UNIVERSITY OF CAPE COAST

FACTORS AFFECTING COMPLETION OF POSTGRADUATE MATHEMATICS EDUCATION STUDENTS IN A GHANAIAN UNIVERSITY

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BY

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Thesis submitted to the Department of Mathematics and ICT Education of the Faculty of Science and Technology Education, University of Cape Coast, in partial fulfilment of the requirements for the award of Master of Philosophy degree in Mathematics Education

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DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature:..... Date:.....

Name: Praise Vera Agbelengor

Supervisor's Declaration

I hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Supervisor's Signature:..... Date:.....

Name: Dr. Isaac Benning

ABSTRACT

The study was conducted to explore the completion of MPhil mathematics education students as well as the factors that can facilitate the completion of these postgraduate students in a Ghanaian university. An explanatory sequential mixed method design was adopted for the study. Data were collected using questionnaire and semi-structured interview. A sample size of seventy-nine MPhil mathematics education students responded to the questionnaire. Also, purposive sampling was used to select eight graduates for the interview. The quantitative data were analysed using descriptive statistics. The findings indicated that most MPhil mathematics education students take more than the maximum duration of three years to complete their study. Some student-related factors which can facilitate completion included: sufficient knowledge in data collection, motivation, work schedules of students as well as their interaction with the supervisors. In addition, supervisory-related factors such as working independently under supervisors' guidance, the ability of students to approach supervisors, constructive criticisms and helpful suggestions given by supervisors can affect the completion of the programme of study. The study again discovered that workshops organized by the department and the university on thesis writing can affect the progress of students' thesis writing. Some recommendations were made based on the findings.

KEYWORDS

Completion

Institutional-related factors

Late completion

Supervisor

Student-related factors

Supervisory-related factors

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DEDICATION

To my parent: Agbelengor Emmanuel and Akwayena Emelda

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LIST OF ABBREVIATIONS

UCC	University of Cape Coast
KNUST	Kwame Nkrumah University of Science and Technology
USA	United State of America
UK	United Kingdom
MPhil	Master of Philosophy
MME	MPhil Mathematics Education
SGS	School of Graduate Studies
PhD	Doctor of Philosophy
DR	Dissertation Research
DMICTE	Department of Mathematics and ICT Education

CHAPTER ONE

INTRODUCTION

As education is important universally, likewise mathematics education since it trains individuals with diverse skills. Considering the curriculum, mathematics plays a useful role in it (Wanjala, Aurah & Symon, 2015). Mathematics is seen as an important subject, hence in Ghana, it is a compulsory subject at basic and secondary school. Although the education system in Ghana places a great deal on mathematics, other countries differ. For instance, in United Kingdom (UK), mathematics is not compulsory for students who are 17 years and above in both England and Wales (Darlington & Bowyer, 2017). This suggests that learning mathematics after 16 years depends on the individual in certain places. Thus, mathematics is a universal language, but not compulsory subject.

Generally, postgraduate education is very important to all nations because it helps to address both economic and social needs of the country (Parker-Jenkins, 2016). However, in Ghana the completion of postgraduate students turns to be very low (Amehoe, 2013). Hence, this study explores factors that can affect the completion of MPhil mathematics education students.

Background to the Study

Several decades have passed yet some students still find it difficult to find the relevance of mathematics in our everyday life but companies, industries and government as a whole continue to hail the importance of the subject. According to Ebiendele (2011), the universal language that we all communicate through is mathematics. This explains that the knowledge

about addition, subtraction, multiplication and division in Ghana is the same in every part of the world. Since mathematics is a universal language, then it is important to all disciplines. Again, in Ghana, mathematics continues to be a core and compulsory subject at basic school levels thus used as a requirement for any programme offered at the tertiary level (Anamuah-Mensah, Asabere-Ameyaw & Dennis, 2005).

The nature of mathematics in Ghana is such that, teachers who qualifies to handle it must be well endowed in the knowledge and delivery of the course. Due to this teacher may have to go through training colleges and universities in order to be well trained in the subject matter. According to Dwarko and Kwarteng (2003), University of Cape Coast was established because highly qualified and skilled human resources were awfully needed in education. The original role of UCC according to Dwarko and Kwarteng is to train graduates to become professional teachers for the country to improve on our education. For this reason, Mathematics teachers need to receive training to become professionals in their field that is why programmes such as Bachelor of Education (B.Ed.) mathematics, MPhil mathematics education and PhD mathematics education are offered in some tertiary institutions. Mathematics education is a programme that trains people to be professional teachers so that they communicate mathematics to students with the right approaches. According to Odili (2012), mathematics educator should be well vest in curriculum development, have good pedagogy to teach and be able to develop lessons to be delivered. Mathematics education contributes to the country's growth and

development by training teachers to be creative, be an entrepreneur and be an enquirer (Abah, 2016).

