes, assignments, and tests.	***S2:*** *I used an app called Start life. Easy timetable likes for the week. So, I upload the topics on that app as a part of the tasks that have to be covered that week. In a day it indicates the topics that I have to study by the end of that day. (RW)*
						S7*: For me, through this study, I have learnt to use the My Study Life online student planner application on my Phone. This app helps me keep track of all my classes, assignments, and tests. (FG)*
					Students use the mobile device for rehearsal of what was covered in class during free time	***S5****: I know that it's not all the times that I am attentive in class, so I record the lectures ad listen to them later in my free time. In addition, know that the things that we are learning now, we are going to apply the concepts during clinical hours. So I recorded the with the intention I will be able to use them as part of my revision/reminders during my clinical years. (RW)*
					Students use concept mapping apps and organise some concepts when reading and rehearse some concept	***S7****: I use concept mapping apps, organize some concepts when reading and rehearse some concept (RW)*

					Students use mobile applications to memorise concepts	***S3:*** *I use Flashcard apps, such as Quizlet to rehearse important concepts until I am sure I understand them. (RJ)*
				Time and Study Environment	Students use the mobile device to manage their study times	***S10:*** *In terms of time management of my studies, I mostly use my phone to set reminders on my phone so that I am reminded of different times I need to study. If set an alarm at night, the sound of the alarm annoys me until I wake up otherwise I would miss that time of my study without the alarm(FG).*
						S1*: I mostly use my phone, one of the things I use the phone for is setting alarms to work me up at night to study(FG)*
						S9*: For me, I use a google calendar to manage my activities. For example, I put dates and times for scheduled group discussions and other important class activities. This helps me to receive alerts about impending events, so this helps me to always know what's coming up next (FG).*
				Elaboration Rehearsal	Students use the mobile device to store information in long-term memory by accessing learning	***S9****: As for me I use my Laptop to download YouTube videos and watch them in my free time. I watch these videos several times for me to be able to understand and keep this information for future use such as examinations (RW).*

					resources that help rehearse	
				Organisation	Students use the mobile device to manage their learning by using an application to manage their study schedules	***S10**: For me, I have learned to use the Start life app on my phone from the pair that I was working with in this study. This requires me to load the tasks that must be completed in the week, so I upload the topics on the app. It lists the subjects I need to study by the end of that day in a day (WR)*
				Peer Learning	Students use the mobile device to learn with their peers	***S6:** I mostly work with my roommate on the google drive that I mentioned, so the most beneficial part of this is everyone helps in updating the notes and we all benefit from these updates. At the time we spent time together discussing the notes we have created and checked each other's sources where we go the additional notes. In so doing we learn from each other(FG).*
				Help-Seeking	Students use a mobile device to seek assistance from other students	***S12**: I communicate with my friends and ask for help with different academic issues such as asking them questions, lend me handouts, books etc. In addition, it has broadened the way we interact (FG)*
				Organisation	Use the mobile device to manage their learning by using an application to manage their	***S4**: So, there's this thing, it's called Google Drive. It's like cloud storage, so you can store something on the Internet and access it through any device that you have. So, what I do is that when I download the handout on my phone, I'll upload it to*

					notes from the class	*Google Drive, and then on my PC, it's also signed into Google Drive. Then I can download it on my PC again or just view it online. (FG)*
						***S11**: As for me, my roommate introduces me to google drive this is very helpful as it helps us in updating the now in real time and concurrently which is not possible with just soft notes on my laptop. At the time we spent time together discussing the notes we have created and checked each other's sources where we go the additional notes. (FG)*
2	Use inside the classroom	Academic mobile device use	The student uses tech device(s) for academic purposes when in a classroom (e.g., Chemistry class); Formal learning environment.	Organisation	Use a mobile device to write notes in class	***S3**: I use my laptop to type notes for in class and I find writing notes by hand to be slow. I am used to doing this from my A level in high school. (RW)*
				Organisation	Use the mobile device to access the internet to check for concept the lecturer asks in class	***S8**: I use my phone to google the concepts that the lecturer has asked us in class (WR).*
				Organisation	Use the mobile device to keep teaching and learning materials for easy access while in class.	***S10**: I take my laptop to class and use it to access my handout each time the lecturer asks us to refer to a handout he/she gave us (RW)*

5.3.3.5 Observation of participant's usage of mobile learning to manage and control their learning inside the classroom

Table 5.9 presents the researcher's observation of participants' usage of mobile learning to manage and control their learning inside the classroom. Throughout the researcher's observations, students were seen using mobile devices inside the classroom, with laptops being the most commonly used type of mobile device. Students also moderately used mobile devices to help manage and control their learning.

Table 5.9: Results on observation of participants' usage of mobile learning to manage and control their learning inside the classroom

No	Key findings
1	In all four observations made by the researcher, students were observed using the mobile device inside the classroom.
2	On the extent of usage of mobile devices, it was observed that there was low usage
3	The commonly used type of mobile device is a Laptop
4	The following are the ways in which mobile devices helped students manage and control their learning: • Mobile devices moderately made it easier for students to accomplish tasks, such as using laptops to take notes in class. • Mobile devices moderately helped students complete tasks more quickly than without them. • Mobile devices allowed students to complete tasks that would not be feasible without them, such as finding the meaning of terms that were asked by the lecturer in class.
5	The students approximately used the mobile device 25% of the class time during the observed lessons

5.3.3.6 Constraints encountered during the use of mobile learning to develop SRL

The main challenge for mobile learning to develop SRL is the cost of internet bundles and buying the device which affects affordance and accessibility. A few students mention distractions from mobile devices as a challenge. Table 5.10 presents a summary of the findings on challenges and proposed solutions to the challenges.

Table 5.10: Challenges and some proposed solutions

No.	Key findings		Extract for the reflective journals supporting the findings
	Challenges	**Suggested Solution**	
1	Some students find YouTube as a distractor because when using a mobile device to search for something educational it comes with some suggested non-educational videos which purely entertaining and they spend most of the time watching these videos instead of watching educational videos.	Use of applications that manage the browers such as the application that manages the browser that when accessing YouTube only y shows a blank page and a search bar with no suggested videos. This also requires a lot of self-discipline.	**S4**: *For me you ……. I do not like YouTube videos because when I search for something educational it comes with some suggested non-educational videos which purely entertaining and I spend most of my time washing these videos, so they distract me. Through this study, I have learned how to manage the web browser. For example, … I have installed an application that manages my browser when I am accessing YouTube it only shows a blank page and a search bar with no suggested videos.*
			S11:*…when is not self-disciplined it is not easy to avoid distractions. For example, at the time I take my laptop to download some supplementary study material for a particular topic, and then I could go on YouTube and start watching football highlights instead of what I planned to do*.
2	Mobile learning comes with distractions when students are using it for their studies, particularly for students who are not self-disciplined	Disable applications such as WhatsApp when using a mobile device to access the internet	**S3:** *I want to support what my colleague has just said, for me, the major problem is WhatsApp I easily get distracted with WhatsApp, so if I want to concentrate when studying I disable my WhatsApp.*
3	The high cost of buying the device and buying internet data bundles makes internet access difficult for students from poor backgrounds.	Students suggested making the Wi-Fi connection available all the time in ~~the~~ teaching areas, hostels and library so that students who cannot manage to buy data bundles can benefit from the free Wi-Fi.	**S9**: *For me the main challenge is cost. The Internet has become part of our academic life and we heavily rely on it, unfortunately, data bundles are expensive so at times we fail to make use of it when we need it most and this affects our academic life.*
			S5: *To me, the main challenge is that much as we all know that the mobile device has become part of our academic life but not all can afford it, so affordability and access to the less privileged students is the big issue……..*

5.3.3.7 Summary of the key findings of the study

The quantitative findings of this study present compelling evidence supporting the effectiveness of the intervention in enhancing self-regulated learning among first-year medical students. The study employed a rigorous evaluation of the intervention's impact on students' self-regulated learning abilities, utilising a t-test statistical analysis. The results clearly indicate a substantial positive effect of the intervention on students' self-regulated learning.

The study's quantitative findings demonstrate a statistically significant improvement in various aspects of self-regulated learning among the first-year medical students who participated in the intervention. These improvements were observed in measures such as cognitive and metacognitive strategies, metacognitive self-regulation, and resource management strategies. The results emphasise the intervention's effectiveness and offer valuable insights into the specific areas of self-regulated learning that experienced the most positive impact.

In addition, the findings of this study have also revealed that mobile devices most widely utilised by first-year medical students are mobile phones and laptops. However, mobile phones emerged as the primary choice for students when it comes to using mobile devices to support their learning outside the classroom.

Interestingly, the study observed relatively low utilisation of mobile devices within the classroom setting. On average, only 10 out of 90 students were observed using mobile devices for tasks such as note-taking and accessing handouts. However, it is crucial to note that this statistic may not accurately represent the overall mobile device usage within other classes in medical school.

Qualitatively, the study also investigated students' perception of mobile learning, which was found to be largely positive, as demonstrated in Table 5.5. Students acknowledged mobile learning as an effective way of managing and supporting their learning. They recognised the value of mobile devices in managing their educational materials, conducting internet searches for information, organising their time and study schedules, and seeking assistance from peers, among other applications, as highlighted in Table 5.6.

However, alongside the benefits, the research also identified some challenges associated with mobile learning, which were detailed in Table 5.8. These challenges encompassed issues such as limited access to reliable internet connectivity, distractions caused by non-academic

applications on mobile devices, and difficulties in adapting to new learning methods. These challenges should be taken into consideration to ensure the successful implementation and utilisation of mobile learning to develop SRL.

The qualitative aspects of the study are summarised in Tables 5.5 to 5.10, presenting a comprehensive overview of the findings. These tables provide valuable insights into the students' perceptions, preferences, and experiences with mobile learning. From the positive acceptance of mobile devices for educational purposes to the specific challenges faced, these qualitative findings supplement the quantitative data, providing a more holistic understanding of the study findings.

Overall, the study establishes that mobile phones and laptops are the most commonly used devices by students, with mobile phones being the preferred choice outside the classroom. Mobile learning is perceived as an effective approach to help them manage their learning, as indicated by students' reliance on mobile devices for various learning-related tasks. However, challenges such as limited internet access and potential distractions must be addressed to optimise the benefits of mobile learning. The qualitative findings further enrich the study by shedding light on the students' perspectives and experiences on the use of mobile learning to support self-regulated learning.

CHAPTER SIX: DISCUSSION OF FINDINGS

> Self-regulated learning skills are particularly important for university students who are often required to independently manage their own learning and meet challenging academic demands. Therefore, carefully planned and organised interventions aimed at improving self-regulated learning can have a positive impact on students' academic achievement. (Kistner et al., 2015, p. 11)

6.0 Introduction

The discussion in this chapter is based on individual research questions. Section 6.1 discusses the findings related to research question 1, on how first-year medical students utilise mobile learning to develop self-regulated learning. This section starts by presenting the results of the quantitative data on participants' self-regulated learning, followed by an in-depth discussion on how first-year medical students employed mobile learning to foster self-regulated learning. This approach was chosen due to the implementation of a mixed-methods explanatory sequential study design, where data sets were collected and analysed sequentially. The primary focus of the discussion is to assess the impact of the intervention on the participants' self-regulated learning skills. Moreover, the collection of quantitative data aimed to quantitatively measure the participants' self reported improvement in self-regulated learning.

Subsequently, Section 6.2 delves into the findings pertaining to research question 2, which examines the perspectives of first-year medical students regarding the utilisation of mobile learning for self-regulated learning. This section discusses the students' perceptions of mobile devices as a means of communication, a tool for collaborative learning, and an aid that facilitates the learning process. Additionally, it discusses the students' perception of mobile learning as a medium for constructing new knowledge, a tool for accessing and managing learning materials, and a resource that enhances effective learning.

Finally, Section 6.3 discusses research question 3 on how mobile learning enables and/or hinders the development of self-regulated learning.

6.1 First-year medical students use of mobile learning to develop self-regulated learning

In many facets of academic life, self-regulation is a crucial skill. Through their academic endeavours, students need to be able to manage and control their learning. Mobile learning can assist students in developing self-regulated learning (Felisoni & Godoi, 2018; Nussbaumert et al., 2014; Yun et al., 2017). However, a crucial question is how students utilise mobile learning to develop self-regulated learning. Hence, this study aimed to understand how first-year medical students make use of mobile learning to develop self-regulated learning.

6.1.1 Discussion of the quantitative data on participants' self-regulated learning

Self-regulated learning (SRL) is a crucial factor in academic success. It refers to the process in which individuals take charge of their learning by setting goals, monitoring their progress, and adapting their approach to attain their objectives (Zimmerman, 2000). Understanding the effective strategies that individuals employ to regulate their learning can assist educators and learners in identifying effective methods to promote SRL. This study used the Motivated Strategies for Learning Questionnaire (MSLQ) to collect quantitative data on participants' self-regulated learning. To evaluate the change in SRL during the intervention period, we conducted a paired-sample t-test on the pre- and post-MSLQ scores. The MSLQ is a widely used tool to measure SRL, and it assesses different motivational and learning strategies that students utilise to regulate their learning. The mean and standard deviations for each section of the MSLQ are presented in Chapter 5 in Tables 5.1, 5.2, 5.3, and 5.4.

6.1.1.1 Improvement in cognitive and metacognitive learning strategies

As presented in Table 5.2, the t-test for critical thinking shows no significant difference in pre-MSLQ and post-MSLQ scores. The absence of significant changes in critical thinking learning strategies can be attributed to the results presented in Table 5.8 in Chapter 5, which indicate that participants in this study did not employ any prominent mobile learning strategies to promote the development of critical thinking skills.

Nevertheless, the intervention had a significant impact on rehearsal, elaboration, and organisation, which is why a comparison of the student's overall pre-MSLQ mean and the post-MSLQ mean of cognitive and metacognitive learning strategies shows an overall mean gain of 2.5.

This study examined the effect of mobile learning on students' cognitive and metacognitive learning strategies, specifically focusing on critical thinking, rehearsal, elaboration, and organisation. The results, presented in Table 5.2, revealed no significant difference between pre-MSLQ and post-MSLQ scores for critical thinking learning strategies. This finding implies that the mobile learning intervention did not significantly affect this specific aspect of learning. A possible explanation for this outcome could be that the participants did not employ any mobile learning strategies to foster critical thinking, as evidenced in Table 5.8. These results align with previous studies that demonstrate the efficacy of mobile learning interventions in enhancing students' learning strategies (Chen et al., 2018; Lai et al., 2017). These studies also indicate that for mobile learning to be effective in improving a learning strategy, it must be employed effectively.

Therefore, the researcher argues that the participants did not use the mobile learning strategies effectively for critical thinking, resulting in insignificant improvement observed in this area. However, the intervention did have a significant impact on rehearsal, elaboration, and organisation learning strategies.

6.1.1.2 Improvement in metacognitive Self-Regulation learning strategy

This study examined the impact of mobile learning on students' metacognitive self-regulation strategies. The findings suggest that the use of mobile learning positively impacts students' improvement of their metacognitive self-regulation learning strategies. This highlights the potential of mobile learning as an effective learning tool for enhancing students' SRL. These findings are consistent with a similar study by Johnson et al. (2020), which investigated the impact of mobile learning on students' metacognitive self-regulation strategies. The study also used the MSLQ to assess the effectiveness of mobile learning on students' learning outcomes and found a significant improvement in the overall mean gain of metacognitive self-regulation strategies.

These study's findings suggest that mobile learning positively impacts students' improvement in their metacognitive self-regulation strategies. Mobile learning provides learners with more flexibility and accessibility to learning materials, which can enhance their metacognitive self-regulation skills. Furthermore, the study's results highlight the potential of mobile learning as an effective learning tool for enhancing students' SRL.

6.1.1.3 Improvement in Resource Management Learning Strategies

According to the results presented in Table 5.4, the change in mean for effort regulation is 0.3, and the T-test shows that there is no significant difference in the pre-MSLQ Score for effort regulation. These results suggest that the intervention did not affect the effort regulation learning strategy. The lack of significant changes in the effort regulation learning strategies can be further explained by the findings in Table 5.8, which indicate that participants did not use any mobile learning strategy to foster the development of the effort regulation learning strategy. However, the intervention did have a significant impact on time and study environment, peer learning, and help-seeking.

6.1.1.4 Overall SRL improvement in the participants

The t-test analysis showed that the overall participants' SRL had a significantly higher mean score in the post-MSLQ mean score than in the pre-test MSLQ mean score ($t=6.27$, $p<0.05$). This indicates a significant improvement in their SRL. The finding is consistent with previous research that has shown the effectiveness of interventions in improving students' SRL (Zimmerman & Schunk, 2001). In addition, a study by Lee et al. (2018) explored the self-regulated learning (SRL) strategies used by university students in their academic work. The findings of the study revealed that students who use their smartphones as a tool for academic work tend to engage in more effective SRL strategies. Specifically, students who used their smartphones for academic purposes reported higher levels of engagement in the following goal setting, task strategies, self-evaluation, and self-reflection.

The use of the Motivated Strategies for Learning Questionnaire (MSLQ) and the quantitative analysis employed in this study yielded valuable insights into the effectiveness of the intervention in enhancing students' self-regulated learning (SRL).

In this study, I conducted a quantitative analysis to evaluate the improvement in each category of learning strategies, and the results indicated an overall increase in mean MSLQ scores for students following the intervention. These findings highlight the significance of employing appropriate instruments, such as the MSLQ, to quantitatively measure SRL and assess the effectiveness of interventions designed to enhance students' self-regulated learning abilities.

6.1.2 Result from the qualitative data on participants' Self-Regulated Learning

Section 6.1 has provided quantitative results that demonstrate the intervention's significant positive impact on participants' self-regulated learning (SRL). However, while the quantitative

data confirms the effectiveness of mobile learning, it fails to elucidate the specific mechanisms through which it influenced SRL. It indicates that mobile device use led to an improvement in student SRL.

Moreover, the quantitative results do not address other important questions that need to be answered to gain a deeper understanding of the intervention's impact. To answer research question 1, the study also incorporated qualitative results, which were presented in Chapter 5, Section 5.3.

In Section 6.1.1 above, I have discussed the qualitative results and provided a more nuanced understanding of the intervention's impact on SRL. By combining quantitative and qualitative data, the study provides a comprehensive picture of the intervention's effectiveness and the factors contributing to its success.

6.1.2.1 Results from the introductory workshop to the study

An introductory workshop for the study was held in the first week of the study. During this workshop, the researcher and participants discussed the SRL learning strategies. The discussions from this workshop revealed that first-year medical students were unaware of learning strategies used for self-regulated learning. After the participants learned about SRL strategies, it became evident that most students' mobile device usage was not well-structured or organised to help them gain or improve SRL skills as demonstrated by this assertion made by S11.

> *For me, I just use my phone here and there nothing serious because most of the time when I want to search for something I get distracted by WhatsApp and Facebook, as a result, I avoid using my phone to search for information from the internet most of the time. I end up just using the handout given by the lecturer and some books in the library (S11).*

The analysis of the statement shows that S11 was struggling with maintaining self-regulation while using their phone to search for information. It seems the student considers his phone as a distractor. This is consistent with research on self-regulated learning (SRL), which emphasises the importance of individuals' abilities to regulate their own learning behaviours and strategies (Zimmerman, 2008). In particular, the finding has highlighted the role of metacognitive factors in SRL, such as goal setting, planning, self-monitoring, and self-

reflection (Winne & Hadwin, 2013). These factors can help learners stay focused and engaged in their learning tasks, and avoid distractions and other barriers to learning.

However, as the passage suggests, external factors such as the availability of social media and other distractions can also influence learners' abilities to regulate their own learning behaviours. Therefore, students need to develop strategies and techniques to help them overcome these challenges and stay on track with their learning goals.

Where student 9 indicated they used the mobile device mostly for non-academic's life as captioned here "*I causally use my phone for academic work, but I mostly use it to link up with friends on social networks*".

This behaviour demonstrates that, while some students did not acquire the ability to utilise their mobile device to manage their learning, they did utilise it for socialising with peers, which is a crucial component in building SRL. This study considered the use of the mobile device to link *up with friends on social networks* as a positive for the intervention in this study since it served as a foundation for the intervention activities.

According to a study by Azevedo et al (2010), the use of mobile technology for learning purposes can support SRL, but it can also distract students from their academic tasks. In this regard, Azevedo et al. (2010) suggested that students need to master how to use mobile devices to regulate their learning to avoid potential distractions and maintain focus on their learning goals. Similarly, a study by Nistor et al. (2015) found that students who engaged in social networking activities during their academic tasks had lower academic achievement compared to those who did not engage in such activities. Nistor et al. (2015) suggest that the use of technology for social purposes during academic tasks may interfere with students' ability to regulate their learning and achieve their academic goals.

Excessive use of technology for non-academic purposes, such as social networking, can have negative effects on academic performance and hinder SRL (Hadwin et al., 2017; Kirschner & Karpinski, 2010; Yun et al., 2017). Therefore, while mobile technology can be a useful tool for student to self-regulate their learning, it is important for students to be mindful of their use and to regulate it appropriately to support their learning

The students in the study revealed that a lack of organisation and self-control hindered their use of mobile devices for learning. This finding aligns with the assertion made by Yun et al.

(2017) that the overall development of self-regulated learning (SRL) can be negatively impacted when mobile device use is not appropriately organised or managed. Previous research has also shown that any SRL initiative must be carefully thought out to effectively help students improve on it (Hadwin et al., 2017; Hanif, 2020; Yun et al., 2017).

While using a mobile device to develop SRL does not necessarily require prior knowledge of SRL strategies, it is essential to have a well-structured and organised SRL development program to effectively support students' SRL (Hadwin et al., 2017). Overall, this suggests that while mobile devices can be useful tools for supporting SRL, it is critical to have a well-planned and structured approach to ensure that students benefit from this technology. The studies by Yun et al. (2017), Hadwin et al. (2017), and Hanif (2020) provide valuable insights into how to design effective SRL programs that incorporate the use of mobile devices.

6.1.2.2 The need for the student to improve their weak learning strategies

The quantitative results of this study have demonstrated that the intervention improved the participants' self-regulated learning (SRL) skills at a level of significance (Section 6.2.1). To understand how participants improved their learning strategies while using mobile devices, it is crucial to first discuss the factors that motivated them to think about improving their learning strategies. The study began by identifying the students' weak strategies, which were assessed using the pre-Motivation Strategy Learning Questionnaire (MSLQ) (Section 4.3.4.6). According to the results, the students' agency to improve their learning strategies was triggered by the identification of their weak learning strategies and the knowledge of SRL skills acquired from the introductory workshop. This finding is consistent with the literature, which suggests that the urgency of learning needs can positively affect students' behavioural intention to use mobile learning (Alasmari & Zhang, 2019).

Two study participants (S1 and S2) made statements in the second fortnight's reflective workshop, indicating that their urgency to improve their learning strategies influenced their use of mobile learning. S1 stated, " *After I realised I had some weak learning strategies, I had to do something about them as quickly as possible. That's why I started using the mobile learning device to strengthen them''*. Similarly, S2 reported, "*The fact that I knew I had weak learning strategies motivated me to use the mobile learning strategies to improve them''*.

These findings are consistent with previous studies, which indicate that students' motivation to engage in SRL can be influenced by their perceived learning needs (Kramarski & Michalsky, 2010; Pintrich & Schunk, 2002). The identification of weak learning strategies can create a sense of urgency that motivates students to engage in SRL, including the use of mobile learning to improve their learning strategies.