To acquire MPhil and PhD certificate, you need to write thesis for one year and two years respectively for each programme. Thesis writing also counts a lot in completion of post graduate program that is why Henson, Hull and Williams (2010) revealed that the nature and quality of a post graduate education goes in hand with the nature and quality of research.

University education in Ghana has a cardinal aim to produce skilled and industrious people since they will be the pioneer of economic and national development (Quansah, Appiah & Ankoma-Sey, 2019). Therefore, university education plays a major role in the growth of the country but the problem has to do with the completion rate of those that enrolled in the university education. The post graduate students taking longer time to complete their programme and low completion among them is globally disturbing (Githae, 2021).

According to Spaulding and Rockinson-Szapkiw (2014), the global graduation rate of doctoral degree is 50%, but pertaining to MPhil dissertation**,** Swanepoel, (2010) reveals that students under supervision who complete their thesis are only a quarter of the students. Likewise, Bunting and Sheppard (2012) identified that countries in Southern Africa have their rate of completion among the doctoral students below 20% until 2004 where the improvement started. It has been buttressed that for South Africa, the graduation is poor as low as 20% for master's degree and 12% for doctoral degree (Sonn, 2016). Also, in South Africa, it was reported that greater number of postgraduate students (more than 61%) spent six years

and above before they graduate (Mphekgwana, Mabila Tirivangasi & Makgopa, 2020).

Again, in Australia the enrollment of domestic and international postgraduate students from 2010 to 2016 sums up to 437,030 but only 65,101 completed within six years (Bednall, 2018). In addition, more than 61% PhD students in Pakistan, take more than two years above the stipulated time to be able to finish their study (Ahmed, Akhtar, Ahmed, Bano & Jaffar, 2021). It was also reported by Costa Bispo and Pereira (2018) that the completion rate of the PhD students within the stipulated time in Brazil stands at around 37%. At Stanford University, the Department of Chemical Engineering website in 2013 revealed that the mean or average year of completing PhD programme is between 4.5 and 5.5 years. Some students are in their tenth year yet are still on their research work while others also used three years to complete. Based on these studies it can be said that the completion of postgraduate students within the stipulated time is a problem in developed countries.

In Nigeria the duration for completion of PhD programmes differs from one university to another, mostly 3 or 4 years but the average duration PhD students used in completing their study ranges between seven (7) to eight (8) years. Some of them do not complete their thesis because of frustration (Duze, 2010) but according to Duze majority of Nigerians who go outside for their post graduate degree usually complete within the minimum time frame. Some factors that have been stated for the completion rate are supervision, family and mode of study just to mention a few.

The question however is, what accounts for the low completion rate among the postgraduate students? Some contributing factors from literature are; sex (Spronken-Smith, Cameron & Quigg, 2018); age (Roets & Botma, 2012), employment and marital status (Wamala & Oonyu, 2012), supervision (Rauf, 2016; Pitchforth et al., 2016; Harrison & Grant, 2015), finance (Osei, Otchere, Banunle, & Dontwi, 2017; Nevill and Chen, 2017), and motivation (Amida, Algarni & Stupnisky, 2021; Spaulding & Rockinson-Szapkiw, 2012) just to mention a few.

Also, in Ghana several scholars revealed that postgraduate students especially masters' students take longer period to complete their studies (Amehoe & Botha, 2013 and Davis & Venter, 2011). This can hamper the development of the university and the country at large especially as postgraduate students' enrolment increases in both developed and developing countries especially PhD students (Cloete, Mouton, & Sheppard, 2015; Cyranoski, Gilbert, Ledford, Nayar and Yahlia, 2015).

A study by Akparep, Jengrey and Amoah (2017) revealed that successful completion of postgraduate depends on both the student and the supervisor. Again, Botha (2016) mentioned both student-related and institutional-related factors as some contributing factors accounting to delay in students' completion and drop-out.

It is on the basis of the above background that this study seeks to explore the completion rate of MPhil mathematics education students and the factors that can account for such completion in a university in Ghana.

Statement of the Problem

Mathematics as a subject is regarded as a prerequisite for the advancement into higher education in several countries. Consequently, the subject is treated as a core subject at the basic school and secondary school level in most nations like Ghana. Since it is a core subject, it is mandated for every student to pursue it hence it presupposes that the number of mathematics teachers in the second and tertiary cycle institutions are expected to be more.