The analysis of the statements made by S1 and S2 above suggests that the participants in the study realised they had weak learning strategies that needed improvement, and this realisation triggered the urgency of their learning needs. Alasmari and Zhang (2019) proposed the Extended Unified Theory of Acceptance and Use of Technology (UTAUT), which highlights the importance of learners' perceived usefulness and ease of use of technology in determining their acceptance and adoption of technology. According to extended UTAUT, the learners' urgency of learning needs is a significant factor in determining their acceptance and adoption of mobile learning technology to improve their learning strategies (Alasmari & Zhang, 2019).

The fact that most study participants became more willing to participate in the study after learning about their pre-MSLQ scores further supports the argument that the learners' interest in using a mobile device to improve their learning strategies was prompted by their urgency of learning needs. This finding is consistent with the study by Bouhnik and Marcus (2006), who found that learners are more likely to use mobile learning technologies to address their learning needs when they perceive a pressing need to do so. Overall, the finding highlights the importance of learners' urgency of learning needs in determining their acceptance and adoption of mobile learning strategy to improve their learning strategies and the potential of mobile learning to develop SRL skills.

6.1.2.3 Participants use a mobile device to develop SRL

This study focused on the use of mobile devices to develop self-regulated learning (SRL), guided by Zimmerman's conceptual framework for studying self-regulation (Zimmerman, 2000). According to Zimmerman, self-regulated learning involves learners making choices about their learning and taking control of the learning process (Schunk, 2012). The study also adopted the Extended Unified Theory of Acceptance and Use of Technology (UTAUT) (Alasmari & Zhang, 2019) and the sociocultural theory (SCT) (Vygotsky, 1978) to analyse the data.

Vygotsky's sociocultural theory emphasises the importance of examining the gradual changes in individuals that allow them to exert control over their ideas, feelings, and actions (Vygotsky, 1978). In line with this perspective, the study used reflective journals and fortnightly reflective feedback workshops to examine the participants' development of SRL skills over the intervention period. The participants' weak learning strategies were improved through individual reflections in reflective journals and reflections during the fortnightly reflective workshop. These reflections helped the students improve their weak learning strategies and gradually improve their SRL abilities.

The study's results demonstrated the importance of considering the why, how, when, what, where, and with whom questions in SRL regulation (Zimmerman, 2000). By using mobile devices to manage and control their learning, the students were able to make choices about their learning and take control of their learning process. The use of reflective journals and fortnightly reflective workshop feedback workshops helped the students improve their weak learning strategies and gradually develop their SRL abilities.

Overall, this study highlights the importance of considering multiple theoretical perspectives, such as Zimmerman's conceptual framework, UTAUT, and SCT, to understand SRL and the role of mobile devices in promoting SRL. The findings suggest that self-regulated learning can be improved through the use of reflective practices and feedback, providing insights for educators and researchers interested in promoting SRL among students.

The participants in the study were engaged in reflections to improve their learning strategies based on feedback from their peers. Zimmerman and Moylan (2009) argue that reflections impact how learners react to their learning experiences. The reflections, which included self-evaluations through reflective journals and fortnight feedback workshops, allowed participants to assess their performance and compare themselves to others (Zimmerman, 1998b; Zimmerman and Moylan, 2009). These self-evaluations led to causal attributions, which are ideas about what led to successes or failures (Alderman, 2008; Zimmerman, 2002; Zimmerman, 2011). During the fortnight reflective feedback workshops, the participants discussed the factors that contributed to their successes or failures in adopting specific mobile learning strategies.

During the fortnightly reflective workshops, study participants were given the opportunity to focus their discussions on failures, ways to improve the failures and success stories. Through

these reflections, participants were encouraged to evaluate their performance in accomplishing different tasks using a mobile device and compare it to that of their peers. This process is a distinct form of self-judgment known as causal attribution, which refers to the ideas about what caused successes or failures (Alderman, 2008; Zimmerman, 2002; Zimmerman, 2011). These specially focused reflections helped the participants, leading to significant improvement in self-regulated learning (SRL) as demonstrated by the t-test results in Chapter 5. It has been established in previous studies that there is a relationship between reflection and SRL (Zimmerman & Moylan, 2009). Therefore, the researcher argues that these reflections were instrumental in improving the SRL of the study participants

Studies have shown that developing a reflective stance can help students systematically improve their SRL skills (Buzza et al., 2013; Kuiper & Pesut, 2004; White, 2013). As shown by the statement below from S4. This statement was recorded in the third fortnightly reflective workshop and s4 reflected that:

> *"I have learnt a lot about how my friends use the mobile device to manage and control their learning, each time I leave this meeting I always think about how I can use my mobile device much better like my friend is doing, I hope that one day I get there".*

Student 4's reflections on how their friends use mobile devices to manage their learning suggest that learning for the successes of others' SRL practices can be a valuable source of inspiration and learning. In addition, the students desire to improve their own SRL skills through the use of mobile devices shows the potential for mobile learning to support students' metacognitive development, which is a key component of SRL.

Furthermore, the statement also highlights the potential benefits of mobile devices in enhancing student SRL. According to a study by Anohah et al. (2021), mobile devices can support students' self-regulated learning (SRL) through various strategies, such as using learning apps, accessing online resources, and collaborating with peers. The study found that students who used mobile devices for SRL reported higher levels of motivation, engagement, and academic achievement than those who did not. The finding underscores the potential of mobile devices to enhance students' SRL skills and highlights the importance of promoting peer learning and metacognitive development in educational contexts

Moreover, Self-regulated learning (SRL) is a critical aspect of learning that requires an understanding of the role of socialisation processes and mediational means in developing self-regulation (Vygotsky, 1978). Against this background, I paired students to allow them to share their experiences during a fortnightly reflective workshop facilitated socialisation, which helped the students improve their weak learning strategies. The students' interaction with their peers and mobile devices further emphasised the significance of socialisation in SRL development. This finding further highlights the importance of socialisation in improving students' self-regulated learning skills and can inform the development of instructional strategies that promote social interaction and collaboration among students. Put differently, socialisation was one of the aspects of this study that helped students improve their weak learning strategies. The study participants interacted with their peers and mobile devices, which on the other hand also answers the question '*with whom'*. The next section, Section 6.1.3, discusses in detail how the participants used the mobile device outside the classroom.

6.1.3 Use of mobile devices outside the classroom

Self-regulated learning (SRL) is an essential skill for students to become successful learners. One aspect of SRL is the ability to control the learning environment, including the location and time of the study. A study by Venter (2011) investigated the strategies for enhancing self-regulated learning among first-year university students. The study found that most students used mobile devices outside the classroom to enhance their learning capacity (Venter, 2011). This finding is consistent with the results of Table 5.8 in the Chapter, which shows that students use their mobile devices mostly outside the classroom rather than inside the classroom for self-regulated learning purposes.

The findings from this study suggest that participants demonstrated confidence in their mobile learning strategies after the intervention, which was evidenced by their ability to explain the specific mobile learning strategies they used and why they preferred them. The successful participants in the study utilised a flexible range of mobile learning strategies and demonstrated the ability to apply these strategies effectively in different learning contexts. This finding is consistent with Boekaerts and Corno's (2005) assertion that successful learners are those who are able to use a range of learning strategies and apply them appropriately. Furthermore, the participants' use of mobile devices to manage their learning, access supplementary reading materials, and use mobile applications effectively improved various learning strategies such as rehearsal, elaboration, organisation, metacognitive self-regulation, time and study

environment, peer learning, and help-seeking. Overall, the study suggests that the use of mobile devices can facilitate the development and application of effective learning strategies inside and outside of the classroom. Subsequent Sections 6.1.3.1 to 6.1.3.7 discuss how the study participants improved different learning strategies using mobile device(s).

6.1.3.1 How first-year medical students used a mobile device on organisation learning strategies

Organisation skills are an essential aspect of academic success. According to Gottfredson & Saklofske (2009), organisation skills include the ability to manage time, set goals, prioritise tasks, plan and execute projects, and keep track of assignments and deadlines. These skills are crucial for students to succeed in their academic and personal lives.

Mobile devices offer several features and applications that can help students improve their organisational skills. For example, calendar apps allow students to manage their time effectively by scheduling their classes, appointments, and deadlines. Reminders can be set up to alert students of upcoming assignments, exams, and other important events. By using these features, students can plan and manage their time efficiently and avoid missing deadlines. Participants in this study report have used their mobile devices to improve their organisational learning strategies.

Participants report that they used mobile devices to keep teaching and learning materials for easy access while in class. A study by Milrad and Spikol (2013) found that students who used mobile devices to access educational materials reported higher levels of engagement and satisfaction with their courses than those who did not use mobile devices. Another study by Chang and Chen (2016) found that students who used mobile devices to access educational materials had higher levels of academic achievement than those who did not use mobile devices. Another way students use mobile devices to manage their learning is by using applications to manage their notes. Students used applications, such as Evernote or OneNote, to take and organise notes from class. These applications allow students to easily access and review their notes, even when they are not in class. A study by Kim et al. (2017) found that students who used note-taking applications reported higher levels of academic achievement compared to those who did not use these applications. A study by Jiang et al. (2016) revealed that students who used mobile applications to manage their notes had higher levels of retention

and recall of information than those who did not use mobile applications. Another study by Kim et al. (2015) found that students who used mobile applications to manage their notes reported higher levels of satisfaction with their courses than those who did not use mobile applications.

The participants involved in this study further reported that they used mobile devices to manage their study schedules. Applications such as My Study Life allowed students in this study to create and manage their study schedules. Participants (S7, S2, and S5) reported that they organised and managed their study plan using the StartMylife app. The participant characterised it as an application similar to a timetable that was used to schedule his weekly study topics. As part of the tasks, he was uploading topics he planned to study on a particular day for a week on that app. At the end of the day, the app summarises lists of the topics he has studied in a day and the topics he hasn't studied. This made it easier for him to decide what to study the following day based on what wasn't covered the day before. The details provided reveal exactly how and when this student used the mobile device. The description of the app functionality by the participant also explains why the student preferred to use the app. The app made it simpler for him to logically and timely organise his study topics. As a result of using this application, the student learned how to manage his time and organise himself. These applications help students to stay organised and ensure they are using their time efficiently.

A study by Alzahrani (2020) found that students who used mobile devices to manage their study schedules reported higher levels of academic achievement compared to those who did not use these applications. Agreeing with this finding, a study by Lee et al. (2014) found that students who used mobile applications to manage their study schedules had higher levels of academic achievement than those who did not. Another study by Song and Lee (2018) revealed that students who used mobile applications to manage their study schedules reported higher levels of satisfaction with their courses than those who did not use mobile applications.

The participants in the study also reported using mobile applications to manage their study schedules, with some using applications like My Study Life or StartMylife. My Study Life allowed students to create and manage their schedules, while StartMylife was characterised as a timetable-like application that helped users schedule their weekly study topics. The StartMylife app allowed students to upload their study topics for the week and summarise their daily activities, making it easier for them to determine what to study the following day. This

level of organisation and planning helps students manage their time effectively and ensures that they are using their study time efficiently. In addition, the details provided by participants in this study shed light on how and why students use mobile devices to manage their study schedules and suggest that such applications could be valuable tools for students looking to optimise their academic performance. As a result, students who use mobile devices and applications to manage their study schedules are more likely to achieve higher levels of academic success and satisfaction with their academic courses.

Participants found these apps helpful in organising their study topics and managing their time more efficiently. The use of such applications has been found to be associated with higher levels of academic achievement and satisfaction with courses, as reported in studies by Alzahrani (2020), Lee et al. (2014), and Song and Lee (2018). It is hoped that such gained SRL skills will help the first-year medical student improve their academic performance. Alzahrani's (2020) study found that students who used mobile devices to manage their study schedules reported higher levels of academic achievement. Lee et al. (2014) also found that students who used mobile applications to manage their study schedules had higher levels of academic achievement. These findings suggest that the use of mobile devices and applications can positively impact students' academic success.

Furthermore, Song and Lee (2018) found that students who used mobile applications to manage their study schedules reported higher levels of satisfaction with their courses. This could be because the use of mobile applications allows students to have greater control over their study plans and schedules, which in turn enhances their overall learning experience.

The results discussed here are further supported by the t-test findings in Section 5.2.1, which demonstrate that the intervention in this study significantly improved the participants' organisational skills. This result is consistent with that of Agranovich et al. (2019), who used time management-based technology to help students develop their ability to organise themselves for academic activities.

Finally, the use of mobile devices in education has become increasingly common, and students are using them to access learning materials, manage their notes, keep track of their schedules, and manage their classes, assignments, and tests. The findings from this study and the literature presented in this section suggest that the use of mobile devices in developing self-regulated

learning, particularly improving their learning strategies can have a positive impact on student learning outcomes, including higher levels of engagement, satisfaction, retention, recall, and academic achievement.

6.1.3.2 How first-year medical students used a mobile device to improve rehearsals learning strategy

Rehearsal learning is a technique used by students to encode and store information in their long-term memory. The use of mobile devices can be an effective way to improve rehearsal learning strategies, making it easier for students to remember information and retain it for longer periods of time.

In this study students reported using the mobile device to rehearse what was covered in class during free time. As reported by S2:

> *I know that it's not all the times that I am attentive in class, so I record the lectures and listen to them later in my free time. In addition, know that the things that we are learning now, we are going to apply the concepts during clinical hours. So I recorded the with the intention I will be able to use them as part of my revision/reminders during my clinical years*

Analysing this statement shows that S2 is using metacognitive strategies to enhance their learning process (Brown, 2014). Metacognitive strategies refer to a student's ability to monitor and control their own learning (Pintrich, 2002). In this case, the student has recognised that they may not always be attentive in class and has implemented a compensatory strategy of recording the lectures and listening to them later (Efklides, 2011). This indicates that the student is aware of their own learning needs and is taking proactive steps to address them.

In addition, the student's recognition of the importance of the concepts they are learning and their application in future clinical hours suggests a deep understanding of the relevance of their coursework to their future professional goals (Zimmerman, 2002). By recording the lectures, the students are creating a personalized learning resource that they can use to revisit the material and reinforce their understanding over time (Kuhn & Dean, 2004).

This finding also suggests that the student is actively engaged in their own learning and is taking steps to optimise their learning outcomes (Zimmerman, 2002). This is an important aspect of self-regulated learning (SRL), which emphasises the role of the student in their own

learning process, promoting self-awareness, self-reflection, and self-regulation (Zimmerman, 2002)

A study by Guo et al. (2014) found that students who recorded their lectures and listened to them later had a better understanding of the content and performed better on examinations. Recording lectures can be particularly helpful for students who have difficulty focusing during class or who need more time to process the information. Students can use their mobile devices to record lectures and then listen to them later when they have the time and attention to focus on the content. This method allows students to practice rehearsal learning at their own pace. Student 12 said that:

> *As for me, I use my Laptop to download YouTube videos and watch them in my free time. I watch these videos several times for me to be able to understand and keep this information for future use such as examinations.*

The statement from S12 shows that they use a particular strategy for learning that involves downloading YouTube videos and watching them multiple times. This suggests that the student is aware of their own learning needs and has taken the initiative to find a strategy that works for them. This strategy appears to be effective for the students as they state that they are able to understand the information better and retain it for future use, such as for examinations. This shows that the student is engaged in a metacognitive process, which involves monitoring their own learning and adapting their strategies accordingly.

This finding highlights that the student prefers visual aids, such as videos, to help them learn and understand information. By watching the videos several times, the student is likely to engage in a process of repeated exposure, which can facilitate retention and recall of information. According to Clark and Mayer (2016), multimedia learning is an effective approach to learning as it integrates both visual and verbal information to facilitate comprehension and retention. In particular, video-based learning has been shown to be effective in enhancing learning outcomes in various fields, including science, technology, engineering, and mathematics (STEM) subjects (Kay & LeSage, 2009; Kim & Gilman, 2018).

The finding that S7 in this study prefers to use videos for learning is consistent with the literature on the effectiveness of visual aids in education. S7 Said:

> *If I fail to understand something in class, I use my phone to download a tutorial or videos to listen to in my free time. These tutorials help me to understand things I fail to understand in class and this happens more often to me.*

The student's use of repeated exposure to the videos also aligns with the concept of spaced repetition, which has been shown to improve retention and recall of information (Karpicke, 2012).

Moreover, the fact that the student is engaging in a metacognitive process by monitoring their own learning needs and adapting their strategies accordingly is consistent with the literature on self-regulated learning (Zimmerman, 2013).

Participants also reported using use concept mapping to rehearse some concepts. As reported by student 7 "*I use concept mapping apps when reading to rehearse some concepts".* Concept mapping is a visual learning tool that helps individuals organise and connect information in a meaningful way (Daley et al., 2016). Concept maps have been found to be effective in improving comprehension, critical thinking skills, and long-term retention of information (Horton & Lovitts, 2014; Novak & Cañas, 2008). The use of concept mapping apps has become increasingly popular in recent years, with many students using them as a study aid (Bhatt et al., 2020).

Research has shown that using concept mapping apps while reading can be an effective way to rehearse and reinforce concepts (Choi et al., 2021; Lai et al., 2017). In a study by Choi et al. (2021), college students who used a concept mapping app while reading a textbook on psychology showed significant improvements in their understanding of the material compared to those who did not use the app. Similarly, Lai et al. (2017) found that using a concept mapping app while reading a science text improved students' comprehension and recall of the information. In addition, in a study by Chang and Hwang (2018), the use of mind maps can significantly improve students' recall ability. Overall, the use of concept mapping apps appears to be a useful tool for students to enhance their learning and retention of information.

In conclusion, mobile devices can be an effective tool for students to improve their rehearsal learning strategies. Educational apps, recording lectures, creating visual aids, and engaging in discussions through social media are some of the ways students can use mobile devices to reinforce key concepts and improve their recall ability. However, it is essential to note that the use of mobile devices should be done mindfully, as excessive use can lead to distraction and

reduced attention spans. Therefore, students should use their mobile devices in a way that helps them to enhance their learning strategies while minimising distractions.

6.1.3.3 How first-year medical students used a mobile device to improve collaborative learning strategies

In recent years, mobile devices have become increasingly prevalent among university students, with many using them as a tool for peer learning (Kirschner & Karpinski, 2010). Through the use of various mobile apps and platforms, students are able to collaborate and share information more easily and efficiently than ever before (Zammitto, 2019).

One way in which participants in this study use mobile devices to improve peer learning is through the use of messaging apps such as WhatsApp. WhatsApp allowed students to create group chats where they could share notes, discuss assignments, and ask questions. A study by Hassan et al. (2019) found that students who used WhatsApp for peer learning reported an increase in their academic performance and a higher level of engagement with their peers.

The participants further reported that they engaged in various collaborative activities, highlighting the importance of peer learning and help-seeking strategies. Studies have shown that peer learning strategies can have a positive impact on the development of collaborative learning in SRL development. For example, a study conducted by Li et al. (2019) found that peer feedback and evaluation can enhance students' SRL during collaborative learning activities. In another study, Ertmer et al. (2018) found that peer coaching can improve students' ability to set goals, monitor their progress, and reflect on their learning during collaborative learning activities as they are developing SRL.

However, it should be noted that the effectiveness of peer learning strategies on collaborative learning SRL development may vary depending on various factors such as task complexity, group size, and students' prior knowledge and experience. For instance, a study by Tsai (2020), and colleagues found that peer learning strategies were more effective for students with high prior knowledge and experience in the task domain. It is crucial to emphasize that when incorporating peer learning strategies for collaborative learning and self-regulated learning (SRL) development in regions with restricted access to technology, such as developing countries, a flexible and inclusive approach is imperative. Customizing strategies to the particular context and considering the distinct challenges encountered by students from

resource-constrained backgrounds will enhance the effectiveness and equity of learning experiences.

Participants in this study reported a number of corroborative activities. One example is the student who recorded lectures and shared them with their roommate, allowing them to discuss and deepen their understanding of the material. Another example involved two students who collaborated by sharing and updating their class notes using Google Drive. This not only helped them organise their notes but also improved their resource management skills and supported their cognitive and metacognitive strategies.

These findings are consistent with previous studies on the benefits of collaborative learning and its impact on self-regulated learning (SRL). Studies have shown that collaborative learning can enhance SRL skills, especially in the areas of resource management and metacognitive and cognitive strategies. For example, Broadbent et al. (2020) found that an online SRL training program and mobile app helped university students improve their resource management, metacognitive, and cognitive strategies. Similarly, Zheng and Chen (2018) showed that mobile device-supported collaborative learning strategies could help students acquire self-regulated problem-solving skills in mathematics.

Tsai (2013) found that the development of SRL requires the use of collaborative learning strategies. Their study demonstrated how SRL skills development in students is influenced by collaborative learning activities. The findings from this current study support these previous studies, showing that collaborative learning can help students improve their SRL skills and strategies. In fact, they showed how SRL skills development in students is influenced by collaborative learning activities. In addition, the use of mobile devices in education has been shown to enhance the learning process by providing students with access to a variety of learning resources and enabling them to collaborate with peers (Kirschner & Karpinski, 2010). Hence, it is argued that collaborative learning helped study participants in this study to improve their SRL skills.

The collaborative learning activities that participant engaged in this study also demonstrates that learning is a social process in which students acquire knowledge through interacting with their peers and more knowledgeable others (Stott & Mozer, 2016; Vygotsky, 1978). This was exemplified through the social interaction between students as they updated their notes in Google Drive and shared and discussed the class lecture recordings with roommates. This is

consistent with Sedlacek and Sedova's (2017) assertion that learners develop their own conceptualisations of phenomena through engagement with their environment as they complete the activities collaboratively.

Mobile learning has been increasingly recognised as collaborative learning activity (Dobao, 2016), where participants can engage in various forms of peer learning activities. The effectiveness of mobile learning through peer learning has been widely discussed in the literature. For instance, Lai (2011) argues that peer learning helps students learn more efficiently by enabling them to develop their knowledge and abilities together. Similarly, Dobao (2016) asserts that peer learning fosters collaborative learning and leads to improved SRL skills.

As presented in Table 5.8, student 10 and student 4 reported that they learned how to use the Start Life app from their partner in the pair. This demonstrates how peer learning helped participants teach each other to use different learning strategies. This finding is consistent with the notion that mobile learning can be an effective means of promoting SRL through peer learning (Dobao, 2016).

Peer learning has also been found to enhance students' retention of learned materials (Lai, 2011; Topping, 2005). This is particularly relevant in the context of mobile learning, where the use of mobile devices can facilitate the sharing of information and knowledge among students. By engaging in peer learning activities, students can reinforce their understanding of course material and develop a deeper level of comprehension. This finding underscores the importance of promoting peer learning when using mobile learning to foster SRL.

6.1.3.4 How first-year medical students used a mobile device to improve metacognitive self-regulation learning strategy

Metacognition is defined as the process of understanding and managing one's own learning strategies (Flavell, 1976). SRL is a cognitive learning process in which the learner sets learning goals, monitors their own learning progress, and adjusts their learning strategies to reach their goals (Zimmerman, 2000). The use of mobile devices in education has gained popularity in recent years, with students using them to access educational resources, collaborate with peers,

and submit assignments. This study demonstrated that using mobile devices to improve metacognitive self-regulation learning strategy is a way to develop SRL.