However, Sims (2017) revealed in his study that England had an overall shortage of mathematics teachers since 2012/13 academic year and again severe shortages since 2016/17 academic year. In addition, mathematics has been identified in a government report as the worst shortage subject among other subjects (MAC, 2016). Again, subjects such as mathematics and science, have experienced shortage of teachers since the 1950s while special education has had perennial shortages since the 1960s (U.S. Department of Education Office of Postsecondary Education, 2017). Possessing an MPhil or PhD certificate is one of the professional means to become a qualified mathematics teacher but Mugendi and Githae (2021) lamented about how several students use longer period to complete their theses and others do not even complete at all.

In addition, it has been revealed that universally, the completion rate of postgraduate studies has not been as desired (Bekova, 2021). In addition, Rockinson-Szapkiw and Spaulding (2014) also revealed that universally, doctoral completion rate is 50%. This means that there a huge challenge associated with the completion of postgraduate students that have to be

dealt with. In as much as Africa is interested to increase the numbers of MPhil and PhD students (Drennan, 2008; Roets & Botma, 2012), the students, supervisors, the institution and the financial supporters are also interested and mostly much focused on their early and prosperous completion (Jiranek, 2010).

Some studies were done in the area of postgraduate students' completion rate but most of the studies focused only on the PhD students. Again, many of the works done pertained to postgraduate students in general and not in one specific programme (Can, Richter, Valchanova, & Dewey, 2016; Shahsavar & Kourepaz, 2020; Van de Schoot, Yerkes & Mouw, 2013; Twebaze, 2023). In addition, some of the studies basically took into consideration only supervisory factor in the completion of students (Ali, Ullah & Sanauddin, 2019; Chugh, Macht & Harreveld, 2022; Seidu, 2015; Teklesellassie, 2019).

The issue concerning completion of postgraduate students in the developed countries is not different from that of the developing countries. In Ghana for instance, during the 19th congregation at University of Education, Winneba, it was addressed that there was an increase in the enrolment of MPhil and master of Education (M.Ed) students but completing on time remained a challenge (University of Education, 2014). Similarly, during the 46th congregation of school of graduate studies and research, the dean stated that most postgraduate students were unable to complete their thesis on time (University of Cape Coast, 2014). This means that low completion rate is a great challenge to many universities.

In Ghana, a number of studies were conducted pertaining to the completion time of postgraduate students (Asante, 2016; Osei et al., 2017; Antwi, 2020) but these studies do not focus on one specific MPhil programme. For instance, Asante (2016) in his study focused on all postgraduate students in the Kwame Nkrumah University of Science and Technology (KNUST) and UCC and also limited it to the challenges that students faced when during their research work. Also, a study by Osei et al. (2017) specifically emphasized on only Distance Education students in KNUST. Similarly, Antwi (2020) centered his study on four different programmes under MPhil Education in KNUST. Again, the study focused on both distance and regular students.

Globally, it had been reported that students' enrollment into postgraduate education has been on the rise (Sidhu, Kaur, Lim & Chan, 2016). For example, over the past five academic years, the enrollment of MPhil mathematics education students in one of the Ghanaian universities has been on the increase according to the enrollment statistics from the Department of Mathematics and ICT Education (DMICTE). Even with this increase, students are not able to complete their programme within the stipulated two years. For instance, the students' enrollment increased from five (5) in 2016 to nineteen (19) in 2017 and again to 29 students in 2018. The students who were enrolled in 2016 and 2017 were expected to complete in 2018 and 2019 respectively. However, based on completion list from DMICTE, those who completed in 2018 and 2019 enrolled even before 2016 and 2017 academic years.

With the reference to the studies discussed earlier in the statement, there is the need to focus on a specific postgraduate programme hence the study, factors affecting the completion of MPhil Mathematics Education (MME) students in a Ghanaian university.

Purpose of the Study

This study was designed to determine the percentage of MME students who completed within the specified periods of the university: expected two years (minimum), three years (maximum) and beyond three years of enrolment. Also, the study seeks to explore factors affecting the completion of MME students in a Ghanaian university.

Research Questions

Four research questions were formulated to guide this study.

1. What is the completion rate of MPhil mathematics education (MME) students within the specified periods of the university?
2. What student-related factors affect the completion of MME students?
3. What supervisory-related factors affect the completion of MME students?
4. What institutional-related factors affect the completion of MME students?

Significance of the Study

The study seeks to know the percentage of MME students who completed within the specified period of the university: expected two years (minimum), three years (maximum) and beyond three years of enrolment. Again, the study seeks to explore the factors that contribute to MME

students' completion. The findings may be useful to the university in policy making relating to the completion of postgraduate students.

In addition, the findings may also help students to know some roles they have to play during postgraduate programmes to complete on time that, knows the reality on the ground. Moreover, the findings of the study may help prospective students and those already on the programme to know some of the challenges in the system and how to deal with them. Students may also have foreknowledge about things they do which can delay their completion.

Again, the findings would reveal some of the roles supervisors as well the university play which can contribute to the completion of MPhil mathematics education students. Finally, the study may serve as a source of literature for other researchers who want to conduct a study relating to completion and factors that affect the completion of postgraduate students.

Delimitations

The study was delimited to Master of Philosophy (MPhil) mathematics education students in only one university in Ghana. It was specifically delimited to students who were enrolled from 2015 academic year through to 2019 academic year. This category of MME students was selected because they had spent a maximum of three years for that matter, they would be able to provide the rich information on the factors that can affect the completion of the MME programme.

Also, student-related factors were delimited to students' research knowledge in mathematics education, student's characteristics and their communication with their supervisors. The supervisory-related factors were

also limited to supervisor-student relations, research support of the supervisor and supervisors' feedback while institutional-related factors were delimited to teaching/learning resources, thesis writing procedures and support services from the university.

Limitations

The survey was via online to gather the quantitative data for this research. But, collecting data online has limitations because respondents might not want to complete the survey. Hence, the researcher constantly sends reminders to the respondents through phone calls and text messages to increase their response rate.

Also, computing the duration of completion was done manually by the researcher based on the enrollment and completion data available at the department. As a result, the data might have a few inaccuracies. However, the information was checked by the students to correct these errors.

Definition of Terms

Completion rate: This is the proportion of students enrolled in a particular year who complete a programme within the expected and the statutory extension period.

Supervisors: They are lecturers who are appointed by the university to serve as a guide for students during their thesis writing.

Student-related factors: These refer to the research knowledge of students, their personal factors such as motivation, time management, work schedules and their financial capacity as well as the way they communicate with their supervisors.

Supervisor-related factors: These refer to how supervisors relate with their students, feedback given to students and the research knowledge of students.

Institutional-related factors: These refer to the teaching and learning resources and thesis writing procedures of the university as well as support services provided to students.

Late completion: This is the situation where MPhil students are unable to complete their programme of study within the expected two-year period of the university.

Organisation of the Study

This study comprised five chapters. Chapter one is introduction which again consists of background of the study, statement of the problem, purpose of the study, research questions/hypothesis, delimitation and limitation of the study. The chapter two involves the literature review where the researcher reviews related articles to the study. Also, the literature was reviewed based on some sub topics: completion rate of postgraduate students, theoretical framework, empirical review on the factors affecting completion and conceptual framework. In the chapter three, the research method of the study was discussed. This includes the research design, population of the study, sampling procedure, data collection instruments, data collection procedures, pilot testing of the instrument, validity and reliability, data processing and analysis, ethical consideration and chapter summary. Chapter four comprises results and discussion and finally Chapter five covers the summary, conclusions, recommendations and suggestions for further studies.

CHAPTER TWO

LITERATURE REVIEW

Overview

A number of studies have been conducted to look at the factors that affect the completion rate of postgraduate students. As a result, this chapter focused on the review of some relevant related literatures. This chapter entailed theoretical framework, conceptual framework and empirical review. The empirical review was structured based on the subheadings; completion rate of postgraduate students and the factors affecting completion (student, supervisory, and institutional-related factors). Finally, a summary of the whole chapter was given.

Completion Rate of Postgraduate Students

A lot of scholars and articles explained completion (Hauser & Koenig, 2011; Horne & Naude, 2007; Latief & Blignant, 2008). Some of the articles refer to completion rate as the same as throughput rate. Higher Education Funding Council for England [HEFCE], (2005), defined completion as the period a student first register to read a programme till the date approval is given to award students with their degree. Caincross (1999) also gave a vivid definition that goes with this study. He defined completion as the ability of a student to start and successfully end a programme hence a certificate awarded on their completion without much emphasis on the duration used in finishing the program. From all the definition, completion rate is all about a successful ending of a programme of study.

Every academic year, tertiary institutions, enrolment continue to increase but one of the major obstacles is the length of time it takes to

complete. According to reports, more students are enrolling in postgraduate programmes globally (Sidhu et al., 2016). In Africa, governments are keen about increased in enrolment of postgraduate students (Roets & Botma, 2012) but the completion and retention of students has turn out to be 'big business for researchers, educators and entrepreneurs alike' (Sondlo, 2016, p. 2). In addition, Lube, Worrel, and Klopper (as cited in Wadesango, & Machingambi, 2011) observed that globally, graduate students' completion rate varies from being poor to an appalling stage.