With the increasing availability of mobile devices, there has been a growing interest in exploring their potential using mobile learning to promote metacognitive self-regulation learning strategies. For example, students can use mobile devices to set their learning goals, monitor their learning progress, and adjust their learning strategies to achieve their goals. Mobile devices can also be used to facilitate reflective thinking, which is a critical aspect of metacognition (Moon, 2004).

In this study, participants reported that they used mobile devices to support metacognitive self-regulation learning strategies in various ways. For example, students use mobile devices to create folders which they use as their reflective journals to keep their experiences for this study. They used these journals to reflect on their learning experiences and track their progress over time in this study. In addition, participants used mobile devices to access educational resources and tools that helped develop their metacognitive skills. For example, mobile apps such as mind map apps and flashcard apps are used to facilitate the development of critical thinking and problem-solving skills. This finding is in line with the study by (Goh, 2012), which found that educational apps can influence the development of metacognitive skills.

Another way in which participants used mobile devices to promote metacognitive self-regulation learning strategy is by using mobile devices to access learning resources and tools from the course management system (CMS) and the internet. According to Sharples et al. (2010), these sources of learning materials can be used to support a range of learning activities, including collaborative learning, reflective thinking, and metacognitive self-regulation learning strategy. For example, in this study, mobile learning was used to support collaborative learning by enabling students to share resources, discuss ideas, and provide feedback to each other. They also used it to facilitate reflective thinking by providing students with prompts to reflect on their learning experiences and evaluate their own learning strategies.

The use of mobile devices in promoting a metacognitive self-regulation learning strategy has several advantages. Firstly, mobile devices provide students with access to a wide range of learning resources and tools, which can be used to develop their metacognitive skills. Secondly, mobile devices are highly portable and can be used anytime, anywhere, which can facilitate the development of self-regulated learning skills. Finally, mobile devices can provide students with

immediate feedback on their learning progress, which can help them adjust their learning strategies to achieve their learning goals (Carver & Scheier, 1981).

The findings in this study have shown that mobile devices have the potential to improve metacognitive self-regulation learning strategy as a way to develop SRL. Mobile devices can be used to support a range of learning activities, including collaborative learning, reflective thinking, and the development of critical thinking and problem-solving skills.

6.1.3.5 How first-year medical students used mobile devices to improve time and study environment learning strategy

The findings from this study are supported by the testimonies of students who utilised mobile devices to improve their time management skills. For instance, S10 and S1 as presented in Table 5.8 reported that they utilised their mobile phones to set reminders to be reminded of the times they needed to study. Student 10 said:

> *I mostly use my phone to set reminders on my phone so that I am reminded of different times I need to study. If set an alarm at night, the sound of the alarm annoys me until I wake up otherwise I would miss that time of my study without the alarm .*

Similarly, S9 used a Google calendar to keep track of her planned academic activities. S9 said:

> *I use a google calendar to manage my activities. For example, I put dates and times for scheduled group discussions and other important class activities. This helps me to receive alerts about impending events, so this helps me to always know what's coming up next.*

She stated that she puts all the dates and times of all significant academic activities, including scheduled group discussions. This enabled her to receive notifications of upcoming activities, thie helped her to keep track of all her activities, thereby helping her improve her organisational as well as time management skills.

The findings of this study have several implications for practice. Mobile learning provides an effective tool for educators to help students improve their time management skills. It can also help students to take ownership of their learning, thereby increasing their motivation and

engagement. Educators can integrate mobile learning into their teaching to help students develop effective time management skills.

Several studies have reported that mobile learning positively influences time management skills among students. For instance, the study by Agranovich et al. (2019) used a time management-based technology to help students develop their ability to manage their time for academic activities. The findings revealed that students who utilised the technology had significant improvements in their time management skills compared to those who did not.

Similarly, Tabuenca et al. (2015) found that utilising mobile devices with graduate students to track time during the learning process improved time management. The study concluded that the use of mobile devices can be an effective tool in improving time management skills among students.

The results of this study are consistent with the findings from previous studies that have shown that mobile learning positively influences time management skills among students. The testimonies of students who utilised mobile technology further support these findings. As technology continues to evolve, educators should explore the potential of mobile learning in improving time management skills among students.

6.1.3.6 How first-year medical students use a mobile device to improve Help-Seeking learning strategy?

Help-seeking is an important self-regulated learning strategy that involves seeking assistance from others when faced with a learning difficulty (Zimmerman, 1990). Help-seeking can be informal, such as asking a peer for assistance, or formal, such as seeking help from a lecturer. Research has shown that students who are effective at help-seeking are more successful in their academic performance (Karabenick & Berger, 2013). Mobile devices have the potential to provide learners with increased opportunities for help-seeking. Mobile devices allow learners to access resources and assistance at any time and in any place. Students can use mobile devices to seek help from peers, teachers, and other resources. The use of mobile devices to access online resources can also help students overcome barriers to help-seeking, such as social anxiety or fear of being judged (De Bruyckere et al., 2019).

In this study, participants report having used mobile devices in seeking formal and informal help from their peers. They reported that they used mobile devices to get different support

from their peers. The support included asking their peers to share the class notes they missed in class and asking questions on the topic they did not understand. This is in line with the Crompton et al, (2017) study which reported that the use of mobile devices provides students with access to resources and support, which enhances their learning outcomes (Crompton et al., 2017). In concurrence with this finding, Ferdig (2013) asserted that mobile devices can be used to improve the help-seeking learning strategy by providing learners with access to resources and support when they encounter difficulties in their learning. For instance, mobile devices in this study participants reported having used mobile learning to access online forums such as the CMC and social media platforms such as WhatsApp where they interact with peers to seek assistance when they encounter difficulties.

In this study mobile devices also helped students to access personalised feedback from their peers. Through the WhatsApp group that was created in this study, participants were encouraged to respond to each other's WhatsApp direct messages in cases where they wanted to provide private feedback to their peers on their questions regarding mobile learning strategies. This mobile device provided participants with immediate feedback on their progress and performance, which allowed them to adjust their learning strategies accordingly. Supporting this finding, Liu et al. (2018), reported that mobile devices can be used to provide feedback on their learning progress, which can help them to identify areas where they need additional support and assistance. Zimmerman and Moylan (2009) asserted that feedback is an important component of SRL, and it is essential for learners to receive timely and informative feedback to adjust their learning strategies.

In addition, as discussed in Section 6.1.3.3, participants used mobile devices to promote collaborative learning. Collaborative learning involves learners working together to solve a problem or complete a task (Johnson & Johnson, 2014). Mobile devices provide students with a platform to collaborate with their peers, share information and resources, and provide feedback to one another. These demonstrated how students used mobile devices to seek help from each other in this study.

Furthermore, the use of mobile devices provides students with opportunities to reflect on their learning and evaluate their progress towards achieving their learning outcomes. For instance, in this study, students kept a reflective journal that they were using to reflect on their use of mobile learning to develop SRL. Crompton et al. (2017) contends that students can use mobile

devices to document their learning experiences, set goals, and track their progress towards achieving those goals.

6.1.3.7 How first-year medical students used a mobile device to improve elaboration learning strategy

Self-regulated learning (SRL) is a crucial skill that enables students to manage their learning effectively, and the use of mobile devices has been shown to promote SRL (Jiao & Lu, 2017). The elaboration learning strategy is one of the learning strategies that has been shown to enhance students' learning and retention of information (Peverly & Sumowski, 2019).

An elaboration learning strategy is an approach that involves actively processing and integrating new information with prior knowledge (Peverly & Sumowski, 2019). It involves generating connections between new and existing information to deepen understanding (Peverly & Sumowski, 2019). There are various methods of elaboration, including summarising, explaining, generating examples, and creating analogies. When learners engage in elaboration, they actively process information and connect it to prior knowledge, which facilitates long-term retention (Dunlosky et al., 2013). Students who use an elaboration learning strategy tend to perform better on tests and retain information longer than those who do not use this technique (Khajavi & Schiefele, 2019).

In addition the effectiveness of the elaboration learning strategy in improving students' critical thinking skills and creativity has been supported by a study conducted by Priawasana et al. (2020). The study examined the influence of elaboration learning on students' cognitive abilities and assessed their critical thinking skills. The findings revealed that the implementation of the elaboration learning strategy significantly enhanced students' critical thinking skills and creativity. Additionally, this approach facilitates a deeper comprehension of the subject matter and encourages learners to establish connections between various concepts (Rohrer & Pashler, 2010).

Mobile devices offered several features that improved the elaboration learning strategy in the study participants. For instance, in this study, students used mobile phones to record lessons and listen to them later for better understanding, as reported by S5:

> *I know that it's not all the times that I am attentive in class, so I record the lectures and listen to them later in my free time. In addition, know that the things that we are*

learning now, we are going to apply the concepts during clinical hours. So I recorded the with the intention I will be able to use them as part of my revision/reminders during my clinical years.

Recording and reviewing lectures as done by S5, can be a highly effective strategy for enhancing learning outcomes. It offers students flexibility, reinforces concepts, aids in clinical application, enables personalised learning, improves accessibility, and assists with exam preparation. By adopting this practice, students can maximise their understanding, retention, and application of course material, ultimately supporting their academic and professional development (Priawasana et al., 2020).

Studies have demonstrated that lecture recordings can serve as an effective elaborative learning strategy when utilised properly (Brame, 2016; Stohr et al., 2019; Zhang et al., 2022).

In a study conducted by Zhang et al. (2022) on assessing the impact of recorded lectures on learning effectiveness, it was found that students who recorded lectures and later reviewed the recordings at their own pace achieved higher academic performance compared to those who did not. The researchers determined that the use of these recordings was associated with improved memory retention and enhanced comprehension of the subject matter, ultimately contributing to a more profound understanding of the course content. Similarly, another study conducted by Kiewra et al. (1991) discovered that recording lectures significantly enhanced students' note-taking abilities and comprehension of the material. The researchers concluded that lecture recordings can serve as a valuable resource for students who struggle with note-taking or those who may miss crucial information during class, ultimately supporting their learning process and academic success.

Therefore, recording lectures and reviewing them later has been proven to be a beneficial elaboration strategy for students seeking to improve their academic performance and retention of information. Additionally, it serves as a useful revision tool for future clinical applications, particularly for first-year medical students as they build a strong foundation in their medical education.

6.1.4 Use of mobile devices inside the classroom

According to the findings presented in Table 5.8, first-year medical students also utilised mobile devices during class. During the focus group discussion, S3, S8, and S10 reported

primarily using mobile devices for organisational purposes, such as note-taking, accessing online resources for additional information, and retrieving handouts or other study materials while attending lectures. S9 mentioned that they preferred typing notes on their laptop instead of handwriting them, as the latter was too slow for their needs. The findings presented above indicate that laptops are the most commonly used mobile device in classrooms among first-year medical students, providing valuable support for their learning experience.

These findings are consistent with Sana et al. (2013)study, which found that university students mostly used laptops to access online or softcopy course content and take notes in the classroom. Conversely, the low usage of smartphones reported by the focus group discussion participants aligns with the findings of Farley et al.'s (2015) study on how students use their mobile devices to support learning. The study found that lecturers often do not develop course materials in a format optimised for smartphone use, rendering these devices less convenient for in-class utilisation. This observation highlights the potential need for adapting educational resources to better accommodate various mobile devices and enhance student's learning experiences in developing countries nonetheless, access to mobile devices and educational content/learning materials in developed countries is often considered to be more convenient compared to developing countries (UNESCO, 2017).

This discrepancy arises from the fact that in developed countries, a significant portion of the population has access to smartphones and tablets which are capable of supporting a wide range of educational applications and online resources (Dahal & Molla, 2019). In addition, developed countries have established robust telecommunications networks with widespread coverage and high-speed internet connectivity (Laxmi et al., 2017). Conversely, in many developing countries, the majority of the population relies on low-end mobile phones which have limited capabilities and are not designed to provide a seamless learning experience.

According to a study conducted by the Pew Research Center (2019), approximately 81% of adults in the United States own a smartphone, making it easily accessible for educational purposes. In addition to widespread ownership, the majority of smartphones in developed countries are equipped with high-speed internet connectivity, large screens, and advanced processing power, enabling users to access a wealth of educational content, including e-books, interactive learning applications, and online courses (Garcia et al., 2019).

On the other hand, developing countries face significant challenges when it comes to accessing educational content via mobile devices. A report by UNESCO (2017) highlights the digital divide in education, stating that many developing countries lack the necessary infrastructure to support widespread mobile internet access. This limitation is further exacerbated by the prevalence of low-end mobile phones, which often have limited internet connectivity options, smaller screens, and less processing power. As a result, accessing and utilising educational materials optimised for mobile devices becomes a considerable hurdle for learners in these regions (Mbarika et al., 2019).

To bridge this gap, there is a need to develop mobile-friendly educational content that can be accessed on low-end mobile phones in developing countries. It is, therefore important for lecturers to take this into account when creating course materials, ensuring that they are optimised for mobile phone use. On the other hand, much as the use of mobile devices should be encouraged inside classrooms, it is important to note that the use of mobile devices inside the classroom should be well-regulated. During the lesson observations, the researcher noted an absence of clear rules or policies guiding the use of mobile devices within the classroom. This observation suggests that the lack of established guidelines could be a contributing factor to the low usage of mobile devices in the learning environment. These findings align with previous research, such as Kim and Kwon's (2012) study, which demonstrated that a lack of well-defined policies and guidelines can lead to the limited adoption of mobile devices in the classroom setting.

Additionally, research has shown that the use of mobile devices in the classroom can improve student engagement and achievement (Chen & deNoyelles, 2013; Kay & Lauricella, 2011). However, without clear rules and regulations, students may be hesitant to use their devices in class for fear of retribution from their lecturers. Clear rules and regulations play a crucial role in managing the power dynamics between undergraduates and academics, as highlighted in a study conducted by Symonds, (2020) examining the reframing of power relationships within the university context. This becomes especially pertinent when considering the influence of power dynamics on the integration of mobile devices in the classroom. Educators, cognizant of these dynamics, possess the ability to shape an environment that either fosters or discourages the use of mobile devices, aligning with their pedagogical objectives and preferences. Achieving a balance between leveraging technology for educational purposes and maintaining

a respectful learning atmosphere necessitates effective communication and a transparent understanding of expectations.

To address this issue, educational institutions should establish clear policies and guidelines for the use of mobile devices in the classroom. These policies should be effectively communicated to both students and educators to ensure that everyone understands the expectations surrounding mobile device usage. Educators should also be encouraged to integrate mobile devices into their lessons, helping students develop the necessary skills for responsible and effective use.

By developing and implementing such policies, institutions can create a supportive environment that promotes responsible use of mobile devices for educational purposes, ultimately enhancing the overall learning experience.

6.1.5 Use of Mobile device as a tool for Mediating SRL Development

Having discussed how first-year medical students used mobile devices inside and outside the classroom, I will conclude this section by discussing mobile devices as an ideal tool for mediating SRL development. Mobile devices possess numerous features that make them ideal for enhancing SRL. Their portability allows for anytime, anywhere use, and they offer a wide range of functions that can enhance learning experiences. For instance, in this study, mobile devices were used to access information and resources, communicate with peers and educators, and create and share content. This versatility highlights their potential as effective instruments in fostering self-regulated learning.

One way in which mobile devices supported SRL development in this study was through the use of educational applications. During focus group discussions and classroom observations, it was evident that many students used various educational software on their devices to support learning. These applications offer features that can potentially facilitate SRL development. For example, some educational apps used in this study provided tools for tracking study progress, offering performance feedback, and suggesting strategies for improvement. Additionally, mobile devices were used for collaborative learning, enabling students to engage with their peers and making the learning process more interactive and engaging. These findings are supported by Efendioglu and Kiraz (2021), who emphasised the role of mobile devices in supporting SRL development through educational apps designed for goal setting, progress tracking, and feedback provision (Scherer, 2019).

The study also observed the use of WhatsApp for group discussions related to learning. Participants reported forming WhatsApp groups specifically to address questions and doubts raised by individual students who had difficulties understanding certain concepts during class. This finding highlights how social media technologies, such as WhatsApp, were used by participants on their mobile devices to facilitate learning. This aligns with the research conducted by Hew and Cheung (2013) on the use of Web 2.0 technologies in K-12 and higher education, which emphasised the supportive role of mobile devices in SRL development by leveraging social media for connecting with peers and educators, sharing educational resources, and engaging in collaborative learning activities.

While the findings indicate that mobile devices are effective tools for facilitating self-regulated learning (SRL) development, it is important to consider the potential challenges reported by certain participants in Section 5.3.36. These findings align with the findings of Kirschner and De Bruyckere (2017), who identified the potential obstacle of distraction when using mobile devices to support their learning. In their study on the impact of Facebook usage on academic performance, Kirschner and De Bruyckere (2017) discovered that individuals who use Facebook had lower GPAs and dedicated fewer hours to studying per week compared to non-users.

It is important to note that mobile devices offer various opportunities for mediating SRL development. Educational applications, social media platforms, and digital tools and resources can greatly assist students in setting objectives, tracking progress, and assessing their performance. Moreover, these digital aids foster collaboration and communication among students and educators. However, it is crucial for students to remain aware of potential distractions and devise strategies for regulating their usage. To mitigate these challenges, learners should develop strategies for managing their use of mobile devices, such as setting boundaries, using apps that limit distractions, and taking regular breaks from screen time. By doing so, they can actively participate in their own learning process by being able to use mobile devices to manage and control their learning.

In this section, I focused on the discussion of the findings on how first-year medical students utilised mobile learning to develop self-regulated learning (SRL). Nonetheless, it is vital to understand the perspectives of first-year medical students on using mobile learning to develop self-regulated learning. Consequently, the following section discusses the results on the

perspectives of first-year medical students on using mobile learning to develop self-regulated learning.

6.2 The perspectives of first-year medical students on using mobile learning to develop self-regulated learning

This section discuss the perspectives of first-year medical students on using mobile learning to develop self-regulated learning. The discussion aims to provide a comprehensive understanding of first-year medical students' perspectives on using mobile learning to develop self-regulated learning. By doing so, we hope to identify the best practices for integrating mobile learning into medical education to promote effective self-regulated learning among students. Mobile learning allows for flexibility and convenience for students, as they can access learning materials and complete coursework from anywhere (Ferreira et al., 2014). The result from this study as presented in Table 5.5, has shown that participants view a mobile device as a medium for communication, a tool for collaborative learning, a tool that makes their learning easier compared to other forms of learning, a tool that helps them develop new Ideas, a tool for managing their learning materials, a tool that helps them save time for their learning.

6.2.1 Perspective of first-year medical students on the mobile device as a medium for communication

The results of this study demonstrate that students perceive mobile devices as useful communication tools and effective tools for developing self-regulated learning skills. The study's participants highlighted various ways mobile devices helped them communicate, which helped them develop self-regulated learning skills. For example, mobile devices helped students stay connected and engaged with their coursework, communicate with lecturers and peers, and access important learning resources throughout this study.

The participants reported that they use mobile devices to access course materials such as lecture notes, slides, and readings from the course management system (CMS), which helps them study and prepare for exams. Additionally, they reported using mobile devices to communicate with lecturers via email or messaging apps to seek clarification on course materials. Similarly, lecturers use mobile devices to provide students with quick feedback on their work or to answer questions about assignments via messaging apps like WhatsApp.

Moreover, the participants noted that they use mobile devices to facilitate collaboration among peers, which was particularly useful for group assignments. Cloud-based collaboration tools

like Google Docs allow students to work together on class notes, while real-time communication through WhatsApp enables them to discuss class topics and ask questions to their peers.

During the focus group discussions, the participants mentioned that they use mobile devices to access online resources such as databases, e-books, and journals, which supplement their class notes. They also reported using mobile devices to register for the semester, which they indicated saved their time as opposed to manual registration. Overall, this suggests that mobile devices can be valuable tools for communication that can help first students develop self-regulated learning in students.

6.2.2 Perspective of first-year medical students on the use of mobile devices as tools for collaborative learning

In this study, mobile devices served as a valuable tool for collaborative learning and helped develop self-regulated learning skills among the study participants. This study shows that mobile devices facilitated effective communication among students through various communication tools such as text messages, voice and video calls, and social media platforms. The use of cloud-based collaboration tools like Google Docs enabled students to work together on class notes, share ideas, and receive feedback from their peers. Additionally, students accessed a vast amount of information on their course through mobile devices, including educational resources such as e-books, online tutorials, and educational apps.

The study participants reported that using mobile devices for collaborative learning enhanced their critical thinking skills. As reported by *S3 "the arguments we make during the group discussion enable me to think on my toes this helps me to think critically on the issue for me to best argue my answers during group discussion".* Furthermore, mobile devices helped students develop self-regulated learning skills by providing them with tools to manage their time and monitor their progress collaboratively with their peers.

This suggests that the findings from this study are in line with several studies which have found that mobile devices can be useful tools for learning and communication. For example, Kim and Kim's (2017) study found that mobile devices can enhance students' learning experiences by providing them with easy access to course materials, facilitating communication with peers and instructors, and promoting collaborative learning. Similarly, Kukulska-Hulme and Traxler (2005) found that mobile devices can promote self-regulated

learning by enabling learners to access learning resources at any time and place and by providing them with opportunities to reflect on their learning. Additionally, a study by Bolliger and Martin (2018) found that mobile devices can promote engagement and interaction among learners, as well as facilitate communication and collaboration in online learning environments.

A study conducted by Järvelä et al. (2007) found that mobile devices are effective tools for collaborative learning in higher education. The study consisted of three phases. In the first phase, a Mobile Lecture Interaction tool was used to enhance self-regulated learning among university students during lectures. The second phase involved using smartphones as regulation tools to support collaboration by facilitating the sharing of knowledge representations at both individual and collaborative levels. Finally, the third phase demonstrated how collaborative learning, integrating face-to-face interactions and social software with smartphones, can promote socially shared collaboration and community building. Overall, the study concluded that mobile devices are valuable tools for collaborative learning.

6.2.3 Perspective of first-year medical students on the use of mobile devices as tools that make their learning easier compared to other forms of learning

The participants in this study revealed that they increasingly depend on mobile devices as tools that facilitate their learning more effectively than other methods. They highlighted that mobile devices offer greater convenience, accessibility, interactivity, and flexibility, making their learning experiences easier compared to alternative forms of learning.

On convenience, participants reported that the mobile device allowed them to access course materials, lectures, and other resources from anywhere and at any time, which helped them keep up with coursework and stay organised. Students also reported that mobile devices provide a more interactive learning experience than other forms of learning. Participants used apps such as Start Life, Google Drives, Mind Maps and other tools to create engaging, interactive content that helps students better understand complex concepts and retain information more effectively. Moreover, it was observed during the lessons that some students used mobile devices to create flexible learning environments. Some students reported in their reflective journals that the mobile device allowed them to work at their own pace and on their

own schedule. This indicates that participants in this study developed a positive perception of mobile devices as a tool that makes their learning easier compared to other forms of learning.

Such perceptions and attitudes were also observed in a study conducted by Kukulska-Hulme (2010) on Mobile Learning as a Catalyst for Change. The study highlighted that the use of mobile devices in education has become increasingly prevalent due to their convenience, accessibility, and flexibility. This aligns with the findings of Yordanova's (2007) study on mobile learning and the integration of advanced technologies in education, which found that mobile devices provide a more interactive learning experience.

This suggests that the outcomes of this study align with previous studies. This further substantiates the notion that mobile devices facilitate easier and more effective learning when compared to traditional forms of education. By leveraging mobile devices, learners can access educational content anytime, anywhere, resulting in an enriched learning experience and improved self-regulation skills.

Overall, the studies conducted by Kukulska-Hulme (2010), Yordanova (2007), and Cheung and Huang (2011), as discussed above, collectively emphasise the positive impact of mobile learning on learning. The convenience, accessibility, and flexibility of mobile devices, coupled with their ability to foster interactivity and personalised learning experiences, contribute to improving the learning process and developing self-regulated skills.

6.2.4 Perspective of first-year medical students on the mobile device as a tool that helps them develop new knowledge

Participants in this study indicated that they view mobile devices as invaluable tools for generating new ideas. One of the main reasons for this perception is the portability and convenience of mobile devices. With the capacity to carry their devices wherever they go, participants were able to access a vast array of information and resources at any time. This constant accessibility enabled them to conduct research and collect information on the move, which greatly assisted them in developing new knowledge. This coheres with El Hariry's (2015) study on Mobile phones as useful language-learning tools. This study found that the portability and convenience of their mobile devices were important factors that contributed to their use of these devices as a tool for idea new vocabulary.

In addition, participants reported that another factor that contributes to the use of mobile devices as a tool for idea development is the wide range of applications and tools available on their mobile devices. Participants used mobile applications designed specifically for idea development, such as mind mapping tools, Start Life, Google Drive, and WhatsApp. These applications provided students with the tools they need to organise their ideas, collaborate with others, and develop their thoughts further. This is congruent with a study by Kim et al. (2016), which reported that university students found mobile applications to be particularly useful in the idea development process.

Additionally, participants mentioned that they regard their mobile devices as instruments for idea development due to the accessibility of social media and online communities. By leveraging social media platforms, they were able to connect with their peers, both within and outside their university, who shared relevant learning materials related to their fields of study. The ability to access such resources proved invaluable in their quest to develop new ideas.

These online communities served as platforms for idea sharing and collaboration, allowing participants to tap into a diverse range of perspectives and expertise. They found this collaborative environment to be highly beneficial in the generation and refinement of their ideas. The study's findings align with the research conducted by Lim et al. (2019) on the regulation of learning and co-creation of new knowledge in mobile learning.

Lim et al. (2019) found that utilising mobile devices for knowledge sharing encourages students to seek fresh insights into their learning, moving beyond a mere transfer of existing content. Through sharing knowledge via mobile devices, students engage in metacognitive interactions, promoting self-regulated learning. This metacognitive engagement has a positive influence on the learning process, fostering a deeper understanding and retention of information.

Therefore, these findings imply that participants perceive their mobile devices as valuable tools for generating new ideas, a notion supported by research. This underscores the potential of mobile learning in nurturing Self-Regulated Learning (SRL). The widespread accessibility of social media and online communities empowers students to connect and collaboratively build knowledge, thereby enriching their learning experiences. Nevertheless, it is crucial to acknowledge a challenge associated with the information age: the proliferation of misinformation and fake news, as highlighted by Schneiner (2019).

The abundance of information and the prevalence of misinformation and fake news pose substantial obstacles to idea development, especially for first-year students who may lack training in effective information search methods. Moreover, these novice students, unfamiliar with discerning credible sources, may unintentionally rely on inaccurate or biased information. This reliance on misinformation can lead to the formation of ideas based on false premises, impeding the cultivation of well-informed perspectives. Consequently, there is a pressing need for comprehensive training programs tailored for first-year students to equip them with the skills necessary for navigating and critically evaluating information sources.

6.2.5 Perspective of First-Year Medical Students Regarding Mobile Devices as Tools for Accessing and Managing Learning Materials

The findings of this study provide valuable insights into the perceptions of first-year medical students regarding the use of mobile devices as tools for accessing and managing their learning materials. The participants overwhelmingly expressed their positive experiences and views on the convenience and efficiency of mobile devices for accessing and managing course material as well as facilitating communication with their lecturers and peers. S1, highlighted the convenience of using their mobile device, stating, *"I use my mobile device to access course materials and communicate with my classmates and lecturer. It's very convenient, and I can do it anywhere."*

In addition to the convenience factor, the participants emphasised that the utilisation of mobile devices increased their engagement in the learning process. S3 shared their experience, stating, *"I feel more engaged in class discussions when I use my mobile device to access course materials. I can participate in discussions even when I'm not physically in class".* These testimonials reinforce the idea that mobile devices serve as catalysts for active participation and enhance the overall learning experience for these students.

The positive perceptions highlighted by the participants align with similar studies conducted in the field. For example, Kukulska-Hulme and Traxler (2005) found that students extensively employed mobile devices to access course materials, communicate with instructors, and collaborate with peers. Yang et al. (2013) discovered that mobile devices offered flexibility and convenience to students in terms of accessing and organizing their course materials. Furthermore, Al-Jarf's (2015) study found that the use of mobile devices resulted in increased

student engagement in the learning process, as evidenced by active participation in class discussions, completion of assignments, and seeking feedback from instructors.

The research conducted by Abdous et al. (2012) further supports the positive perceptions of mobile devices among students. Their study revealed that students recognised mobile devices as valuable tools for accessing learning materials and communicating with instructors and classmates. Students utilised mobile devices to access various course materials, such as lecture notes and videos, as well as to facilitate communication within their academic community. Similarly, El-Hussein and Cronje (2010) found that students considered mobile devices as crucial tools for managing their learning materials. Students preferred using mobile devices over traditional methods such as desktop computers due to their portability and user-friendly nature. The ability to access course materials and communicate seamlessly using mobile devices significantly contributed to their effectiveness as educational tools.

Overall, the results of this study, in conjunction with previous studies, have indicated a widespread recognition among students of the value and benefits of using mobile devices to access and manage their learning materials. The positive perceptions expressed by first-year medical students affirm the growing importance of integrating mobile devices into educational settings. Mobile devices offer unprecedented convenience, foster engagement, and enhance students' ability to interact with course materials, instructors, and peers. As mobile technology continues to evolve, it is crucial for educational institutions to embrace and capitalise on the potential of mobile devices to optimise the learning experience for their students.

6.2.6 Perspective of first-year medical students on a mobile device as a tool that aid effective learning

Participants in this study reported that mobile device has become a vital tool for their learning and help them save time. Students indicate that mobile devices help them keep up with their academic activities such as coursework, lectures, research, and communication with peers and faculty members. A study by Kay et al. (2012) found that the majority of the students in their sample used mobile devices for learning activities. The study further found that students used mobile devices for activities such as accessing course materials, reading e-books, accessing learning resources, and communicating with peers and faculty members.

The participants in this study reported that they used mobile devices for learning activities, which helped them to save time by enabling them to access learning materials and resources on the go. They mentioned that mobile devices have several features that make them ideal for learning. They said that mobile devices are portable and they easily carry them around. This makes it easy for them to access learning materials and resources anytime, anywhere. They also said that mobile devices are highly customisable, which enables them to use various applications that suit their learning needs. For instance, students can use applications that help them organise their schedules, like the Start Life app, take notes, and create mind maps, as was reported by most participants.

In addition, the mobile device helped students to search for information on the internet which are more relevant and directly related to their work as opposed to using hard copy learning materials where such searching consumes their time, as reported by S11:

> *My phone helps me to save time for my studies, hard copy book takes longer for someone to learn some concepts since books are usually not summarized there are detailed, but online tutorials or electronic handouts are usually summarized and straight to point so there help you save time and helped someone learn faster and effectivel.*

These findings cohere with a study by Lai and Wang (2014), who found that students perceived mobile devices as a tool that helped them save time for their learning. The study found that students used mobile devices to access learning materials and resources, communicate with peers and faculty members, and complete assignments. Similarly to this study, students in Lai and Wang's (2014) study reported that using mobile devices for learning activities helped them save time by enabling them to access learning materials and resources on the go. Also agreeing with this finding is a study by Al-Rahmi and Othman (2013). The study found that students used mobile devices for activities such as accessing course materials, communicating with peers and faculty members, and completing assignments. The students further reported that using mobile devices for learning activities helped them save time and improve their academic performance by enabling them to access learning resources and communicate with peers and faculty members more efficiently.

In general, the majority of the students find mobile learning to be helpful to them and an effective tool that can help them in the development of SRL. These findings are in line with

the study by Patil et al. (2016), which found that students had a positive attitude and perceived mobile learning as an important tool to support their learning. Agreeing with this finding is a study by Hanif (2020), who found that most students appreciated the mobile learning concept as a helpful learning aid.

Much as most participants find the mobile device as a tool for managing their learning materials,, the participants also reported some challenges associated with the use of mobile devices as a tool for managing their learning materials. Some participants reported technical difficulties, such as poor network connectivity and battery life, which hindered their ability to access course materials. Others reported concerns about the security of their personal information when using mobile devices to access course materials. Agreeing with this finding, a study by Lai et al. (2017) found that students faced technical difficulties such as poor network connectivity and battery life, when using mobile devices to access course materials. The study also found that students had concerns about the security of their personal information when using mobile devices to access course materials.

In addition, some participants reported that they perceive mobile devices as a distractor because some applications such as social networking sites are distractive to them when they're studying. Others reported that the small screens of mobile devices such as smartphones cause fatigue and are not suited for certain learning activities such as scrolling down webpages or navigating between multiple windows on the device. This finding is related to Diliberto-Macaluso and Hughes's (2015) study, which found that most gadgets lead to more classroom disengagement and distraction. This was also observed in Selwyn's (2016) study which found that students reported that using mobile devices can be annoying and disruptive at times, citing issues including eye fatigue from continuously staring at the screens of mobile devices with smaller screens like smartphones. This also aligns with the findings of Issa et al. (2021) regarding Smartphone use and its influence on ocular health among university students in Saudi Arabia. The study revealed that a significant proportion of students (66.0%) using smartphones for academic purposes experienced one or more ocular problems following their smartphone usage.

6.3 The enablers and hindrances of using mobile in the development of self-regulated learning

Mobile devices used in mobile learning can enable and/or hinder self-regulated learning, depending on how it is implemented and used (Kizilcec, 2021; Sha, 2012). The finding from

this study has revealed that mobile devices is an enabler in the development of self-regulated learning (SRL). Mobile learning has emerged as an increasingly popular way for students to access educational resources and learning materials. The convenience and flexibility that mobile learning provides have been cited as key reasons why students choose to engage in this form of learning. Participants in this study reported that they appreciated the ability to learn at any time, any place, and at their own pace, which made mobile learning an attractive option for many students in this study.

According to Keegan (2002), mobile learning represents "a new level of flexibility, where learning can take place in a variety of locations and at times that are convenient for the learner". The participant reported that flexibility was particularly important for students who may have other commitments, making it difficult to attend class. Mobile learning allowed them to access resources such as handouts and notes for the lesson(s) they missed, in their free time. Participants also reported that mobile learning assisted them to have access to a wide range of resources. Participants in this study reported that they were able to access a variety of online educational resources, including e-books, videos, and other multimedia materials. These resources were available from anywhere, allowing them to learn beyond the traditional classroom setting.

In addition, participants reported that they consider mobile devices an enabler because mobile devices enabled them to access various apps that facilitated their learning, such as WhatsApp, Start Life, Mind map apps, Google Drive and Google Calendar. Participants also used mobile applications such as WhatsApp. They said that they used WhatsApp because it is a communication app that enabled them to create groups and share text, audio, and video messages. Students created discussion groups on WhatsApp where they were discussing questions and other materials related to their studies. This fosters collaboration among students and encourages them to take an active role in their learning process.

Participants also used mobile applications such as Start Life. Start Life is a productivity app that helps students manage their time effectively. It allowed them to create to-do lists, set reminders, and prioritise tasks. Start Life helped participants to stay organized and focused, which is essential for academic success. Google Drive and Google Calendar are also useful apps for mobile learning that were used by participants in this study. Google Device allowed students to access their coursework and educational materials from anywhere and allowed them to edit the shared class note in real-time. Google Calendar helped students manage their

schedules, set reminders, and plan their study time effectively. These apps helped students stay on top of their academic responsibilities and ensure they did not miss any deadlines.

Mind map apps such as MindMeister were also beneficial for mobile learning that was used by a participant in this study. Mind maps are visual representations of ideas and concepts. Students used them to organize information, brainstorm ideas, and create study notes. Mind map apps allow students to create and share mind maps with their classmates, making collaboration and idea-sharing easy. This finding has demonstrated that mobile learning is an effective way to facilitate learning using mobile devices. WhatsApp, Start Life, Google Device, Google Calendar, and mind map apps are all useful tools for mobile learning. They allow students to collaborate, stay organized, manage their time effectively, and create and share ideas. As mobile technology continues to evolve, mobile learning will become an even more integral part of higher education.

Furthermore, participants reported that they consider mobile learning as an enabler for learning because it provided them with an opportunity to compress or synthesise different handouts into one summarised, easily readable handout. As reported by S2: "*In terms of revisions, the mobile devices help me compress notes. For example, I may have 5 handouts each with 5 pages for a particular topic. Since they give us electronic hands out, I easily summarise these hands out using my laptop into six pages by taking notes of the key concepts. This helps me learn more as I am summering the notes and reduces my time of study on such topics and this gives me time to study topics more often.*" This is particularly useful for students who may have difficulty organising and managing large amounts of information (Sharples et al., 2014).

Moreover, participants reported that mobile devices enabled them to access a wide range of learning resources beyond what is traditionally available in hard-copy books. With mobile devices, students were able to search for questions and answers on the internet and access e-books, videos, and other educational materials. This not only expands their knowledge but also provides them with a more diverse and comprehensive learning experience. As Trifonova and Ronchetti (2003) study found that mobile devices can help learners "explore their interests and needs" and "discover and integrate new knowledge from a variety of sources".

Much as most students described mobile learning as an enabler of learning, the use of mobile devices in learning environments can create distractions and interruptions that can affect students' focus and attention. Distractions and interruptions can come in many forms in the

context of mobile learning. For example, some participants in this study reported that they were at times interrupted by phone calls, text messages, or social media notifications while they are engaged in learning activities on their mobile devices. These interruptions can be particularly problematic when learners are engaged in complex learning tasks that require sustained attention and concentration. As reported by the participant. “For me when a teacher asks us a question in class, I like googling it, but most of the time, when I switch on my data on my phone then, I find that some WhatsApp messages from my friend start popping up then instead of concentrating on what I want to do I start reading the messages”.

Studies have shown that distractions and interruptions can have a negative impact on student learning. For example, a study by Chen and Yan (2016) found that learners who were frequently interrupted by phone calls during an online course performed worse on tests of learning outcomes than learners who were not interrupted. Similarly, a study by Kirschner and Karpinski (2010) revealed that learners who were distracted by unrelated content while studying performed worse on a comprehension test than learners who were not distracted.

Participants further reported the challenges of using a mobile device to control and manage learning and proposed solutions to these challenges. Some students reported that they found applications like YouTube as a distractor because when using a mobile device to search for educational material, it comes with some suggested non-educational videos that are purely for entertainment, and they spend most of the time watching these videos. Some participants in this study manage YouTube distruction by using applications that manage browsers. Students mentioned that they utilized applications to control their mobile browser settings. These apps enabled them to access specific YouTube videos without any suggested content. The apps achieved this by configuring the web browser to display a blank page with only a search bar, eliminating any suggested videos. The same is the case with social network applications like WhatsApp. WhatsApp is a distractor for students who are not self-disciplined when using their mobile devices to search for information on the internet. . Participants in the study reported that they disable WhatsApp when using a mobile device to access the internet.

To mitigate the negative effects of distractions and interruptions in mobile learning environments, students can adopt several strategies. One strategy is to encourage learners to turn off their mobile devices or switch them to silent mode during learning sessions. Additionally, educators can incorporate breaks into learning sessions, which can provide

learners with opportunities to check their mobile devices and attend to any urgent messages or notifications.

6.4 Chapter Summary

This chapter has presented the results and analysis of the study focusing on the use of mobile learning by first-year medical students to develop self-regulated learning.

The study demonstrates the effectiveness of the Motivated Strategies for Learning Questionnaire (MSLQ) in measuring self-regulated learning and comparing means for different strategies. Participants displayed confidence in their mobile learning strategies after the intervention, substantiated by their ability to articulate specific strategies used and explain why they preferred them. Successful participants showcased a versatile range of mobile learning strategies and effectively applied them in diverse learning contexts.

Section 6.1 discussed the findings pertaining to research question 1, which investigates how first-year medical students use mobile learning to develop self-regulated learning skills. The results showed significant improvement in the participants' cognitive and metacognitive learning strategies due to the intervention. On cognitive strategies, students improved in areas such as rehearsal, elaboration, and organization, indicating better retention, integration, and organization of medical concepts. In terms of metacognitive strategies, students demonstrated increased self-regulation abilities, including monitoring their learning progress, evaluating comprehension, and adjusting study methods. The intervention also enhanced resource management strategies, such as time management, study environment management, peer learning, and help-seeking. The findings provide compelling evidence that mobile access improved self-regulated learning among first-year medical students.

In Section 6.2, the focus was on research question 2, which aimed to investigate the perspectives of first-year medical students regarding the utilisation of mobile learning for self-regulated learning. The findings revealed that the first year medical students considered mobile devices to be valuable tools for their education. They appreciated how mobile devices eased the access and management of learning materials, which made studying more efficient for them. They also recognised the collaborative learning potential offered by mobile devices, allowing them to connect and engage with peers, leading to improved SRL. The participants also pointed out the importance of mobile devices as communication tools, facilitating

seamless communication with peers and lecturers. The portability and flexibility of mobile devices were also appreciated, as they allowed students to learn anytime and anywhere, fitting into their busy schedules. Additionally, mobile devices were seen as a means to expand knowledge and stay up to date with advancements in the medical field. Overall, the perspectives of first-year medical students on mobile learning were positive, highlighting the benefits of incorporating mobile devices into medical education and providing insights for educators and policymakers.

Section 6.3 addresses research question 3, which investigates how mobile learning enables or hinders the development of self-regulated learning. This study found that mobile devices are generally seen as enablers of self-regulated learning. Participants appreciated the flexibility and convenience of mobile learning, allowing them to access educational resources at any time and place. They reported accessing a wide range of online materials, including e-books, videos, and multimedia resources. Mobile applications like WhatsApp, Start Life, Google Drive, Google Calendar, and mind map apps were also beneficial for collaboration, organisation, time management, and idea-sharing.

Mobile devices were considered helpful in compressing and summarising handouts, making it easier for students to manage and revise information. Mobile learning also provided access to a diverse range of learning resources beyond traditional books. However, distractions and interruptions posed challenges to focus and attention. Participants mentioned being interrupted by phone calls, text messages, and social media notifications, which affected their learning experience.

To address these challenges, strategies were suggested, such as turning off or silencing mobile devices during learning sessions and incorporating breaks for learners to attend to urgent messages or notifications. Some participants used browser management applications to limit access to distracting content on platforms like YouTube, while others disabled social network applications like WhatsApp while using mobile devices for educational purposes.

Overall, this research contributes to our understanding of how mobile learning can be effectively utilised to enhance self-regulated learning in the first years students in a developing country context.

CHAPTER SEVEN: MOBILE LEARNING FOR SELF-REGULATED LEARNING

> Considering the importance of understanding the course material and students' self-regulated learning in universities; it is essential to apply appropriate learning models and resources to make students improve academic ability and self-regulated skill. (Hendikawati et al., 2019)

7.0 Introduction

This chapter discusses the findings for Research Question 4, which focuses on the support needed by first-year university medical students when using mobile learning to foster their self-regulated learning (SRL) skills. It draws upon insights derived from various sources, including reflective journals, fortnightly reflective workshops, and focus group discussions. Additionally, in Section 7.2, this chapter presents a proposed framework aimed at providing effective support to first-year students in developing their SRL skills through the utilisation of mobile learning, specifically within the unique context of a developing country.

7.1 Supporting first-year university medical students to develop self-regulated learning through the use of mobile learning

The results from this study have demonstrated that support given to students on SRL development must be provided in a properly organised way for it to help them develop SRL skills. In addition, developing effective skills for successful SRL is crucial for university students to become independent and lifelong learners (Dabbagh & Kitsantas, 2005). However, students may not possess the necessary skills to regulate their learning effectively and thus require support from educators to develop these skills. In this context, a well-designed SRL development program that explicitly supports students in acquiring SRL skills is crucial (Dabbagh & Kitsantas, 2005). This, therefore, prompts consideration of how a self-regulation learning-support initiative should be designed to support students' SRL development both inside and outside the classroom.

The design for the self-regulation learning-skills initiative used in the study consists of six activities. The study activities include introductory work, assessment of weakness and strength of learning strategies through pre-MSLQ, the pairing of the participants based on the strength

or weakness of their learning strategies, reflective journals, fortnight reflective workshop and, assessment of weakness and strength of learning strategies through post-MSLQ at the end of the intervention. The results of this study have shown that participants who completed all the activities in this study had their SRL improved at a level of significance (see Section 5.1.3).

The results from this study suggest that when support is provided in a well-designed and organised way, it can help students develop SRL skills. In addition, the study has demonstrated the importance of reflective activitiessuch as reflective journals and reflective workshops, in promoting SRL development. These activities provide opportunities for students to reflect on their learning process, identify strengths and weaknesses, and adjust their strategies accordingly. Such activities help students become more aware of their learning and provide them with the tools to improve their learning outcomes.

An examination of the results displayed in Table 5.7 reveals that students require guidance in choosing effective mobile applications to facilitate self-regulation of their learning. Participants also indicated that opportunities for collaborative learning experiences helped them a lot in developing their self-regulated learning skills. Some participants further indicated that they needed fundamental technological skill training. These findings are corroborated by other research, such as Ballouk et al.'s (2022) which determined that students need more instruction in SRL and methods for monitoring their learning progress. Ballouk et al. (2022) further stated that insufficient guidance can hinder students' SRL development, making it essential to provide a supportive environment that fosters self-regulatory behavior, ultimately enhancing students' SRL skills.

Providing students with guidance on the effective use of mobile applications is critical to their success in developing SRL skills. Mobile applications have been proven to be effective in promoting SRL among students (Kramarski & Gutman, 2020), but students need to be directed to the most effective applications for their learning needs. In addition, opportunities for collaborative learning where students can share experiences and learn from one another are essential. Collaborative learning has been shown to enhance students' SRL skills, particularly when they engage in activities that require them to reflect on their learning and identify areas for improvement (Zhang et al., 2021).

Basic technological skill training is also critical for students' success in developing SRL skills. Yet, many students seem to lack basic technological skills, such as how to search for information on the internet and how to use mobile applications effectively (Ballouk et al., 2022). Without these skills, students may struggle to use mobile applications to support their learning and regulate their behaviour effectively.

Moreover, supporting and fostering an environment of SRL in universities is crucial for students' success in developing SRL skills (Chitra et al., 2022). Therefore, supporting students in developing effective SRL skills is crucial for their academic success and lifelong learning. educators should provide well-designed and organised SRL development program that explicitly supports students in acquiring SRL skills. The program should include reflective activities that promote self-awareness and help students adjust their learning strategies. When support is provided in such a way, it can effectively help students develop SRL skills and become independent and lifelong learners.