Recently, a study by Mugendi and Githae (2021) revealed that many students either take longer than expected or never complete their theses. Additionally, it has come to light that the completion rate of postgraduate study has not generally been as desirable (Bekova, 2021). Globally, colleges and universities have issues with the number of years students use to complete their programme of study, how effective the postgraduate training is and the high dropout rate of postgraduate students (Reason, 2017; Sondlo, 2013).

The concern of completion and retention among postgraduate students started way back in 1930s at United State as stated by early researchers and this situation was termed as 'student mortality' - students who do not finish their programme of study (Berger, Lyon &, Seidman, 2005). A number of studies have communicated worries about the duration students employ in their postgraduate education (Amehoe, 2014; Lessing & Schultze, 2002; Sondlo, 2016; Thomas, 2015). This means that the issue of postgraduate completion with regards to the number of years used is very important to a lot of researchers with stakeholders and governments.

According to Hadi and Muhammad (2019), postgraduate challenges affect both developing and developed countries, however developed nations emphasize attending and resolving the issues quickly because of the abundance of resources. In South African universities only 15% of postgraduate students graduate in a timely manner, graduate in a timely manner, and this is seen as the standard by the students (Bopape, 2018). The study of Barasa and Omulando (2018) revealed that just 11% of PhD students in Kenya complete their studies on average in 6 years. Additionally, Barnard and Fourie (2013) established that the low output experienced by both local and international educational institutions has an adverse effect on the institutions' resources and places financial burden on the students.

Theoretical Framework

The General System theory and Jiranek's Dissertation Completion Triangle model underpinned this study. These theories helped explore and identify the factors affecting the completion of postgraduate students.

The General System Theory

The General System examines the association that exist between structures as well as the wholeness of these structures. The theory was named after Ludwig Von Bertalanffy in the 1950s. He defined a system as a "set of elements in interaction" (Bertalanffy, 1973, p.84). Occasionally, the word "holistic" is used interchangeably with System (Bertalanffy, 1973).

Again, the theory plays trans-disciplinary role because the concepts involved in its development are from different disciplines such as biology, physics, philosophy of science and engineering. For this reason, the theory

is applicable to many fields of studies such as social science, mathematics, economics, and biology. To emphasise, Bertalanffy explained general system as a theoretical system which is applicable to many disciplines.

Under this system the world is recognise in terms of relationship and integration for that matter anything in it is interrelated. The principle of organisations is the approach of the system theory. According to Bertalanffy (1956), the system theory entails division of goals among staffs in an organization. He further explained formal organizations as organisations set up for the purpose of achieving common goals or objectives. The structure of organisations according to Handy (2006) is described by the roles people play, positions people occupy, departments and sections found in that organisation.

The theory points out that organisations either public or private are describe as complex entities which if classified as system will be well understood. Bertalanffy (1968) emphasized that when the environment of an organization made up of complex entities is understood using a system point of view then the system theory is been adopted. In addition, each system recognizes a number of super-systems and a variety of sub-systems whose contribution to the interaction, collaboration, and dissemination of information and resources is central to the achievement of the objectives of the organization. One thing the theory is silent about is how the environment and the components interact.

The systems theory has been employed in several research studies involving organizations across several disciplines in academia and business. For instance, Rong'uno (2016) employed the systems theory to explore the

factors that affects completion rates of doctoral students in Kenya. Consequently, the system theory was a suitable one to underpin this study because the university involved in the study can be described as an organization which consists of sub systems; colleges, faculties and the departments in the school. These sub systems have their roles assigned to them and these roles are interconnected in such a way that if each sub system performs its duty diligently then the vision or the common goal of the universities will be accomplished.

Jiranek's Dissertation Research model

The second theory to underpin the study is the Jiranek's Dissertation Research (DR) Completion Triangle model. As the name portrays, the proponent of the model is Vladimir Jiranek in the year 2010. This model was adapted from Tinto's integration model and it focused on the research period of education. Although the model was based on only dissertation research, it was employed in this study since thesis writing mostly affects student's completion in the university. Moreover, the model was developed based on studies pertaining to completion rate of students.