7.1.1 Guidance on the effective use of mobile devices to support SRL development

During the second reflective workshop session, participants conveyed their need for guidance from more knowledgeable others (MKOs) in pinpointing effective mobile applications to aid in self-regulating their learning. A majority of the students (47 of the 59 who attended fortnight reflective workshop at this point in time) expressed enthusiasm about using mobile learning to manage and oversee their learning after being introduced to the concept. They began experimenting with various ideas recommended by their peers, but this led to distractions and, ultimately, a waste of time. Consequently, these students noticed no improvement in their capacity to control and manage their learning. As a result, they sought advice on the most suitable mobile applications to support them in self-regulating their learning endeavours.

In this study, students reported experimenting with various mobile applications but did not achieve their desired outcomes. This is because the choice of the mobile application can impact their self-regulated learning and lead to worse outcomes (Hsu et al., 2014). Thus, it is essential to identify the right mobile application that can meet their needs and help them self-regulate their learning effectively.

The necessity for guidance from MKOs regarding mobile learning applications is not exclusive to this particular group of students. Prior research has demonstrated that students frequently face challenges with self-regulation and require assistance in effectively utilising mobile

learning applications (Cochrane & Bateman, 2010; Hsu et al., 2014). Consequently, students need support in identifying effective mobile learning applications and receiving guidance on how to employ them for self-regulated learning. This study utilised the sociocultural approach to address the request by the students on the need for guidance on choosing and using the mobile application. The sociocultural approach goes beyond the individual and recognises that agency is frequently shared by dyads and small groups (Wertsch et al., 1993). In line with this approach, the researcher realised that neither he nor the participants possessed the answer to the request for the need of extra guidance and that a solution would be found by working together.

In order to better understand the mobile learning strategies used by the participants, the researcher and the participants had a discussion resulting in changes to the subsequent fortnight reflective workshops. Rather than simply sharing their success stories, successful participants were required to describe how the mobile learning strategies they utilised functioned and helped them manage and control learning. They were also allowed to demonstrate how the mobile strategy works. During their presentations, participants were given an opportunity to ask questions regarding the presented mobile learning strategies. This process helped participants learn more about the strategy before trying it, thereby helping them make a better decision on whether to adopt the strategy. This change in approach was valuable as it allowed participants to understand the strategies better before implementing them, leading to more effective adoption of the strategies. Additionally, it saved participants time and resources, as they were only concentrating on trying the strategies they were sure would work for them.

After the second reflective workshop, some students in the study requested to switch pairs based on the learning strategies they observed needing improvements. This resulted in changes to some of the initial pairs set at the study's beginning. The students opted to switch pairs based on what they had learned from other participants, highlighting the importance of peer-assisted learning in SRL development.

The incorporation of WhatsApp and the creation of a group for SRL support was also agreed upon by the participants in the study. Participants used the WhatsApp group to discuss successes and setbacks in between successive fortnight reflective workshops. The WhatsApp group enabled members to receive assistance right away, rather than having to wait for two weeks to get help from the larger audience participating in the study. This prompt feedback

and assistance were necessary for effective SRL development, considering that participants were supposed to participate in this study for only 16 weeks.

Peer-assisted reflective learning has been found to be an effective strategy for SRL development (Zhang et al., 2018). The results of this study suggest that students who were given the opportunity to switch pairs based on learning strategy and those who participated actively in the WhatsApp group had improved SRL. These findings are consistent with previous studies highlighting the effectiveness of peer-assisted and technology-mediated learning in promoting SRL (Lee & Choi, 2017; Yilmaz, 2017).

These results are not unique to this study. For instance, studies by Clarebout and Elen (2006) and Lust et al. (2013) revealed that students who use technology to promote their self-regulated learning usually need support. Though these authors did conclude that students who had explicit instruction were more likely to use the tools as intended, the results of this study and the literature review presented here supported the need for an explicit strategy when implementing SRL development initiatives that use mobile learning to develop SRL. The fact that participants in the subsequent fortnightly reflective workshops reported how the guidance they were receiving had benefited them suggests that support in SRL development initiatives is necessary.

Additionally, the participants in the pair assisted one another with some fundamental skills, as shown in the following remark from student 5.

> *One major need for us as students is the need for supplementary learning resources to complement our class ……. my peer I was working with this in the study helped me to learn some skills on how to quickly find information on the internet such as the use of '+', "when typing the keyword for search. For example, 'anatomy + Human Heart'.*

Studies by Sletten (2017) and Korkmaz and Mirici (2021) are in line with the findings of this study. These studies used pre-recorded short videos with SRL training and study recommendations were employed to improve students' SRL. Students watched these short videos on their mobile devices to help them with the prescribed study approaches. The outcomes of the two studies revealed that the support given in the two interventions helped to improve students' SRL. Based on the findings of the two studies and the findings of this study, it is reasonable to conclude that coordinating expectations between students and teachers on

acceptable mobile device users can improve learning by fostering SRL and allowing students to focus on the mobile device's valuable applications as a learning tool (Malka & Ariel1, 2019).

Furthermore, the use of well-organised support to foster SRL, as was done in this study, is also consistent with the Baars et al. (2022) study, in which 20 evidence-based study strategies were provided with a brief description and a video on how to use them. Baars et al. (2022) studied first-year students who were allowed to use the app for self-study sessions and revealed that students were generally happy with the app and that it improved students' SRL skills and motivation over the course of a five-week course. Based on the findings of this study and results from other studies, it can be argued that students need support if they are to develop SRL skills using mobile learning. Agreeing with this are Baars and Viberg (2022), who asserted that offering support at the 'right' time and 'right' place for learners across formal and informal learning contexts would be a promising method to help the student develop self-regulated learning using mobile learning.

Moreover, it must be noted that to effectively assist students to self-regulate their learning using mobile learning, there is a need to use multiple supporting strategies, as was done in this study. This is consistent with the result of the study by Tabuenca et al. (2015 which demonstrated that combining the online SRL training module with the mobile app aided students' adoption of SRL strategies the most. However, as compared to a control condition, the daily diaries gathered via the mobile app without the online SRL training did not appear to enhance students' SRL strategies, but combining the two yielded a better result.

In Section 6.1, I discussed the findings on how first-year medical students utilised mobile learning to develop self-regulated learning (SR). In this section, I have discussed the necessary support required for them to appropriately use mobile learning to develop self-regulated learning (SRL). It has been established that the use of mobile learning had a significant impact on the SRL of these students, and this, in turn, may influence their perspectives on how mobile learning can influence their SRL. Furthermore, this section considered the ways in which first-year medical students believe that mobile learning can be used to better support their self-regulated learning.

This has helped to identify the areas in which mobile learning can be optimised to meet the needs of first-year medical students and enhance their ability to regulate their learning. This has resulted in the development of a proposed framework for developing SRL .

7.1.2 Technical support for students

Developing SRL skills requires individuals to be able to monitor their own learning process, regulate their emotions and motivation, set appropriate goals, and choose effective learning strategies. A lack of technical know-how can hinder the development of SRL in several ways. Other than the call about the need for guidance on the effective use of mobile devices to support SRL development, some participants in this study also reported that they needed technical support. Other than the approach discussed in Section 6.2.1, the researcher encourages the students to help each other in the pair to improve their technical skills. The students report that lack of technical know-how affected them in many ways. SRL requires individuals to set appropriate goals that are specific, measurable, achievable, relevant, and time-bound. Without technical know-how, individuals may struggle to identify the specific skills or knowledge they need to learn and set goals that are relevant and achievable. In this study participants, the goal was to improve their weak learning strategies. Participants with poor technical know-how struggled to identify appropriate mobile learning strategies to improve their weak learning strategies. This was the case because, without technical know-how, individuals may struggle to identify and evaluate different learning strategies and choose the ones that are most effective for them.

Research has shown that the ability to choose effective learning strategies is crucial to the development of SRL (Zimmerman, 1998). Individuals with technical knowledge are better able to evaluate different learning strategies and choose the ones that are most effective for them based on their learning goals and preferences. This, in turn, enables them to optimise their learning and achieve their goals.

In order to successfully help students to develop using mobile devices, educators need to support technologically less capable students. In a study by McCombs and Vakili (2005), students who had access to technology were more likely to develop SRL skills better than those who did not have access to technology. The study showed that technology provides individuals with access to a variety of learning resources, including online textbooks, videos, and interactive tutorials. Individuals with technical skills can evaluate these resources and choose the ones that are most effective for their learning goals and preferences.

Furthermore, individuals with technical skills can use various mobile learning strategies to develop SRL skills. Mobile learning strategies include using mobile apps, social media, and other digital tools to support learning. A study by McQuirter and Meeussen (2017) found that participants with technical skills were better able to identify and use mobile learning strategies to support their SRL development.

7.2 Proposed framework for supporting first-year students to develop SRL using mobile learning in developing country context

The ability to self-regulate one's learning is critical for academic achievement, yet it is also challenging. Students are frequently unable to successfully manage and control their learning without enough support (Baars & Viberg, 2022; Tabuenca, 2015; Ward et al., 2022). Supporting both metacognitive processes like planning, monitoring, and reflection as well as cognitive processes might help students develop their self-regulated way more optimally (Baars & Viberg, 2022). The results from Domínguez and García (2017) study indicate that university students, even when they are frequent users of digital technology, tend to not use these technologies to regulate their learning process. Hence, there is need for deliberate initiative or programme in the university that can help students use mobile learning to foster SRL. Against this background, the researcher has proposed a seven-step framework for developing self-regulated learning (SRL) using mobile learning. This framework has been developed based on the experiences the researcher gained from the intervention implemented in this study, and it is supported by relevant literature (Baars et al., 2022; Hsu & Ching, 2015; Kramarski & Heaysman, 2021; Strydom, 2020).

7.2.1 Seven-step framework for developing SRL using mobile learning

Self-regulated learning (SRL) is a dynamic and interactive process through which learners proactively take charge of their own learning experiences (Zimmerman, 2000). By engaging in goal setting, progress monitoring, and the implementation of effective strategies, learners become active participants in their educational journey (Winne & Hadwin, 2008). To facilitate this process, a framework can be employed, providing students with a structured and systematic approach to develop and enhance their self-regulation skills (Zimmerman, 2000). The framework acts as a roadmap, offering guidelines, strategies, and resources that support learners in their pursuit of self-regulated learning.

The framework provides a structured plan outlining a sequence of activities, resources, and support mechanisms that learners can utilise to enhance their self-regulation skills (Vovides, 2007). It offers a clear path for students to follow, helping them navigate their self-regulated learning journey with greater confidence and purpose.

One outcome of this study is a proposed framework for developing SRL using mobile learning. This proposed framework has been designed to help facilitate self-regulated learning with the help of mobile devices. The framework has been developed based on the findings and activities conducted in this study which focused on how first-year medical students use mobile devices to develop self-regulated learning. By integrating key elements and strategies identified in the study, the proposed framework aims to optimise students' ability to use mobile learning to develop self-regulation. Figure 1 presents the proposed framework.

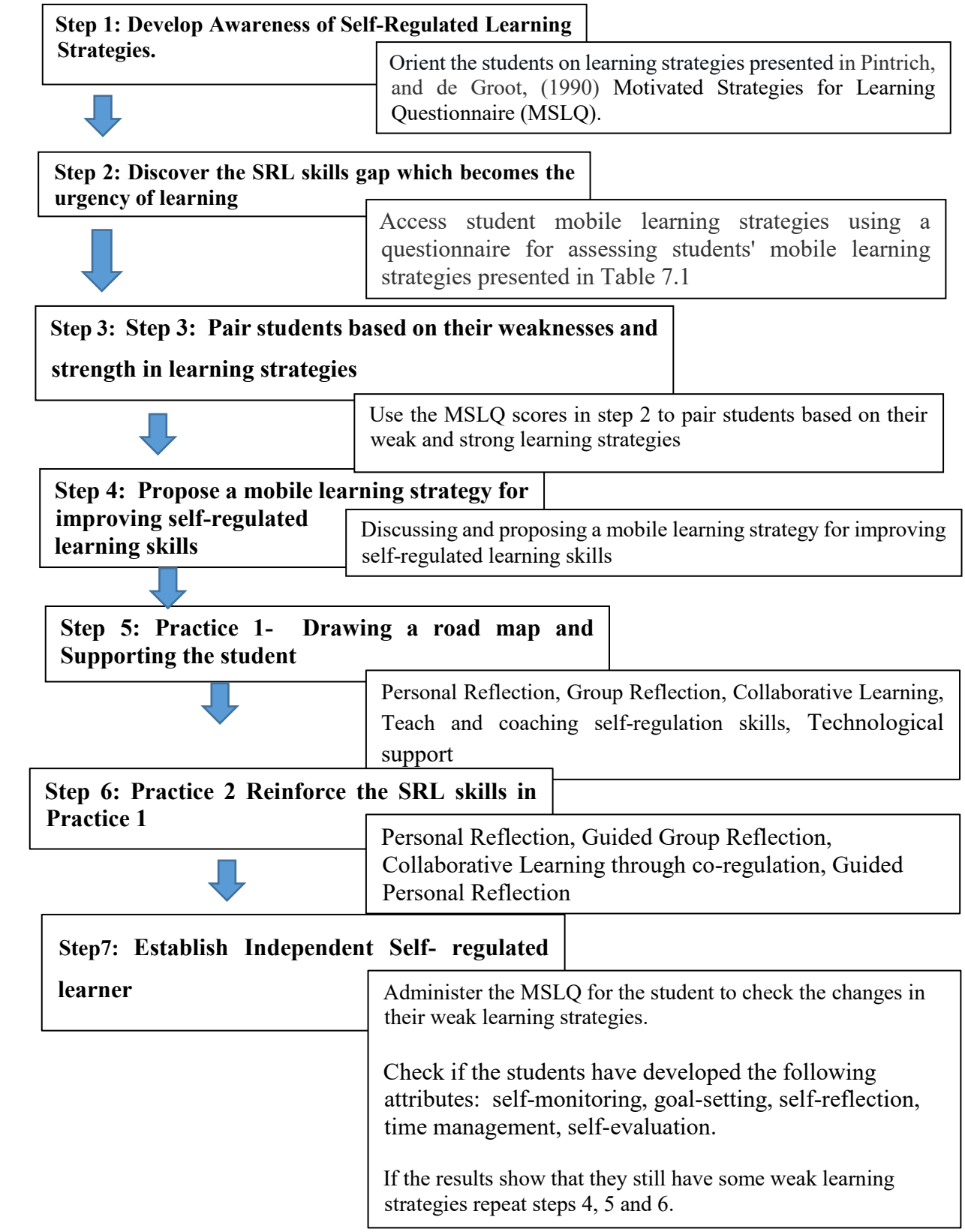

Figure 7.1: Framework for developing SRL in first-year students using mobile learning

Step 1: Develop Awareness of Self-Regulated Learning Strategies

"Students are usually unaware of strategies to self-regulate their learning and study efficiently" (Baarsat et al., 2022, p.1). Additionally, the lack of self-regulated learning strategies has a negative impact on the successful use of mobile devices to nurture SRL skills, as demonstrated by this study, which has found that a lack of awareness of SRL strategies impacted how well first-year students used mobile learning to develop SRL. It is therefore essential that every SRL improvement initiative begins by orienting the students on SRL strategies that are available in the literature. One such strategy is Motivated Strategies for Learning Questionnaire (MSLQ) by Pintrich and de Groot (1990). This can be accomplished through a workshop or another viable method. During this orientation, the students should be given an opportunity to discuss the SRL strategies that can help them enhance their understanding of the learning strategies as well as allow them to familiarise themselves with the strategies. Once the students are made aware of self-regulated learning strategies, administer questions adopted from Pintrich and de Groot (1990) Motivated Strategies for Learning Questionnaire (MSLQ).

Step 2: Discover the SRL skills gap which are the urgency of learning

Once the students have been oriented to learning strategies, they need to be helped to identify their learning strategies' gap, which is their weak learning strategies, using the suggested questions in Table 7.1 below. These questions have been adopted from Pintrich and de Groot (1990) Motivated Strategies for Learning Questionnaire (MSLQ) but customised to mobile learning. Students should be allowed to rate themselves on a scale of 1 to 7, where the statement very true to them is a 7; and the statement that is not at all true to them is 1.

Table 7.1: Questionnaire for assessing students' mobile learning strategies

No	Question	Learning Strategy
1	When I study, I use my mobile device to practice saying the material to myself over and over.	Rehearsal
2	I use my mobile device to make lists of important concepts for the course and memorise them.	
3	When reading for the class, I use my mobile device to make up questions to help focus my reading	Elaboration
4	When I study for this course, I pull together information from different sources, such as lectures, readings, and discussions, and my mobile device helps me keep track of all these	
5	Even if I have trouble learning the course material, I try to do the work on my own with the help of a mobile device, without help from anyone	Help-Seeking
6	When I cannot understand the material in a course, I ask another student in the course for help, and I also use my mobile device to search for answers online	
7	I try to identify students in the course whom I can ask for help if necessary and I use my mobile device to contact them	
8	When I become confused about something I am reading, I go back and try to figure it out, and I use my mobile device to search for supplementary reading material online	Metacognitive Self-regulation
9	If course readings are difficult to understand, I change the way I read the material, and I use my mobile device to search online for alternative ways of reading	
10	I ask myself questions to make sure I understand the material I have been studying in the class	

11	If I get confused taking notes in class, I just record the lesson on my mobile device and make sure I sort it out afterwards.	
12	I try to work with other students from this class to complete the course assignments with the help of mobile device(s)	Peer Learning
13	When studying, I often set aside time to discuss the course material with a group of students from the class	
14	When studying, I read my notes and course readings over and over again and used my notes saved in my mobile device to support this.	Organisation
15	When I study for this course, I go through the readings and my class notes and try to find the most important ideas, and I use my mobile device to save these ideas	
16	I use my mobile device to make simple charts, diagrams, or tables to help me organise course material.	
17	I make sure that I keep up with my course's weekly readings and assignments on my mobile device	
18	When I study for this course, I go over my class notes and make an outline of important concepts with the help of my mobile device.	
19	When a theory, interpretation, or conclusion is presented in class or in the readings, I try to decide if there is good supporting evidence, and I use my mobile device to search for good supporting evidence online	Critical Thinking
20	I treat the course material as a starting point, and I use my mobile device to search for information online for me to try to develop my own ideas about it.	
21	When I study for a course, I use my mobile device to write brief summaries of the main ideas from the readings and my class notes	
22	I use my mobile device to try to play around with ideas of my own related to what I am learning in this course.	
23	I use reminders on my mobile device to try to help me to stick to my study schedule	

24	I make good use of my study time for this course, and my mobile device helps me manage time well	Time and study environment

After collecting data, calculate the average for each item and each learning strategy. Communicate the result to each student so that they know the learning strategies which they may want to improve.

The MSQL scores are then used to pair students based on their weaknesses and strength in the learning strategies. Scoring of the MSQL individual's score for learning strategies are computed by summing up all the items under it. Items marked as “reversed” are reverse-coded items. These negatively worded items and the ratings are reversed before an individual's score is computed. For reversal, a participant who circles 1 for that item is given a score of 7 and so on. Accordingly, a one becomes a 7, a 2 becomes a 6, a 3 becomes a 5, a 4 remains a 4, a 5 becomes a 3, a 6 becomes a 2, and a 7 becomes a 1. The simplest way to reflect a reverse-coded item is to subtract the original score from 8. For example, if the original score is 2 to the negatively worded item, it is computed as follows 8 - 2 = 6, 6 being the score for the positively worded version of that question.

Step 3: Pair students based on their weaknesses and strengths in learning strategies

SRL is an essential aspect of education that can enable students to take charge of their learning process (Zimmerman, 2013). The key to SRL is the ability of the learner to monitor their learning, adjust, and set realistic goals (Schunk & Zimmerman, 2012). However, not all students have the same strengths and weaknesses in their learning strategies, and thus, it can be beneficial to pair them with students who have complementary strategies.

Pairing students based on their strengths and weaknesses in learning strategies can be beneficial as it allows students to learn from each other. According to Hwang and Wang (2019), pairing students with complementary learning strategies can provide opportunities for students to learn from each other and support each other's learning process. This approach can promote peer learning and social interactions, which can be motivating and engaging for students. It also provides students with the opportunity to practice and develop SRL skills in a collaborative context.

In their pairs, students can help strengthen their weak learning strategies by using their unique abilities to assist each other in the learning process. For instance, a student who is good at goal-setting but struggles with monitoring their progress can be paired with a student who is good at

monitoring but may need help with goal-setting. Together, they can share strategies and hold each other accountable, leading to improved SRL skills (Wolters & Pintrich, 1998).

Moreover, pairing students with different strengths and weaknesses can foster a more inclusive learning environment. Students with different learning styles and strategies can learn from each other and develop a greater understanding and appreciation for diversity in learning. By working with peers who have different strengths and weaknesses in learning strategies, students can develop empathy, respect for differences, and greater self-awareness (Cohen & Lotan, 2014).

After students are paired based on their weak and strengths in learning strategies, engage students in a workshop to come up with a proposed mobile learning strategy for improving self-regulated learning skills.

Step 4: Propose a mobile learning strategy for improving self-regulated learning skills

Before students start working in their pairs, discuss with the students the learning strategies and possible applications (Apps) that they can use to manage and control their learning and summarise them in Table 7.2. The suggestion should come from the student based on their understanding of each learning strategy as well as their experience with those that have used some mobile learning strategies before. Table 7.2 is used to record students' proposed mobile learning strategy for improving self-regulation learning and suggested mobile applicationss students can try.

Table 7.2: Proposed mobile learning strategy for improving self-regulation learning

Learning strategy	Proposed mobile learning strategy for improving self-regulation learning	Suggested mobile application student can try
Rehearsal		
Elaboration		
Organisation		
Critical Thinking		
Metacognitive Self-Regulation		
Time and Study Environment		
Effort Regulation		
Peer Learning		
Help-Seeking		

With so many different mobile applications available, it can be difficult for students to know which ones to use and how to use them effectively. To address this challenge, educators and peers need to provide guidance and suggestions for mobile learning strategies and mobile applications that students can use to manage and control their learning. It is important to note that these suggestions are only recommendations, and students should be free to utilise the strategies they are already familiar with and find effective.

According to the findings from this study, without guidance on which applications to use, students can waste a significant amount of time searching for mobile learning tools that may not be the best fit for their learning needs. By providing students with a list of effective mobile learning strategies can save students valuable time and help them focus on what matters most: improving their weak learning strategies.Through activities in this step, students can learn about the different mobile learning strategies and mobile applications that are available to them and identify which ones work best for their individual learning styles. Some strategies may include using mobile flashcards to memorise key concepts, downloading mobile educational games to reinforce learning, or using mobile apps to help them manage their time and studies.

In addition, giving students a suggested list of applications they can try out gave them the opportunity to try out different mobile learning strategies. This helps them gain a better understanding of how mobile technology can improve their learning strategies. Moreover, by actively managing and controlling their own learning, students are more likely to be engaged and motivated in their studies, leading to better academic performance and overall success.

In general, providing guidance on effective mobile learning strategies can be a valuable tool for educators to help students manage and control their learning. By offering suggestions and allowing students to explore different options, educators can help students become more confident and efficient learners who are able to manage and control their learning, ultimately leading to better outcomes. Once the mobile learning strategy for improving self-regulated learning skills has been proposed, draw a road map for supporting students. However, simply engaging in SRL training is not sufficient; it is equally crucial to reinforce the acquired skills through practical application.