The development of the model was based on several studies on completion rate of postgraduate students in some countries which include studies in Australia as well as UK. Some of the studies that Jiranek based his model on include Kearns, Gardiner and Marshall (2008); Wright (2003); Wright and Cochrane (2000); and his own study, Jiranek (2010). A lot of factors were identified as factors affecting students' thesis completion. Among these studies, the study of Wright and Cochrane (2000) considered the following variables; gender, Faculty (Science, Humanities and Arts),

and age but among these factors only Faculty had a significant effect on successful and early submission of thesis. Also, the study of Kearns, Gardiner and Marshall (2008) pointed out that for a successful completion, the supervisor and time management on the part of the students are key.

Based on the factors identified in the studies above, Jiranek developed his model by classifying the factors into three main parts (Jiranek, 2010). The classifications include; student factor, supervisor's factor and availability of resources and facilities. The student factor includes student's financial status, skills and the ability to manage time. The supervisor factor entails the quality of the supervisor, how regular students meet their supervisors and the assistance that students receive from supervisors while the resources include availability of teaching materials. There exists interrelationship among these three factors are illustrated in Figure 1.

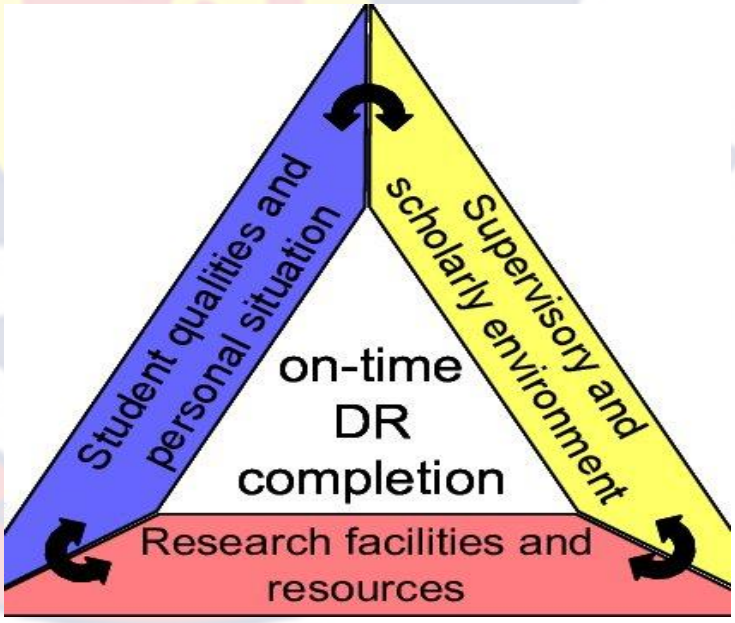


Figure 1: Thesis completion model (Jiranek 2010)

Empirical Review

This section presents a review of empirical studies on factors affecting the completion of postgraduate students. Concerning the factors that lead to late completion of postgraduate students, it does not depend solely on a factor rather factors. Numerous studies have classified factors affecting non-completion rate under three broad factors; and students characteristics, quality supervision and institutional environment (Ghatak, Menon & Mahanty, 2021; Komba & Chiwamba, 2018; Motseke, 2016; Ndayambaje, 2018; Spronken-Smith et al., 2018; Thomas, 2019; Van Rooij, Fokkens-Bruinsma and Jansen (2021); Ward & Brennan, 2020), Similarly, based on other studies Jiranek (2010) classified three factors to affect postgraduate students' thesis completion. These factors are student qualities and personal factors, supervisor's quality and nature and availability of resources and facilities. In addition, student issues, institutional factors, and supervisory factors have all been highlighted as obstacles to postgraduate student success in Malaysia (Singh 2018). Based on the above researches, it can be concluded that three factors (student, supervisory and institutional) affect the completion of postgraduate students.

Student-Related Factors

The student plays a vital role in the completion of postgraduate education programme. The student is key because he or she owns the research when it comes to writing the thesis. There are numerous roles that students need to play and this can affect the completion rate negatively or positively. According to Hadi and Muhammad (2019), the individual circumstances of postgraduate students have a significant impact on how

they tackle the entire research process. Again, Ekpoh (2016) revealed student-related factors as one of the factors that affect thesis writing. Hence, the role of students is key to the early completion of thesis thus completion of the whole postgraduate process. The following student-related factors were discussed below: financial factor, research knowledge of students, motivation, employment status, time management and personal characteristics.

Financial factor

In the first place, students' capability to fund the entire postgraduate education is paramount to the programme's completion rate. Many people in Ghana who qualify to attend university are unable to go because of the high cost involved (example; admission fees, accommodation fees, purchase of books and so on). Again, those who get the chance to enter the university find it difficult to complete because of the same challenge. Financial inconsistencies possess a lot obstruction to students (Mapolisa, 2013; Goldrick-Rab, 2016). A study by Turner found that "school interest and school finishing" were dependent on family pay (Turner, 2014, p. 36). This means the level of interest in education and the ability of students to complete their schooling is influenced by the financial status of their families. Again, a study conducted by Nevill and Chen (2017) distinct monetary provision as a key element that hinders the completion rate of doctoral students. In addition, a recent study by Mugendi and Githae (2021) revealed that most postgraduate students mentioned financial difficulties as the main reason why they did not complete their degrees.