After students have gained an initial understanding of SRL strategies and techniques and proposed mobile learning strategy for improving self-regulation learning that has been developed, they need opportunities to transfer and apply these skills in their learning. Hence, the next step is practice 1. Practice 1 helps solidify the students' grasp of SRL concepts and allows them to adapt their strategies to different contexts and challenges.

Step 5: Practice 1 - Drawing a road map and Supporting the student for their SRL

Before starting any initiative, it is important to have a plan or a road map. In the context of this framework a "road map" should comprise of clearly defined set of activities, each carefully aligned with a timeline. It should outline a series of structured activities designed to scaffold the student's improvement of SRL through the use of mobile learning technologies. Each activity within this road map should be strategically crafted to progressively build upon the foundation laid by initial activity, fostering incremental growth and development in students' SRL skills.

In the case of using mobile learning to foster SRL, it is important to set a time limit for the initiative. A minimum of 16 weeks could be a reasonable time for the initiative to field tangible results. This suggestion is based on the experience in this study. During this time, the student should be encouraged to use the mobile device to improve their weak learning strategies. The road map should be communicated to the student so that they can plan and set goals on how they will be using the mobile device to improve their learning strategies.

Supporting the student

To ensure that the student is successful in using mobile learning to improve their weak learning strategies, they need support. This support can be provided in various ways, including collaborative work, reflection, and coaching in self-regulated learning skills as was the case in a previous study (Hennecke & Bürgler, 2022). When students are left without guidance or receive minimal strategy instruction and support, they often struggle to regulate their own learning effectively (Winne,2005). Research has shown that students tend to overestimate their abilities (Yadegaridehkordi et al., 2019). Consequently, students who lack strong SRL strategies require additional support and scaffolding to navigate the learning process successfully. Without such guidance and support, students can feel lost and find it challenging to make progress in their learning (Kirschner et al., 2006).

Additionally, a study conducted by Martyn et al. (2014) explored the integration of wireless handheld devices (WHDs) in nursing curriculum. The study emphasised the importance for educational institutions to ensure that students possess the necessary technological literacy to effectively utilise WHDs. Furthermore, the researchers discovered that students should be introduced to the use of WHDs during the initial stages of their education and receive consistent support throughout their studies. This calls for optimal support as students use mobile learning to develop self-regulated learning skills.

Technological support

Technological support plays a crucial role in assisting students, especially those in developing countries, in their educational pursuits. According to Martyn et al. (2014), it is important to guide students on the effective utilisation of various mobile technology tools that can enhance their learning experience. This guidance can be provided by either peers or educators. In my study, peer-to-peer orientation was used. Participants were paired based on their strengths and weakness hence, they were able to help each other.

To further enhance the effectiveness of technological support, it is essential to expand its scope beyond mere orientation. Students should be encouraged to explore the diverse range of mobile learning tools available to them and understand how these tools can be used to manage and control their learning. By fostering a comprehensive understanding of these tools, students can leverage their potential benefits to improve their SRL and enhance their educational outcomes.

Additionally, technological support should extend beyond the initial orientation phase. Students should have ongoing access to assistance and guidance whenever they encounter challenges or have questions regarding the use of mobile learning tools. This can be achieved through regular workshops, online resources, or dedicated support personnel who can provide prompt responses and solutions to student queries.

Furthermore, it is important to acknowledge the evolving nature of mobile technologies and the continuous emergence of new tools and applications. Therefore, students should be encouraged to stay updated on the latest mobile technological advancements relevant to managing and controlling their learning. This can be facilitated through the establishment of online communities or forums,

such as the WhatsApp group utilised in this study. Such platforms should provide information on emerging technologies and their potential applications in education.

Overall, technological support is a vital aspect of student assistance, particularly in developing countries. By providing orientation, ongoing guidance, and encouraging students to explore and stay updated on relevant technological tools, educators and peers can empower students to leverage technology effectively for their educational benefit.

Collaborative learning

Students should be encouraged to work collaboratively with each other so that they can discuss their experiences of using a mobile device to manage and control their learning (Yadegaridehkordi et al., 2019). This can be done in pairs, where each student is paired with another student. The pairs could be changed every few weeks to allow students to work with different peers. Collaborative work helps students to learn from each other as they share their experiences and knowledge (Johnson & Lee, 2020).

Coaching in self-regulated learning skills

Along the way, as students are trying to use different mobile learning strategies to improve their weak learning strategies, it is crucial to teach and coach them in self-regulated learning skills (Brown & Martinez, 2019). There needs to be coaching in self-regulation skills through modelling and instruction, giving them practice opportunities, prompts for skill enactment, and reinforcement of successive strategies (Clark, 2017). Like a coach on a sports team, the educator should first instruct the student in skills and then provide needed support, or scaffolding, for self-regulation enactment at the moment (Brown & Martinez, 2019).

Reflection

Reflection is an important part of the learning process (Silvia et al.,2013). It helps students to evaluate their progress, identify their strengths and weaknesses, and plan for improvement. In the context of using mobile learning to foster self-regulated learning (SRL), reflection can be done in two ways: personal reflection and group reflection.

Personal Reflection

Students should be encouraged to keep a reflective journal of all their experiences (including challenges and successes). They should be given the platform to share their recorded experience with their peers. This should not only be limited to the peer in the pair but also to other students. This, therefore, calls for group reflection, where a group of 10 or more students can share their reflections. Personal reflection helps students to develop self-discipline and self-awareness (Silvia et al,2013).

Group Reflection

In a study conducted by Moon (2013), group reflection was defined as a collaborative practice where group members engage in active dialogue and introspection to evaluate their collective efforts and identify areas for improvement. The process involves reflecting on both individual contributions and group dynamics, promoting shared learning and growth within the group (Moon, 2013).

Considering the usefulness of group reflection, allow students taking part in the SRL development initiative to meet and discuss their recorded experiences. Group reflections allow students to meet and discuss their recorded experiences at an agreed time interval, say once a week or once every two weeks. The group reflections should be done with a group of 10 or more students. It should be ensured that the groups are manageable.

During the reflections (both in reflective journals and fortnight feedback workshops), participants should be encouraged to be doing self-evaluation. Through self-evaluation, participants will assess themselves on how well they perform on a task and how they compare to others (Zimmerman 1998b; Zimmerman & Moylan, 2009). One of the key issues participants should discuss during group reflections should be what led to successes or failures in adopting particular mobile learning strategies they choose. Panadero et al. (2016) stipulate that repeating the SRL training process and placing learners alone to experience that process iteratively is more promising for effective SRL training. For this reason, it is important to reinforce the SRL skill, hence the next step is to reinforce the SRL skills in practice.

Panadero et al. (2016) assert that in order to enhance the effectiveness of self-regulated learning (SRL) training, it is crucial to engage learners in a process of iterative training where they are repeatedly exposed to SRL experiences on their own. This approach holds great promise for fostering effective SRL development.

The research conducted by Panadero et al. (2016) highlights the importance of providing learners with repeated opportunities to engage in self-regulated learning. By allowing students to experience SRL iteratively, educators can facilitate a deeper understanding and internalisation of SRL strategies. This iterative approach not only enhances students' metacognitive abilities but also promotes the development of self-regulated skills necessary for successfully attaining the learning outcomes. Recognising the significance of reinforcing SRL skills, the next step involves reinforcing the SRL skills that will be acquired in this step.

Step 6: Practice 2 Reinforce the SRL skills in Practice 1

SRL skills enable learners to set goals and plan, monitor, and evaluate their progress towards the achievement of their learning objectives (Zimmerman, 2008). To reinforce SRL skills, it is important to provide learners with opportunities to reflect on their learning experiences and identify areas for improvement. During this step, SRL skills should be reinforced through guided personal reflection and collaborative learning.

Reinforcing SRL skills through Guided Personal Reflection

After several group reflections, students should be given the opportunity to engage in guided personal reflection. During this process, learners should focus on discussing their failures and identifying strategies for improvement based on what they have learned from their peers. According to Zimmerman and Moylan (2009), reflections have a significant impact on how students respond to their learning experiences. Therefore, these focused reflections should encourage students to evaluate themselves based on how well they accomplish different tasks using mobile devices and how they compare to their peers. Through this process, learners can identify areas for improvement and set goals for their future learning.

Collaborative Learning through Co-regulation

After the guided personal reflection process, collaborative learning should be encouraged by applying Vygotsky's Zone of Proximal Development (ZPD) theory. ZPD is a construct that

emphasises the importance of social interaction in learning (Vygotsky, 1978). The educator should encourage collaborative learning through co-regulation. Co-regulation refers to the supportive process of interaction between knowledgeable others and novice learners. Through co-regulation, learners receive the support, coaching, and modelling they need to understand, express, and modulate their thoughts, feelings, and behaviours (Murray et al., 2015).

Co-regulation is different from self-regulation, which emphasises the learner's ability to take responsibility for their own learning. However, co-regulation is an important component of SRL because it provides learners with the social support they need to become self-directed learners. According to Zimmerman and Moylan (2009), co-regulation helps learners develop a sense of competence and self-efficacy, which are essential components of SRL.

In the context of SRL, co-regulation involves students working collaboratively with their peers and educators to achieve their learning objectives. During co-regulation, learners receive feedback and guidance from their peers and educators, which helps them identify areas for improvement and develop strategies for achieving their learning goals. Co-regulation also helps learners develop metacognitive skills, such as planning, monitoring, and evaluating their own learning, which are essential components of SRL (Murray et al., 2015).

Overall, reinforcing SRL skills through guided personal reflection and collaborative learning is essential for students' SRL improvement. Guided personal reflection enables learners to identify areas for improvement and set goals for their future learning, while collaborative learning through co-regulation provides learners with the support they need to reach their learning objectives, which in this case is to improve their SRL. Educators should encourage learners to reflect on their learning experiences regularly and provide them with opportunities to collaborate with their peers. By doing so, educators can help learners develop the necessary skills to become self-regulated learners. Finally, after this step, check the progress of the learner’s SRL skills.

Step 7: Establish Independent Self-regulated learner

This step involves assessing the student's progress in applying the learning strategies and developing self-regulated learning skills. The main goal of this step is to help students realise if they have achieved their goal of becoming independent in their learning by developing self-regulated learning skills.

To achieve this goal, it is essential to administer the post-Motivated Strategies for Learning Questionnaire (MSLQ) to the student. The MSLQ is a self-report instrument used to assess students' motivational and cognitive strategies for learning. The questionnaire can help identify areas of weakness in learning strategies, and based on that, the teacher can provide feedback to the students to improve their learning strategies.

After administering the MSLQ, the educator should analysis and review the results. The educator should discuss the results with the student. This will help them understand their strengths and weaknesses in learning strategies. If the results of the MSLQ show that the student still has some weak learning strategies, it is necessary to repeat steps 4, 5, and 6.

In additional to the quantitative assessment of SRL from MSLQ score, the following qualitative attributes should also be used to establish if a student has developed into an independent a self-regulated learner.

Self-monitoring: This involves monitoring one's learning progress, identifying areas of weakness, and making necessary adjustments to improve learning.

Goal-setting: Students should learn to set realistic and achievable learning goals that align with their interests and abilities.

Self-reflection: Students should reflect on their learning experiences, identify what worked and what didn't work, and use this knowledge to improve their future learning.

Time management: Students should learn to manage their time effectively to balance academic, personal, and social commitments.

Self-evaluation: Students should evaluate their learning progress, identify areas of improvement, and make necessary adjustments to improve their learning outcomes.

In conclusion, the establishment of independent practice as a self-regulated learner is an essential step in self-regulated learning. It involves assessing the student's progress, identifying areas of weakness, providing feedback, and helping students develop self-regulated learning skills and

strategies. By developing these skills, students can become more independent in their learning and achieve their learning goals more effectively.

7.3 Chapter Summary

This chapter presented a detailed and comprehensive discussion of Research Question 4, which delves into the support necessary for first-year university medical students to foster their self-regulated learning (SRL) skills through the use of mobile learning. By combining insights obtained from various sources such as reflective journals, fortnight reflective workshops, and focus group discussions, a comprehensive understanding of the challenges and requirements faced by these students was achieved.

The chapter initiates by presenting the empirical findings derived from reflective journals, fortnight reflective workshops, and focus group discussions. These findings shed light on specific areas where first-year medical students require support in order to effectively develop their SRL skills. The support needed by these students in their pursuit of self-regulated learning includes the provision of technical support, guidance on the utilisation of learning apps, and assistance in identifying the most suitable applications to support their SRL endeavours.

Drawing upon these insights, the chapter presents a proposed framework in section 7.2. This framework is designed to provide effective support to first-year students in developing their SRL skills through the use of mobile learning tools, specifically within the unique context of a developing country. It outlines strategies, approaches, and interventions that can be employed to facilitate self-regulated learning and maximise the benefits of mobile learning in developing country context.

Overall, this chapter contributes to the understanding of how mobile learning can be harnessed to enhance self-regulated learning skills among first-year university medical students. By identifying the specific support requirements and proposing a framework, it provides valuable insights for educators, policymakers, and researchers interested in promoting effective self-regulated learning practices through mobile technonogies in medical education.

CHAPTER 8: SUMMARY OF FINDINGS, RECOMMENDATIONS AND CONCLUSION

> Self-regulated learning is essential for success in higher education and beyond. The ability to self-regulate one's own learning is perhaps the most important skill students can learn in college and the university, therefore universities should prioritise the development of self-regulated learning skills in their students, as it can lead to improved academic outcomes and lifelong learning habits. (Pintrich & Zusho, 2007, p.1)

8.0 Introduction

This concluding chapter encompasses a comprehensive overview of the research findings, key findings of the study, contribution to knowledge, limitations of the study, my reflections, recommendations, and conclusion. By examining the contents of the preceding chapters as a cohesive whole (Hacker, 2010), this chapter aims to synthesise the key insights from the study.

In Chapter 6, the research questions which guided this study were presented to support analytical statements. In this chapter, the research questions are presented again in order to support the overview, major findings, the limitations of the study, recommendations, contribution to knowledge, reflections and conclusion.

8.1 An Overview of the Study

The development of self-regulated learning skills is crucial for achieving success in higher education and beyond. The skill of being able to independently regulate one's own learning is of utmost importance for students during their university years. Therefore, universities should give priority to fostering SRL abilities in their students. This focus can result in enhanced academic achievements and the establishment of lifelong learning habits (Pintrich & Zusho, 2007). For this reason, the aim of this study was to explore how first-year medical students make us of mobile learning to develop SRL.

This study was conducted in Malawi, a developing nation. A mixed-methods explanatory sequential study design was employed, as data sets needed to be collected and analysed in sequence. In the first phase, quantitative data from the pre-MSLQ (Motivated Strategies for

Learning Questionnaire) provided the foundation for pairing participants based on their strengths and weaknesses in MSLQ learning strategies. In the second phase, qualitative data was collected through observations, reflective journals, and focus group discussions. Subsequently, in the third phase, the post-MSLQ collected quantitative data on students' MSLQ learning strategies. This quantitative data(pre-MSLQ and post-MSLQ) was used to if there was an improvements in SRL among the study participants.

The qualitative data contributed a deeper understanding of how first-year students leverage mobile learning to enhance their self-regulated learning. The study adopted the Extended Unified Theory of Acceptance and Use of Technology (UTAUT) model and Socio-cultural Theory as lenses for data analysis, addressing the following research questions.

1. How do first-year medical students make use of mobile learning to develop self-regulated learning?
2. What are the perspectives of first-year medical students on using mobile learning to develop self-regulated learning?
3. How does mobile learning enable and/or hinder the development of self-regulated learning?
4. How can university first-year medical students be supported to develop self-regulated learning through the use of mobile learning?

8.2 Key Findings of the Study

This section highlights and summarizes the principal findings that have emerged from the study. The findings in respect of research questions 1, 2, 3 and 4, are presented in that order.

8.2.1 Findings related to research question 1:

How do first-year medical students make use of mobile learning to develop self-regulated learning?

This study has found that mobile devices are frequently used by students to manage and control their learning both inside and outside the classroom. However, the majority of the usage was found to be outside of the classroom. Moreover, the study's results demonstrate a notable improvement

in both cognitive and metacognitive learning strategies, underscoring the positive effects of the intervention.

Regarding cognitive learning strategies, the participants exhibited improvements at a level of significance in various areas. Rehearsal, a fundamental technique for retaining information (Brown, 2014), saw significant improvement indicating that the intervention effectively facilitated students' ability to reinforce their understanding of concepts through rehearsal. Additionally, elaboration, a strategy involving the integration of new information with existing knowledge (Peverly & Sumowski, 2019), also showed an improvement. This improvement implies that students were able to connect new medical knowledge with their prior learning, leading to a deeper understanding of the subject matter. Furthermore, organisation, a crucial cognitive approach for structuring and categorizing information, experienced significant improvement, signifying that the mobile learning intervention aided students in arranging concepts in a coherent and accessible manner.

In terms of metacognitive learning strategies, the intervention had a positive impact on the participants' self-regulation abilities. Metacognition involves the awareness and regulation of one's own learning process peers (Kirschner & Karpinski, 2010). The study revealed that medical students demonstrated increased metacognitive self-regulation strategies after engaging with mobile learning. This suggests that students became more adept at monitoring their learning progress, evaluating their comprehension, and making necessary adjustments to optimise their study methods.

Furthermore, the mobile learning intervention proved instrumental in enhancing resource management learning strategies among first-year medical students. Effective resource management is essential for academic success and entails several key aspects (Tabuenca et al., 2015). Participants indicated improvements in time management skills, suggestion that they were better able to allocate sufficient time to various learning tasks and avoid procrastination. Secondly, the study environment management strategy witnessed positive improvement as well, illustrating that students learned to create conducive study spaces that minimised distractions and maximised productivity. Thirdly, the intervention encouraged peer learning, facilitating students in collaborative study sessions where they could exchange knowledge and support each other's self-regulated learning growth. Finally, help-seeking strategies were also improved, implying that

students became more proactive in seeking assistance from peers, lecturers, mentors, or online resources when facing challenges.

In conclusion, the findings of research question 1 provide compelling evidence that mobile learning has a significant impact on first-year medical students' self-regulated learning. The study highlights the improvement in cognitive learning strategies such as rehearsal, elaboration, and organisation, as well as the positive influence on metacognitive self-regulation strategies. Moreover, the intervention's role in enhancing resource management learning strategies, including time and study environment management, peer learning, and help-seeking strategies, underscores its effectiveness in fostering holistic and efficient learning experiences among first-year medical students. These results emphasise the importance of integrating mobile learning methodologies into medical education to empower students in their pursuit of academic excellence.

8.2.2 Finding related to research question 2:

What are the perspectives of first-year medical students on using mobile learning to develop self-regulated learning?

The study findings have provided valuable insights into the perspectives of first-year medical students in a developing country context regarding the use of mobile learning to develop self-regulated learning. The result of this study has found that first-year medical students perceive mobile devices as invaluable tools that greatly aid their learning process. Firstly, they appreciate the ease with which they can access and manage learning materials through mobile devices. The convenience and portability of these devices allow them to study and access relevant resources anytime and anywhere, facilitating their self-regulated learning practices.

Another significant aspect highlighted by the participants in this study is the role of mobile devices in fostering collaborative learning experiences. By utilising various mobile applications and platforms, first-year medical students engaged in group discussions, share study materials and collaborate with their peers more efficiently. This social aspect of mobile learning enhances their SRL and facilitates mutual support among the students (Sedlacek & Sedova, 2017).

Furthermore, the students acknowledged mobile devices as powerful communication tools. Through mobile devices, they could easily connect with their peers, educators, and other resources, fostering a network that promotes effective learning and provides quick access to assistance when

needed. This communication aspect of mobile devices not only aids in their academic pursuits but also creates a sense of belonging to a learning community, which positively impacts their motivation and overall academic experience (Yot-Domínguez & Marcelo, 2017).

In comparison to other traditional forms of learning, the participants believed that mobile devices make their learning more manageable and enjoyable. The flexibility and personalised learning experience offered by mobile devices empower them to tailor their study methods to suit their individual learning styles and paces. This adaptability contributes significantly to their self-regulated learning strategies, enabling them to take ownership of their learning and develop a greater sense of responsibility towards their academic progress.

Lastly, it was found that first-year medical students perceive mobile devices as facilitators of knowledge acquisition. They reported that mobile learning tools and applications contribute significantly to their understanding of concepts, enabling them to grasp new knowledge more effectively and efficiently. As a result, they feel more empowered to engage with their studies and cultivate a deep sense of intellectual curiosity.

Overall, the perspectives of first-year medical students on using mobile learning for self-regulated learning indicate a resounding endorsement of the role of mobile learning in developing self-regulated learning. The convenience, collaborative opportunities, communication benefits, and knowledge-enhancing capabilities of mobile devices have emerged as crucial factors contributing to their positive experiences as they develop self-regulated learning practices in their pursuit of medical education.

8.2.3 Findings related to research question 3:

How does mobile learning enable and/or hinder the development of self-regulated learning?

This study found that mobile devices are generally seen as enablers of self-regulated learning. Participants appreciated the flexibility and convenience of mobile learning, allowing them to access educational resources at any time and place. They reported accessing a wide range of online materials, including e-books, videos, and multimedia resources. Mobile applications like WhatsApp, Start Life, Google Drive, Google Calendar, and mind map apps were also beneficial for collaboration, organisation, time management, and idea-sharing.

Mobile devices were considered to be helpful in compressing and summarising handouts, making it easier for students to manage and revise information. Mobile learning also provided access to a diverse range of learning resources beyond traditional books. However, distractions and interruptions posed challenges to focus and attention. Participants mentioned being interrupted by phone calls, text messages, and social media notifications, which affected their learning experience.

To address these challenges, strategies were suggested, such as turning off or silencing mobile devices during learning sessions and incorporating breaks for learners to attend to urgent messages or notifications. Some participants used browser management applications to limit access to distracting content on platforms like YouTube, while others disabled social network applications like WhatsApp while using mobile devices for educational purposes.

8.2.4 Findings related to research question 4:

How can university first-year medical students be supported to develop self-regulated learning through the use of mobile learning?

The study provides valuable insights into the support required by first-year university medical students to develop self-regulated learning (SRL) through the use of mobile learning. It highlights the significance of assistance from more knowledgeable others (MKOs) in this process. The following aspects of support have been identified as essential in this study:

Guidance in selecting effective mobile applications: First-year medical students reported the need for guidance in choosing mobile applications that can effectively facilitate self-regulated learning. MKOs, such as experienced educators or knowledgeable peers, can provide valuable recommendations based on their expertise. These recommendations can help students identify applications that are specifically designed to enhance SRL and offer relevant features like goal setting, progress tracking, and personalised learning pathways.

Opportunities for collaborative learning: Collaborative learning experiences play a crucial role in supporting first-year medical students to develop SRL through mobile learning. By engaging in collaborative activities, students can benefit from exchanging experiences, insights, and strategies with their peers (Yadegaridehkordi et al., 2019). This interaction allowed them to learn from each other's successes and challenges, thereby enhancing their self-regulatory skills. MKOs can

facilitate collaborative learning environments by organising group discussions, study groups, or online forums where students can share their mobile learning experiences.

Technological skill training: To effectively utilise mobile learning for self-regulated learning, some participants indicated that they require fundamental technological skill training. The reported that they needed training in various aspects, such as internet search techniques, evaluating the credibility of online sources, and using specific mobile applications that have proven to be effective for SRL. MKOs offered hands-on training sessions in this study.

By addressing these support needs, universities empower students to leverage mobile learning as a tool for developing self-regulated learning. Collaborative efforts among educators, knowledgeable students, and other knowledgeable individuals can create an environment conducive to the successful integration of mobile learning into the students' self-regulatory practices.

Overall, the findings of the study indicated that mobile learning has a positive impact on SRL development among first-year medical students. However, learners need to be mindful of the potential risks of distraction associated with mobile device usage. To overcome these challenges, learners must develop effective strategies for managing their device usage. By taking an active role in their learning and developing the skills and strategies necessary for lifelong learning, learners can effectively utilise mobile devices to foster their SRL skills

8.3 Contribution to Knowledge

The first contribution to knowledge in this study is the use of fortnightly reflection workshops. This study makes a significant contribution to the methodology by incorporating fortnightly reflection workshops as a novel approach. The reflective workshops afforded the participants an opportunity to actively engage in sharing their experiences regarding mobile learning strategies aimed at enhancing their weak learning strategies. Rather than relying solely on individual reflections, in this study, I used group reflection. Group reflection involves a collective examination and analysis of experiences, actions, and outcomes by a group of individuals. It fosters a collaborative environment where participants can openly discuss their thoughts, perspectives, and insights, leading to a deeper understanding, improved performance, and informed future actions (Lipman-Blumen & Leavitt, 2005).

Unlike most previous studies (Al-Rawahi & Al-Balushi, 2015; Barnard-Brak et al., 2010; Gaupp et al., 2018) that solely focused on individual reflections, this study recognised the potential benefits of group reflection and employed fortnight reflection workshops. These workshops were conducted at regular two-week intervals to encourage sharing experiences among participants. By engaging in group reflection, participants were exposed to a broader spectrum of experiences that they could learn from. This approach facilitated a rich exchange of ideas and insights, enabling participants to gain a more comprehensive understanding of how mobile learning strategies improve their self-regulated learning.

The utilisation of fortnightly reflection workshops not only provided a platform for participants to share their experiences but also created a supportive and collaborative learning environment. Through these workshops, participants had the opportunity to learn from one another, draw inspiration from different perspectives, and collectively identify effective strategies to improve their individual learning strategies. The group dynamics are inherent in the workshops allowed for the emergence of diverse viewpoints, fostering critical thinking and promoting innovative solutions to improving.

The second contribution to knowledge from this study is the use of t-test in the analysis of SRL results. The study has made a valuable contribution to the field of mobile learning and self-regulated learning (SRL) by employing t-tests in the analysis of the SRL results. In contrast to previous studies (Anand, 2015; Anohah et al., 2021; Sha et al., 2012) that solely compared pre- and post-intervention mean scores without employing statistical tests, this study utilised t-tests to determine the statistical significance of the score changes. This analytical approach significantly strengthens the evidence regarding the impact of the intervention on the development of SRL among students engaged in mobile learning. By employing rigorous statistical analysis, the study offers more robust evidence supporting the effectiveness of mobile learning in fostering SRL.

Moreover, this study went beyond the traditional approach of examining the impact of SRL on mobile learning and delved into the ways in which mobile learning can actually promote SRL. This innovative perspective constitutes a substantial contribution to the field as it sheds light on an unexplored area of research. The findings of the study reveal that mobile learning can serve as an effective tool for fostering SRL among students. By emphasising this relationship, the study introduces a fresh viewpoint on the potential educational benefits of mobile learning.

In addition, the study made another noteworthy contribution by introducing a guided process for helping students use mobile learning to improve their Self-Regulated Learning (SRL). This study employed a step-by-step approach, providing students with guidance on utilising mobile learning to foster SRL skills. Consequently, educators now have a tool at their disposal that guide how to effectively support students using mobile learning to support SRL. This study's guided steps for developing SRL not only fill a gap in the existing literature on mobile learning but also offer a clear and structured process for coming up with SRL development initiative or intervention.

Moreover, the development of this framework, centred on mobile learning for SRL skill development, constitutes a significant contribution to knowledge. The proposed framework could serve as a guide for educators who wish to employ mobile learning to foster SRL skills among their students. By breaking down the process into manageable steps, the framework enhances accessibility and attainability in SRL development for students. Its practical approach and concise guidelines provide valuable resources for educators dedicated to enhancing students' SRL skills, thus improving overall students' learning experience.

8.4 Research Limitations

One of the study's limitations is that I did not have the opportunity to observe participants' use of mobile devices outside of the classroom. This was owing to the difficulty of how to achieve this since students were using mobile learning in various settings such as their hostels, libraries, and homes, to name a few. It would have been ideal for me to see and observe how the mobile device was utilised outside of the classroom. In this manner, I would have been able to gather first-hand information and comprehend how they utilise the mobile device outside of class. Unfortunately, in this study, we had to depend on student reflections on how they utilised mobile devices as they reported during the fortnightly reflective workshops. However, we are certain that the fortnightly reflection workshops generated valuable information on how the students used the mobile device to develop SRL inside and outside the classroom. In addition using self-reported improvement by the particpants presents so limitation within the scope of this study. While self-reported data can offer valuable insights into participants' perceptions and experiences, its reliance on accounts of the participants may introduce potential biases.

If I were to conduct this study again, I would include an approach that would enable me to observe a sample of first-year students using mobile devices in their learning outside the classroom**.**

8.5 My Reflections

As I embarked on my PhD journey, I diligently maintained a reflective journal to document my personal reflections. My journal served as a tool for exploring the intricate process of my learning and personal growth. Consequently, my reflection as a researcher in this study extends beyond a mere account of the activities conducted or an overview of what went well or poorly. Instead, it encompasses a continuous critical examination of the work undertaken, facilitating a process of learning and development. In this section, I will delve into my journey as both a learner and researcher, providing detailed insights into my experiences with the research activities and highlighting the achievements and challenges encountered along the way.

At the onset of this study, the implementation of intervention programs seemed impossible. Considering the demanding schedules of first-year medical students, I initially doubted their ability to allocate sufficient time over a full semester to participate in my study. To my surprise, however, I received an overwhelming response, with more than half of the classs expressing interest in participating in this study. This unexpected enthusiasm from the participants rejuvenated my spirits and instilled a sense of optimism in me.

During the first workshop, where I introduced students to the concept of Self-Regulated Learning (SRL), I observed a remarkable level of curiosity among the participants. They eagerly embraced the opportunity to delve into the intricacies of SRL and explore various mobile learning strategies. I strongly believe that this genuine curiosity motivated them to become active and engaged participants in my study, contributing to its overall success.

Following a presentation of my research proposal to Education Higher Degrees Committee (EHDC) at Rhodes Univeristy, I received valuable feedback, one of which was the questioning of whether I intended to study self-regulated or self-regulation learning. Consulting the relevant literature in response to this query, I discovered that self-regulation is a broader concept encompassing the ability to regulate various aspects of one's functioning, while self-regulated learning specifically refers to the application of self-regulation within the context of learning and academic performance. Armed with this newfound knowledge, I decided to focus on the concept of self-regulated learning in my study, recognising its relevance and potential impact on students' educational experiences.

This journey was not a bed of roses, it had its own challenges**.** One of the obstacles that I encountered during my study was the research ethics in Malawi. Before I could start my research, I had to obtain ethics approval from Rhodes University, where I was enrolled. However, this was not enough, as I also needed to obtain ethics approval from Malawi, where my research was to take place. This process proved to be tedious and laborious, and it tested my patience to the limit. For instance, the College of Medicine Research and Ethics Committee (COMREC) members were particularly strict in their rules and regulations. They scrutinised every detail of my research proposal and required me to submit numerous documents and forms. Even after submitting all the required documents, I had to wait for three months before I could receive their approval. This delay affected my research timeline and caused me a great deal of stress and anxiety.

Lastly, as I reflect on my academic journey, I cannot help but feel a tinge of disappointment. Two years into my study, I lost my scholarship, which had been a significant financial aid source. The cause of this unfortunate turn of events was my decision to change jobs due to circumstances beyond my control. For personal reasons, I can not share these details in this thesis. . My previous employer was my sponsor, and my new job did not offer sponsorship opportunities. This setback was a major blow to my academic aspirations, and I had to seek alternative funding to continue my studies.

Despite these challenges, I persisted in my studies, driven by my passion for knowledge and desire to positively impact my field of study. I had to work harder than ever before, juggling my studies with my new job and other responsibilities. It was not an easy path, but it was one that I chose, and I was determined to see it through to the end.

Overall, this PhD journey was a valuable learning experience that taught me the importance of hard work, perseverance, and resilience. It has also taught me the value of having a supportive network of family and friends who believe in me and my dreams. As I move forward in my career, I am confident that these lessons will continue to guide me, helping me overcome any obstacles I may encounter.

8.6 Recommendations

Based on the findings of this study, I recommend that educators and institutions should consider incorporating mobile learning into their curriculum to support the development of self-regulated learning skills among students. Self-regulated learning (SRL) is a crucial skill that can benefit students in taking control of their own learning by managing their time, identifying and using effective study strategies and fostering a sense of ownership over one's learning process. These can help students navigate their transition from high school to university with greater ease and confidence, setting themselves up for academic success and personal growth.

In addition, higher learning institutions should also have a deliberate policy that will create an initiative that will develop a programme that will use mobile learning to develop SRL among first-year students. This study provides evidence that mobile learning can be an effective tool for students in managing, controlling, and monitoring their learning inside and outside the classroom. Educators should also provide guidance and support for students on the effective use of mobile learning applications and tools to manage and control their learning. This can include providing training on how to use certain applications and teaching technical skills like searching for information effectively from the internet.

Moreover, it is important to note that while mobile learning can positively impact SRL development, learners need to be mindful of the potential risks of distraction associated with mobile device usage. Therefore, educators should also emphasise the importance of developing effective strategies for managing device usage to overcome these challenges. Overall, the findings of this study highlight the potential benefits of incorporating mobile learning into the curriculum to support the development of self-regulated learning skills among students.

8.7 Conclusion

Based on the findings of this study, I conclude that effectively designed mobile learning strategies can maximise the benefits of fostering Self-Regulated Learning (SRL) in first-year students. As discussed in Chapter 6, it should be noted that when using mobile learning to develop SRL, the improvement of weak learning strategies the improvement does happen with individual learning strategies, particularly when collaborative learning is involved. For example, a student could start by using a mobile device to seek help, which will result in peer learning, from peer learning, students can learn other skills like organisation, time management, and rehearsal, just to mention

a few. According to the findings of this study, mobile learning, anchored by theoretical lenses such as Vygotsky's Social Cultural Theory(SCT), presents appealing options to assist in student SRL skills development.

It should also be highlighted that there is no 'one-size-fits-all' approach to using mobile learning to develop SRL. Students utilise mobile devices in a variety of ways to foster SRL. Some develop SRL when utilising various mobile applications on mobile devices, others while sharing learning materials, and yet others while searching for information online. The findings of this study show that no single application or mobile learning approach assisted in developing SRL for a specific set of students. To encourage SRL in a certain group of students, various students utilise different mobile learning approaches or mobile applications. Above all, this study has demonstrated that mobile learning is an effective tool in fostering self-regulated learning (SRL) skills in first-year students.

In terms of contribution to the body of knowledge, this study makes two significant contributions to the field of mobile learning and SRL. By utilising statistical analysis to examine the impact of mobile learning on SRL development, the study provides more robust evidence for the effectiveness of mobile learning in education. Additionally, the study's focus on how mobile learning can foster SRL represents a new perspective on this relationship. The study's guided process for developing SRL and framework for SRL development offers practical tools for educators seeking to support student SRL development using mobile learning. Together, these contributions highlight the potential of mobile learning to improve student SRL skills and offer valuable resources for educators seeking to use mobile learning to promote SRL development in first-year university students.

Nonetheless, the use of mobile learning in the promotion of SRL has both challenges and successes. However, the findings from this study have demonstrated the successful use of mobile learning to foster SRL in medical studies. Since this study focused specifically on first year medical students, researching with students in other fields of study necessitate more research on mobile learning to foster self-regulated learning skills.

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Appendices

Appendix A1

21st March, 2022

The Registrar,
Kamuzu University of Health Sciences
Private Bag 360
Blantyre 3

Dear Sir

A request for permission to conduct educational research:
Exploring how first-year medical students make use of mobile learning to develop self-regulatory learning in a developing country

My name is Ishmael Nyirenda, and I am a doctoral student at Rhodes University, my student number is G21N24539. I respectfully request your permission to research with first-year medical study in the year 2022. I plan to conduct the study for one semester or more. This study is titled: Exploring how first-year medical students make use of mobile learning to develop self-regulatory learning in a developing country. The primary goal of this longitudinal study is to engage students in using mobile learning to develop self-regulation learning skills.

First-year university students in developing countries frequently find themselves in an educational environment that is very different from the one from which they came, and their preparedness for university studies is becoming more diverse as the university students' population is growing. In order to manage these demands of university studies, research suggests that university students must possess efficient self-regulation learning (SRL) skills. However, despite the potential benefits and overwhelming evidence supporting the efficacy and appropriateness of using mobile learning in learning in the developed world, most developing countries such as Malawi are yet to fully pursue the use of mobile learning to support the development of self-regulation learning. Against this backdrop, the proposed study intends to investigate how first-year university medical students can make use of mobile learning to develop self-regulation in a developing country. Thus, this is partly the relevance of the proposed study, and based on the literature the researcher has reviewed, an interventionist study of this type will be the first of its kind in a developing country such as Malawi.

This study will be divided into six steps: Step 1: Data collection on participants' perceptions on the use of mobile learning to develop SRL; Step 2: Pre-intervention data collection on students' competency for each of the nine cognitive learning strategies of the MSLQ; Step 3: Workshop; Step 4: Fortnight reflective workshop and observation; Step 5: Focus group Discussion; and Step 6: Post-intervention data collection on students' competency for each of the nine cognitive learning strategies of the MSLQ.

The researcher intends to start collecting data on the students' perception of the use of mobile learning to develop self-regulation learning. Studies suggest that although studies on mobile learning have found that using mobile learning in teaching and learning has yielded positive results. However, other literature argues that before any intervention to incorporate mobile devices in learning is made, it is necessary to analyze if students can, will, and want to use mobile devices for learning. After this, data will be collected on students' competency for each of the nine cognitive learning strategies of the Motivation Strategies for Learning Questionnaire(MSQL). This step aims to assess students' self-regulated learning abilities in order to get a general view of the efficacy and applicability of the learning strategies that will be utilized to develop self-regulated learning during the intervention. The data collected using the MSQL will also be used to pair students based on their strengths and weaknesses for each of the nine cognitive learning strategies. After students are paired, the researcher will hold a workshop. The researcher intends to use the workshop as a platform to orient the participants on the planned intervention. During the workshop, the participants and the researcher will come up with suggestions on possible ways of how mobile learning can be used to improve SRL guided by the MSLQ manual. After the

orientation workshop, the researcher intends to host fortnight reflective workshops, and we will do sixteen workshops in the study's eight-month period (academic year). In the reflective workshop, the researcher and participants will reflect on and discuss the entire research process to develop a guideline on how to use mobile learning to develop self-regulation learning.

Participants' participation in this research study is entirely voluntary and has the option to withdraw at any time. I request your permission to observe participants' in their classrooms. Since the study participants will be using mobile devices to manage and control their learning activities inside and outside the classroom, the researcher intends to observe how the participants (first-year medical students) will be using mobile devices to manage and control their learning activities inside and outside their classroom. After all these, I will conduct a focus group interview after the study. Data collected will not be used for other purposes apart from research. If you permit me, I will follow research ethics principles by respecting participants' opinions and contributions and any agreements I make with them to build strong trust in the study's credibility and a positive relationship. In addition, I will provide participants unrestricted access to research findings both during and after the study.

Should you have any questions, please direct them to Mr. Siyanda Manqele, Ethics Coordinator, Research Office, Rhodes University +27 (0) 46 603 7727, s.manqele@ru.ac.za or contact me directly at +265999672775, inyirenda@kuhes.ac.mw or my supervisor, Doctor C. Simuja using c.simuja@ru.ac.za or +27607124088.

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Appendix A2

21st March 2022.

The Director of Student Affairs,
Kamuzu University of Health Sciences
Private Bag 360
Blantyre 3

Dear Sir

A request for permission to conduct educational research: Exploring how first-year medical students make use of mobile learning to develop self-regulatory learning in a developing country.

My name is Ishmael Nyirenda, and I am a doctoral student at Rhodes University with the student number G21N24539. I respectfully request your permission to research with first-year medical study in the year 2022. I plan to conduct the study for one semester or more. This study is titled: Exploring how first-year medical students make use of mobile learning to develop self-regulatory learning in a developing country. The primary goal of this longitudinal study is to engage the student in using the use of mobile learning to develop self-regulation learning skills.

First-year university students in developing countries frequently find themselves in an educational environment that is very different from the one from which they came, and their preparedness for university studies is becoming more diverse as the university students' population is growing. In order to manage these demands of university studies, research suggests that university students must possess efficient self-regulation learning (SRL) skills. However, despite the potential benefits and overwhelming evidence supporting the efficacy and appropriateness of using mobile learning in learning in the developed world, most developing countries such as Malawi are yet to fully pursue the use of mobile learning to support the development of self-regulation learning. Against this backdrop, the proposed study intends to investigate how first-year university medical students can make use of mobile learning to develop self-regulation in a developing country. Thus, this is partly the relevance of the proposed study, and based on the literature the researcher has reviewed, an interventionist study of this type will be the first of its kind in a developing country such as Malawi.

This study will be divided into six steps: Step 1: Data collection on participants' perceptions on the use of mobile learning to develop SRL; Step 2: Pre-intervention data collection on students' competency for each of the nine cognitive learning strategies of the MSLQ; Step 3: Workshop; Step 4: Fortnight reflective workshop and observation; Step 5: Focus group Discussion; and Step 6: Post-intervention data collection on students' competency for each of the nine cognitive learning strategies of the MSLQ.

The researcher intends to start collecting data on the students' perception of the use of mobile learning to develop self-regulation learning. Studies suggest that although studies on mobile learning have found that using mobile learning in teaching and learning has yielded positive results. However, other literature argues that before any intervention to incorporate mobile devices in learning is made, it is necessary to analyze if students can, will, and want to use mobile devices for learning. After this, data will be collected on students' competency for each of the nine cognitive learning strategies of the Motivation Strategies for Learning Questionnaire(MSQL). This step aims to assess students' self-regulated learning abilities in order to get a general view of the efficacy and applicability of the learning strategies that will be utilized to develop self-regulated learning during the intervention. The data collected using the MSQL will also be used to pair students based on their strengths and weaknesses for each of the nine cognitive learning strategies. After students are paired, the researcher will hold a workshop. The researcher intends to use the workshop as a platform to orient the participants on the planned intervention. During the workshop, the participants and the researcher will come up with suggestions on possible ways of how mobile learning can be used to improve SRL guided by the MSLQ manual. After the orientation workshop, the researcher intends to host fortnight reflective workshops, and we will

do sixteen workshops in the study's eight-month period (academic year). In the reflective workshop, the researcher and participants will reflect on and discuss the entire research process to develop a guideline on how to use mobile learning to develop self-regulation learning.

Participants' participation in this research study is entirely voluntary and has the option to withdraw at any time. I request your permission to observe participants' in their classrooms. Since the study participants will be using mobile devices to manage and control their learning activities inside and outside the classroom, the researcher intends to observe how the participants (first-year medical students) will be using mobile devices to manage and control their learning activities inside and outside their classroom. After all these, I will conduct a focus group interview after the study. Data collected will not be used for other purposes apart from research. If you permit me, I will follow research ethics principles by respecting participants' opinions and contributions and any agreements I make with them to build strong trust in the study's credibility and a positive relationship. In addition, I will provide participants unrestricted access to research findings both during and after the study.

Should you have any questions, please direct them to Mr. Siyanda Manqele, Ethics Coordinator, Research Office, Rhodes University +27 (0) 46 603 7727, s.manqele@ru.ac.za or contact me directly at +265999672775, inyirenda@kuhes.ac.mw or my supervisor, Doctor C. Simuja using c.simuja@ru.ac.za or +27607124088.

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Appendix A3

2st March 2022

The Head of Biomedical Sciences Department,
Kamuzu University of Health Sciences
Private Bag 360
Blantyre 3

Dear Sir
A request for permission to conduct educational research: Exploring how first-year medical students make use of mobile learning to develop self-regulatory learning in a developing country

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Should you have any questions, please direct them to Mr. Siyanda Manqele, Ethics Coordinator, Research Office, Rhodes University +27 (0) 46 603 7727, s.manqele@ru.ac.za or contact me directly at +265999672775, inyirenda@kuhes.ac.mw or my supervisor, Doctor C. Simuja using c.simuja@ru.ac.za or +27607124088.

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Appendix B: Pre MSLQ and Post MSLQ

THE MOTIVATED STRATEGIES FOR LEARNING QUESTIONNAIRE (MSLQ): PART B: LEARNING STRATEGIES (Pintrich et al., 1991).

Gender: Male Female

Age: 18-20 20-22 above 22

Nationality: …….

If Malawian, Name the Region:……..

Do you want to participate in a later interview regarding this questionnaire? □ Yes, please write your email in the following box to receive the invitation.

□ No

The following questions ask about your learning strategies and study skills. **There are no right or wrong answers. Answer the questions about how you study the MBBS 1 course as accurately as possible**. Use the scale below to answer the questions. If you think the statement is very true of you, circle 7; if a statement is not at all true of you, circle 1. If the statement is more or less true of you, find the number between 1 and 7 that best describes you.

1 2 3 4 5 6 7 **No at all Very true true of me of me**							
Learning Strategy Scale							
Items	**Not at all true**						**Very true of me of me**
32. When I study the reading for the course, I use my mobile device to make an outline of the material to help me organize my thoughts.	1	2	3	4	5	6	7
36. When reading for the class, I use my mobile device to make up questions to help focus my reading.	1	2	3	4	5	6	7
39. When I study, I use my mobile device to practice saying the material to myself over and over.	1	2	3	4	5	6	7
40. Even if I have trouble learning the course material, I try to do the work on my own with the help of a mobile device, without help from anyone.	1	2	3	4	5	6	7
41. When I become confused about something I am reading, I go back and try to figure it out, and I use my mobile device to search for supplementary reading material online	1	2	3	4	5	6	7

42. When I study for this course, I go through the readings and my class notes and try to find the most important ideas, and I use my mobile device to save these ideas	1	2	3	4	5	6	7
43. I make good use of my study time for this course, and my mobile device help me manage time well	1	2	3	4	5	6	7
44. If course readings are difficult to understand, I change the way I read the material, and I use my mobile device to search online alternative ways of reading.	1	2	3	4	5	6	7
45. I try to work with other students from this class to complete the course assignments with the help of mobile device(s)	1	2	3	4	5	6	7
46. When studying, I read my notes and course readings over and over again and used my notes saved in my mobile device to support this.	1	2	3	4	5	6	7
47. When a theory, interpretation, or conclusion is presented in class or in the readings, I try to decide if there is good supporting evidence, and I use my mobile device to search for good supporting evidence online.	1	2	3	4	5	6	7
49. I use my mobile device to make simple charts, diagrams, or tables to help me organize course material.	1	2	3	4	5	6	7
50. When studying, I often set aside time to discuss the course material with a group of students from the class	1	2	3	4	5	6	7
51. I treat the course material as a starting point, and I use my mobile device to search for information online for me to try to develop my own ideas about it.	1	2	3	4	5	6	7
52. I find it hard to stick to a study schedule even if I set reminders on my mobile device	1	2	3	4	5	6	7
53. When I study for this course, I pull together information from different sources, such as lectures, readings, and discussions, and my mobile device help me keep track of all these	1	2	3	4	5	6	7
55. I ask myself questions to make sure I understand the material I have been studying in the class.	1	2	3	4	5	6	7
63. When I study for this course, I go over my class notes and make an outline of important concepts with the help of my mobile device.	1	2	3	4	5	6	7
66. I use my mobile device to try to play around with ideas of my own related to what I am learning in this course.	1	2	3	4	5	6	7
67. When I study for a course, I use my mobile device to write brief summaries of main ideas from the readings and my class notes.	1	2	3	4	5	6	7
68. When I cannot understand the material in a course, I ask another student in the course for help, and I also use my mobile device to search for answers online	1	2	3	4	5	6	7
70. I make sure that I keep up with my course's weekly readings and assignments on my mobile device.	1	2	3	4	5	6	7
72. I use my mobile device to make lists of important concepts for the course and memorize them.	1	2	3	4	5	6	7
75. I try to identify students in the course whom I can ask for help if necessary and I use my mobile device to contact them	1	2	3	4	5	6	7
79. If I get confused taking notes in class, I just record the lesson on my mobile device and make sure I sort it out afterward.	1	2	3	4	5	6	7

Appendix C : **Reflective Workshop Guide**

Reflective Workshop Guide

To be attended by all participating (first-year medical students) **Research questions in focus:**

1. How do first-year medical students make use of mobile learning to develop self-regulated learning?
2. What are the perspectives of first-year medical students on using mobile learning to develop self-regulated learning?
3. How does mobile learning enable and/or hinder the development of self-regulated learning?
4. How can university first-year medical students be supported to develop self-regulated learning through the use of mobile learning?