Correspondingly, Hickman (2003) in his study pertaining to distance education students pointed out one challenge affecting low completion among many other factors as cost of tuition and financing other expenses. This normally results in deferment of their programme of study. According to Rong 'uno (2016), the "nervous system" of any research project involves proper monetary support. This confirms that money is needed to complete the research stage of students' especially postgraduate students, right from paying school fees, printing of questionnaires, travelling to do interviews and observation, traveling to see supervisors and other aspects of research. As a way to tackle this challenge, Botha (2018) suggested that universities should take into account establishment of Postgraduate Research Endowment Fund (PREF). This fund would render support to postgraduate students who have financial difficulties during their research.

Research Knowledge of Students

In addition, students' inability to understand the whole research process significantly affects the completion rate, starting from defining the research problem (Pearson & Kayrooz, 2004). Ssegawa and Rwelamila (2009) revealed in their study that students' knowledge about research, supervisors and poor research environment contribute to the late completion of research students, but the major problem is poor research knowledge on the part of students. For instance, some postgraduate students may have the ideas about the research but may be unable to express it coherently (Bitchener & Basturkmen, 2006). This means that sometimes is not about poor knowledge about the research but the ability to express yourself well in

writing and linking up the ideas properly to provide meaning to the supervisors and other readers.

Similarly, Martin and Khan (2017) in their work to identify the problems students face in writing their thesis in Bangladesh argued that student's insufficient knowledge about research is one of the major problems that most supervisors pointed out. In conjunction to this result Manchishi, Ndhlovu, and Mwanza (2015) found out that students do not even understand their own topic they are working on. This basically means that students do not understand the basis of research. The start of a good research is choosing a good and a researchable topic and they do not understand their topics then the whole research process would be greatly be affected. Before one can complete the whole postgraduate process on time, he or she needs to identify research problem early and also know how to go about the whole process without this this completion would be late.

Correspondingly, a study was conducted by Shariff, Ramli, and Ahmad (2015) among PhD students in Malaysia on factors that would aid timely completion of their programme. The study focused on six factors and among these factors it was identified from the findings that research skill factors are a major factor of timely completion of PhD. The study adopted quantitative method where questionnaire was used in collecting data and analysis was done using means and standard deviation. Among the research skills are thinking skills, technical writing skills, independent working skills and decision-making skills.

Motivation

Motivation is like a fundamental basis for thesis writing as well as the whole postgraduate programme. It is the inner force, passion, or motive that propels one to act (Deci and Ryan, 2012; Ryan, 2017). Regardless of any distraction postgraduate students would encounter during their studies, Rauf (2016) point out that students' dedication, active participation, and motivation are crucial for early thesis completion. Motivation can be in two forms; intrinsic (self-encouragement) and extrinsic motivation (external encouragement). A study by Amida et al., (2021) identified that the greatest motivational type that affected graduate students' opinions of completion was intrinsic motivation. This means that without motivation especially self-motivation, completion rate of postgraduate students would be low.

Students who are intrinsically motivated have interest and are committed to their tasks. One of the things that reduce students' commitment and interest in research is lack of understanding of research (Safari, Navazeshkhah, Azizi, Ziaei & Sharafi, 2015). The experience and understanding that students accrue from their research class and how the lecturer has taught the content of the course may affect students' interest in thesis writing. According to Bednall (2018) students who are intrinsically motivated tend to complete their PhD study.

It was highlighted by supervisors that postgraduate students' lack of motivation is a major problem for the students (Armstrong, 2013). Buttressing on this, a study conducted by Lynch, Salikhova and Salikhova (2018) outlined the need to improve postgraduate intrinsic eloquence of student.

Employment status

The ability of postgraduate students to combine their jobs and studies properly can affect their completion rate. Working alongside postgraduate studies is very important to students since it releases them from financial burdens. In line with this, a study by Bekova (2021) disclosed that participation in financial gain-generating activities has been seen as a factor that delays completion rates in Tanzania. Meanwhile, Bekova revealed that on-campus employment has reportedly been found to boost the likelihood of thesis completion on time. According to Alegbeleye and Jantchou (2019) the heavy workloads that postgraduate students cope with at their workplaces have an impact on their academic performance.