Agenda:

1. Welcome Address
2. presentation of reflection recorded in reflective journals
3. Discussion challenges and solutions to the challenges encountered

Tasks

- Discuss recorded experiences in their reflective journals.
- Discussion on how students are using the proposed mobile learning strategy to manage and control their learning experiences.

4. Appreciation/Closing Remark

Appendix D: Self-Regulated Learning (SRL)- Orientation Workshop Guide

Research questions in focus:

1. How do first-year medical students make use of mobile learning to develop self-regulated learning?
2. What are the perspectives of first-year medical students on using mobile learning to develop self-regulated learning?
3. How does mobile learning enable and/or hinder the development of self-regulated learning?
4. How can university first-year medical students be supported to develop self-regulated learning through the use of mobile learning?

Discussion guiding question

On each of the following Learning Strategies of the Motivated Strategies for Learning Questionnaire (MSLQ) Manual, what is the mobile learning strategy that can be used to improve how you manage and control your learning inside and outside the classroom?

Cognitive and Metacognitive Strategies

Rehearsal

Basic rehearsal strategies involve reciting or naming items from a list to be learned. These strategies are best used for simple tasks and activation of information in working memory rather than the acquisition of new information in longterm memory. These strategies are assumed to influence the attention and encoding processes, but they do not appear to help students construct internal connections among the information or integrate the information with prior knowledge.

Item No. in MSQL	Item	Proposed mobile learning strategy for improving self-regulation learning
39	When I study for this course, I practice saying the material to myself over and over.	
46	When studying for this course, I read my course notes and the course readings over and over again.	
72	I make lists of important terms for this course and memorize the lists.	

Elaboration

Elaboration strategies help students store information into long-term memory by building internal connections between items to be learned. Elaboration strategies include paraphrasing, summarizing, creating analogies, and generative note-taking. These help the learner integrate and connect new information with prior knowledge.

Item No. in MSQL	Item	Proposed mobile learning strategy for improving self-regulation learning

53	When I study for this course, I pull together information from different sources, such as lectures, readings, and discussions.	
67	When I study for this course, I write brief summaries of the main ideas from the readings and the concepts from the lectures.	
81	I try to apply ideas from course readings in other course activities such as lectures and discussions.	

Organization

Organization strategies help the learner select appropriate information and also construct connections among the information to be learned. Examples of organizing strategies are clustering, outlining, and selecting the main idea in reading passages. Organizing is an active, effortful endeavor and results in the learner being closely involved in the task. This should result in better performance.

Item No. in MSQL	**Item**	**Proposed mobile learning strategy for improving self-regulation learning**
32	When I study the readings for this course, I outline the material to help me organize my thoughts.	
42	When I study for this course, I go through the readings and my class notes and try to find the most important ideas.	
49	I make simple charts, diagrams, or tables to help me organize course material.	
63	When I study for this course, I go over my class notes and make an outline of important concepts.	

Critical Thinking

Critical thinking refers to the degree to which students report applying previous knowledge to new situations in order to solve problems, reach decisions, or make critical evaluations with respect to standards of excellence.

Item No. in MSQL	**Item**	**Proposed mobile learning strategy for improving self-regulation learning**
47	When a theory, interpretation, or conclusion is presented in class or in the readings, I try to decide if there is good supporting evidence.	
51	I treat the course material as a starting point and try to develop my own ideas about it.	
66	I try to play around with ideas of my own related to what I am learning in this course.	
72	Whenever I read or hear an assertion or conclusion in this course, I think about possible alternatives.	

Metacognitive Self-Regulation

Metacognition refers to the awareness, knowledge, and control of cognition. We will focus on metacognition's control and self-regulation aspects on the MSLQ, not the knowledge aspect. Three general processes make up metacognitive self-regulatory activities: planning, monitoring, and regulating. Planning activities such as goal setting and task analysis help to activate, or prime, relevant aspects of prior knowledge that make organizing and comprehending the material easier. Monitoring activities include tracking of one's attention as one reads and self-testing and questioning: these assist the learner in understanding the material and integrating it with prior knowledge. Regulating refers to the fine-tuning and continuous adjustment of one's cognitive activities. Regulating activities are assumed to improve performance by assisting learners in checking and correcting their behaviour as they proceed on a task.

Item No. in MSQL	**Item**	**Proposed mobile learning strategy for improving selfregulation learning**
36	When reading for this course, I make up questions to help focus my reading.	
41	When I become confused about something I'm reading for this cours3, I go back and try to figure it out.	
44	If course materials are difficult to understand, I change the way I read the material.	
55	55. I ask myself questions to make sure I understand the material I have been studying in the class.	

Resource Management Strategies

Time and Study Environment

Besides self-regulation of cognition, students must be able to manage and regulate their time and their study environments. Time management involves scheduling, planning, and managing one's study time. This includes setting aside blocks of time to study and the effective use of that study time and setting realistic goals. Time management varies in level, from an evening of studying to weekly and monthly scheduling. Study environment management refers to the setting where the student does her course work. Ideally, the learner's study environment should be organized, quiet, and relatively free of visual and auditory distractions.

Item No. in MSQL	**Item**	**Proposed mobile learning strategy for improving selfregulation learning**
43	I make good use of my study time for this course.	
52	I find it hard to stick to a study schedule(REVERSED)	
70	I make sure I keep up with the weekly readings and assignments for this course.	

Effort Regulation

Self-regulation also includes students' ability to control their effort and attention in the face of distractions and uninteresting tasks. Effort management is self-management and reflects a commitment to completing one's study goals, even when there are difficulties or distractions. Effort management is important to academic success because it signifies goal commitment and regulates the continued use of learning strategies.

Item No. in MSQL	Item	Proposed mobile learning strategy for improving self-regulation learning
60	When course work is difficult, I give up or only study the easy parts. (REVERSED)	
74	Even when course materials are dull and uninteresting, I manage to keep working until I finish.	

Peer Learning

Collaborating with one's peers has been found to have positive effects on achievement. Dialogue with peers can help a learner clarify course material and reach insights one may not have attained on one's own.

Item No. in MSQL	Item	Proposed mobile learning strategy for improving self-regulation learning
45	I try to work with other students from this class to complete the course assignments.	
50	When studying for this course, I often set aside time to discuss the course material with a group of students from the class.	

Help-Seeking

Another aspect of the environment that the student must learn to manage is the support of others. This includes both peers and instructors. Good students know when they don't know something and are able to identify someone to provide them with some assistance. There is a large body of research that indicates that peer help, peer tutoring, and individual teacher assistance facilitate student achievement.

Item No. in MSQL	Item	Proposed mobile learning strategy for improving self-regulation learning
40	Even if I have trouble learning the material in this class, I try to do the work on my own, without help from anyone. (REVERSED)	
58	I ask the instructor to clarify concepts I don't understand well.	
68	When I can't understand the material in this course, I ask another student in this class for help.	
75	I try to identify students in this class whom I can ask for help if necessary.	

Appendix E: Focus-Group Interview guide

Focus-Group Interview
(*To be answered by focus group participants: Open for discussion***)**
Attendance (Participants' Preferred name or Coded Name):
……
……

Good day. Thank you for taking part in this research. I must say that your participation, support, and the results we have got so far have been so helpful. Please feel free to share your thoughts, understanding, or critiques where necessary in this interview session, as these will assist in providing answers to the following research questions:

Research questions in focus:

1. How do first-year medical students make use of mobile learning to develop self-regulated learning?
2. What are the perspectives of first-year medical students on using mobile learning to develop self-regulated learning?
3. How does mobile learning enable and/or hinder the development of self-regulated learning?
4. How can university first-year medical students be supported to develop self-regulated learning through the use of mobile learning?

Interview Questions

1. Describe how you have been using your mobile devices to manage and control your learning activities since you join this study? Please name the specific mobile device(s) you were using; how it helped you; and where you have been using it i.e inside classroom, outside classroom, in the library/ at home/hostel.
2. Explain how you socially interact with your partner in the pair and how you were helping each other use mobile devices to manage and control your learning activities
3. In your view, in what ways did the reflective workshop help you plan your strategies on using mobile devices to manage and control your learning activities.
4. Explain some of the technological challenges you encountered as you were using mobile devices to manage and control your learning activities
5. In your view, did the use of mobile learning enable and/or hindered you in managing and controlling of your learning activities?
    i. If it enabled,explain how? or
    ii. If it hindered explain how?
6. Based on these responses, how do you think mobile learning should be incorporated into teaching and learning process for it to improve how students control and manage their learning activities?
7. In your views, did you receive the required support for you to appropriately use the mobile device to manage and control your learning activities during this study? If you feel you received the required support, please describe how the support helped you.

8. Base on your experience of using mobile device in this study, what is your view on use of mobile device on the following: a medium for communication; a medium for management and control of learning materials; a tool for effective learning; a means for collaborative learning; and a means for development of new ideas.
9. Base on your experience of using mobile device in this study, what your views on use of mobile device to manage and control your learning.

Appendix F: Observation tool

Research questions in focus:

1. How do first-year medical students make use of mobile learning to develop self-regulated learning?
2. What are the perspectives of first-year medical students on using mobile learning to develop self-regulated learning?
3. How does mobile learning enable and/or hinder the development of self-regulated learning?
4. How can university first-year medical students be supported to develop self-regulated learning through the use of mobile learning?

Observing participants using mobile learning to manage and control their learning in the classroom	
Date:	**Lesson duration:**
Description of Context:	

use of mobile learning to manage and control their learning		
Item	**Response**	Comment
Is or are the mobile device(s) used by the students during the lesson?	☐ YES ☐ NO	
To what extent did the students used the mobile device	☐ Low ☐ Moderate ☐ High	
Type of mobile device is used	☐ Smartphone ☐ Laptop ☐ Tablet ☐ others_____	

In general terms, to what extent do or are the mobile devices used by the student to manage and control their learning.	• Make the students' task easier to accomplish ☐ Low ☐ Moderate ☐ High • Help the students to complete the task faster than without it ☐ Low ☐ Moderate ☐ High • Allow students to complete the tasks that could not be feasible without the mobile device ☐ Low ☐ Moderate ☐ High • Enable students to work more independently/alone during the lesson ☐ Low ☐ Moderate ☐ High • Enable students to work more in groups during the lesson ☐ Low ☐ Moderate ☐ High • Mobile devise enables students' to further pursue the learning beyond lesson time ☐ Low ☐ Moderate ☐ High	
What was the approximate amount of time did the student used the	Select a range ☐ < 25% ☐ 25%-50% ☐ 50%-75% ☐ 75%-100%	
mobile device during the lesson/activity?		

Appendix G: Informed Consent form

Informed Consent form

This informed consent form is for first-year medical (MBBS) students at Kamuzu University at Health Sciences(KUHeS) and who I am inviting to participate in this educational research titled: *Exploring how first-year medical students make use of mobile learning to develop self-regulated learning in a developing country.*

Name of Scholar: Ishmael Nyirenda

Name of Organization: Rhodes University

Part I: Information Sheet

Introduction

My name is Ishmael Kamtagwala Nyirenda, and I am a doctoral student in Education Department at Rhodes University with the student number G21N2453. I respectfully request that you take part in this research. From August 2022, I plan to conduct the study over one semester or more. If you agree to participate, I will explain what is expected of you in detail and provide you with all the information you need to understand the study. Please note that you do not have to decide today whether or not you will participate in the research. Before you decide, you can talk to anyone you feel comfortable with about the research. This consent form may contain words that you do not understand. Please ask me to stop as we go through the information, and I will take the time to explain. If you have questions later, you can ask them about me. Thank you for your time, and I hope you will respond favourably to my request.

Purpose of the research

First-year university students in developing countries frequently find themselves in an educational environment that is very different from the one they came from. As a result, their preparedness for university studies is becoming more diverse as the university student population is growing. In order to manage these demands of university studies, research suggests that university students should possess efficient self-regulated learning (SRL) skills. However, despite the potential benefits and overwhelming evidence supporting the efficacy and appropriateness of using mobile learning in the developed world, most developing countries such as Malawi are yet to fully pursue the use of mobile learning to support the development of self-regulated learning. Against this backdrop, the proposed study intends to investigate how first-year university medical students can make use of mobile learning to develop self-regulated learning in a developing country. Therefore, we want to learn about the

perspectives of first-year medical students in using mobile learning to develop self-regulated learning, how first-year medical students use mobile learning to develop self-regulated learning, and how first-year medical students can be supported to develop self-regulated learning through the use of mobile learning. We also want to learn if mobile learning enables and/or hinders the development of self-regulated learning in first-year medical students. We believe that you can help us if you can take part in the study and be able to share your experiences of using mobile learning to develop Self-regulated learning at the end of the study.

Type of Research Intervention

The proposed research is an Interventionist study. As a result, an appropriate research process that is relevant to the study has been proposed. The researcher intends to start collecting data on the students' competency for each of the nine cognitive learning strategies of the Motivation Strategies for Learning Questionnaire(MSQL) (Pintrich et al., 1991). This data will provide a baseline score indicating students' individual strengths and weaknesses related to the nine cognitive learning strategies before implementing the intervention. The data collected using the MSQL will also be used to pair students based on their strengths and weaknesses for each of the nine cognitive learning. After students are paired, the researcher will hold a workshop. During the workshop, the participants and the researcher will come up with suggestions on possible ways of how mobile learning can be used to improve SRL guided by the MSLQ manual. After the orientation workshop, the researcher intends to host fortnight reflective workshops for four months (one semester). Students are expected to share their experiences and challenges recorded in their reflective journals during these workshops. The reflective workshop will begin with discussing the students' recorded experiences in their reflective journals. This will be followed by a discussion on how students are using the proposed mobile learning strategy to manage and control their learning experiences. After the last fortnight's reflective workshops, the participants selected for the focus group discussion will be interviewed to collect data on research questions 1, 2, 3, and 4.

Participant Selection

You are invited to take part in this research because you are in year one. Since the study is on how first-year medical students make use of mobile learning to develop self-regulated learning in a developing country. We feel you can contribute much to our understanding and knowledge of how year one medical students can make use of mobile learning to develop self-regulated learning.

Voluntary Participation

Your participation in this research is entirely voluntary. It is your choice whether to participate or not. If you choose not to participate in all the services you receive as a student will not be affected, and you have the right to withdraw at any time during your study.

Procedures

We are asking you to help us learn more about how first-year medical students make use of mobile learning to develop self-regulated learning in a developing country. We are inviting you to take part in this research project. If you accept, you will be asked to take part in using a mobile device(s) to manage and control your learning; keep a reflective journal on your experience of using a mobile device(s) to manage and control your learning; take party fortnight feedback work, and you may also be purposely selected to be part of focus group discussion.

For focus group discussions

In the event that you are selected to be part of the focus group, please note that you will take part in discussion with 6-7 other persons with similar experiences. This discussion will be guided by me.

The group discussion will start with me, and I will make sure that you are comfortable during the focus group discussion. We will be given a chance to ask questions about the research that you might have. Then we will ask you the questions indicated below in the **Focus-Group Interview guide** and give you time to share your knowledge. The questions will be about your experience of using a mobile device to manage and control your learning. **We will not ask you to share personal beliefs, practices or stories, and you do not have to share any knowledge that you are not comfortable sharing**. The discussion will take place at the Kamuzu University of Health Science Mahatma Gandhi campus in Blantyre, and no one else but the people who take part in the discussion or me will be present during this discussion. The entire discussion will be recorded, but no one will be identified by name on the tape. The recorded file will be on my computer in a password-protected file. The information recorded is confidential, and no one else except myself will have access to the recorded file. The file will be destroyed soon after my PhD Thesis is approved by both the internal and external examiners.

Duration

This study will take place for four months in total. During that time, you will be asked to take part in using a mobile device(s) to manage and control your learning; keep a reflective journal on your experience of using a mobile device(s) to manage and control your learning; take party fortnight feedback work, and you may also be purposely selected to be part of focus group discussion.

Risks

The study poses a low risk to the participants. Considering that even though you may have a mobile device(s) but your technical abilities to use the gadget appropriately might not be the same compared to your counterparts. In some cases, this might create fear/anxiety in you that your technological knowledge gap (if any) may be known to your peers and me, the researcher, which may shame you. Please note that whatever happens during data collection, I will keep strict confidentiality and privacy between me, the participants, and my two research supervisors. Above all, I will always reflexively think of my position as a researcher and conduct the study ethically and follow all KUHeS and Rhodes University research principles. Lastly, through the fortnight reflective workshop, I will be checking your progress on the improvements in your weak learning strategies that will be identified at the begging of the workshop.

Benefits

The study has the potential to help you to take part in the activities of this study, such as using a mobile device to manage and control your learning. This will offer you an opportunity to develop self-regulated learning. This will result in you becoming an autonomous learner who can manage and control your own learning using a mobile device. Improvements in self-regulated learning will help you easily adjust to university studies and achieve early academic success, which you can build on throughout your studies in MBBS at KUHeS. The study will also offer you an opportunity to share your own experiences with using mobile learning to develop SRL with your fellow MBBS 1 students. Theoretically, the findings from the study may offer the potential to contribute to the development of a theoretical framework for the development of self-regulation using mobile learning in higher education institutions (HEIs) based on the developing country experience. It may also help experiential understanding of how the interaction between the user and mobile device(s) can influence the development of self-regulated learning.

In terms of policy and practice, this study's findings might provide developing countries with empirical findings that can be relied on in making decisions regarding mobile learning technologies in higher education institutions (HEIs). Furthermore, since most studies are based on developed country experiences, this study will be based on developing country experiences and hence will contribute to the literature knowledge base for future studies on self-regulation, mobile learning, and the education technology field from a developing country perspective.

Reimbursements

You will not be provided with an incentive to take part in this study. However, we will give you k1000 for your time.

Confidentiality

We will not be sharing information about you with anyone outside of the research team. The information that we collect from this study will be kept private. Any information about you will have an identifier on it instead of your name. Only me will know what your number is, and I will keep the information in a password-protected file on my computer. It will not be shared with or given to anyone except Professor Kenneth Ngcoza, and Dr Clement Simuja will have access to the information as my supervisors.

If you are selected for the focus group discussion, we will ask you and others in the group not to talk to people outside the group about what was said in the group. We will, in other words, ask each of you to keep what was said in the group confidential. You should know, however, that we cannot stop or prevent participants who were in the group from sharing things that should be confidential with other people outside the group.

Sharing the Results

Nothing that you tell me in this study will be shared with anybody outside the research team, and nothing will be attributed to you by name. The knowledge that we get from this research will be shared with you and my supervisors before it is made widely available to the public. Each participant will receive a summary of the results. There will also be small meetings with all the research participants to share the findings of the study at the end of the study. Following the meetings, we will publish the results so that other interested people may learn from the research.

Right to Refuse or Withdraw

You do not have to participate in this research if you do not wish to do so, and choosing to participate will not affect your study at KUHeS in any way. You may stop participating in the fortnight reflective workshop or the focus group discussion at any time you wish without your study at KUHeS being affected. I will give you an opportunity at the end of the focus group discussion to review your remarks, and you can ask to modify or remove portions of those if you do not agree with my notes or if I did not understand you correctly.

Who to Contact

If you have any questions, you can ask them now or later. If you wish to ask questions later, you may contact me on 0999672775/0885727445. This proposal has been reviewed and approved by the Rhodes University Education Ethics Committee in South Africa and the local IRB- College of Medicine Research and Ethics Committee(COMREC). COMREC is a committee whose task is to make sure that research participants are protected from harm. If

you wish to find out more about the COMREC, contact the COMREC Chairperson on 0888118993

Part II: Certificate of Consent

- I understand the purpose of the research study and my role in it.
- I understand that I shall be conducting this study with a doctoral student as requested.
- I understand the benefits of participating in this research study may affect how I make use of mobile learning to improve my self-regulation learning skills.
- I understand that the researcher and I may reach an agreement on anonymity in the study.
- I understand that I shall frequently participate in the study's design
- I understand the data collection instruments to be used in this research include workshop, observation, focus-group interview, and reflection.
- I understand and agree that there shall be a focus-group interview at the end of the study.
- I understand and agree that the focus-group interview and workshop proceedings will be recorded electronically.
- I understand that the researcher shall select participants for focus group interviews based on frequent participation and willingness to use mobile learning to improve self-regulation learning skills.
- I understand that some of the classes I will attend will be observed fortnightly by the researcher.
- I confirm that I am not participating in this study for financial gains.
- The Rhodes University and COMREC have given ethical clearance to this research project, and I have seen the clearance certificate.
- By participating in this research project, I will contribute to using mobile learning to develop self-regulatory learning.
- I will participate in the fortnight reflective workshops frequently to reflect and share my experience of using mobile learning to improve my self-regulation learning skills.
- I understand that I will be participating in a reflective workshop to discuss and reflect on suggesting a guideline for using mobile learning to improve my self-regulation learning skills.
- My participation is entirely voluntary, and should I at any stage wish to withdraw from participating further, I may do so without any negative consequences.
- I am aware that the researcher plans to publish the research findings in a thesis, conferences, conference proceedings, book chapters, or journal articles. Confidentiality and anonymity of records, on the other hand, will be maintained or agreed upon.
- I am aware that the researcher may invite me to conferences and seminars to hear his presentation on the study's findings.
- The researcher will answer any further questions that I might have concerning the research or my participation.

I have been invited to participate in research about using mobile learning to develop Self Regulated Learning.

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it, and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study.

Print Name of Participant_____

Signature of Participant _____
Date _____
Day/month/year

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this ICF has been provided to the participant.
Print Name of Researcher/person taking the consent_____

Signature of Researcher /person taking the consent_____

Date _____
Day/month/year