It would have best if postgraduate students can take study leave to be able give concentrate fully on their studies, but Botha (2016) found that there were fewer chances for postgraduate students to request study leave from their workplace, which led to a decline in the completion of students at that level. Students who are workers may take longer period to complete the programme of study since their time need to be apportioned between their job and thesis writing. Rauf (2016) revealed that several postgraduate students find it difficult to balance work, family, and studies.

Time management

Furthermore, students' ability to manage their time is another aspect that worry students. In postgraduate education, a lot of time need to be dedicated and sacrifices need to be made but students find it difficult or fail to manage the least time they have. Inability to schedule time to study,

giving themselves timeline in writing thesis and doing assignments and the inability to follow those plans all factor into the time management.

A study conducted by Thondhlana, Mawere, and Weda (2011) opined that poor management of time from the student's perspective affects completion of research work hence the completion of the student. Likewise, a study by Gachugi (2013) noted that distance education students have a problem with how to manage the limited time they have in combining family life, work and studies. The categories of students in distance education are similar to those in regular education in the sense that, some of them have families and also work. Therefore, this may also affect the completion rate of their education. Similarly, a study conducted by Zulieta, Sudarsana, A1`rrieta, and Ancho (2020) argued that students who are teachers in other schools find difficulty in combining their teaching to the schooling leading to unsuccessful completion of their postgraduate programme.

Planning is very important in the completion of postgraduate program. For instance, within two months, the researcher needs to complete chapter two of the thesis then go for data by the 5th week. It is one thing planning and another going according to the plans therefore; researchers need to be disciplined to follow their plans. Botha (2016) in his study at the University of Ghana revealed in his findings that students have problems with time. As a result, there is the need to educate postgraduate students on how they have to manage their time (Nzewi, Chiekezie, & Ikon, 2016).

Supervisory-Related Factors

According to Ssenyonga and Nakiganda (2020), the role of research supervision is to facilitate and monitor the research activity. A good and quality supervision is essential for high-quality postgraduate study (Hamilton & Carson, 2015; Motseke, 2016; Ndayambaje, 2018; Spronken-Smith et al., 2018; Van Rooij et al., 2021). It is important to know that the supervisor cannot be overlooked in postgraduate studies especially in thesis writing. Although high-quality postgraduate supervision is "vital" in timely completion (Holtman & Mukwada, 2014), students are also supposed to cooperate with their supervisors. This means both the student and the supervisor must do their parts to ensure a good supervision.

Several research studies in the field of education (Hadi, Muhammad, 2019; Kimani, 2014; Goha & Qouta, 2021) examined the impact of supervisory processes on the achievement of learners and the completion of their theses. A study conducted by Shariff, Ramli, and Ahmad (2015) among PhD students in University Utara Malaysia (UUM) identified supervisory arrangement as the second major factor affecting students' completion rate. More so, several literatures pointed out successful supervision of graduates is a problem in universities around the world (Manyike, 2017; Sadiq, Barnes, Price, Gumedze & Morrell, 2019). The supervisory-related factors were discussed under the following subheadings; research knowledge of supervisors, supervisors' relationship with students and supervisors' feedback.

Supervisor's Research Knowledge and Support

Naturally, one can only give what he or she has. In the same way lecturers can only teach what they know so supervisors also need to be equipped with research knowledge to be able to supervise the students. Lategan (2009) discovered that supervision starts when supervisors are vest in problem identification, good at methodology and finding solution to the problem. Similarly, a supervisor is described to be good when he or she has the following features: have the ability to identify good research topic, have, an understanding on the methodology of research, support students and give students quick feedback (Dietz, Jansen & Wadee, 2006). This means for a lecturer to be a competent supervisor he or she must be vest in research, both theoretically and practically.

Supervisor's interest in students' research work is another important area of supervision. Ali, Watson and Dhingra (2016) conducted a study on postgraduate research students and the attitude of their supervisors towards supervision. Online data collection was involved in this study using questionnaire. Both students and supervisors were respondents. From the findings, both supervisors and students agreed that supervisors should have interest in the research that students do. The interest supervisors have in student's research caused them to be part of the research work.

When supervisors are given areas that are not of their interest it poses a lot of challenges which automatically affect the completion rate of student negatively. On the other hand, supervising thesis of your interest causes the supervisors to work willingly, which positively affect the completion rate of students. As a result, the appointment of supervisors by the departments or

universities should be based on the similarity of interest and expertise in the research area of the students (Donald, Saroyan, & Denison, 1995). Ives and Rowley (2005) emphasised the importance of matching supervisors to graduate students in terms of topic expertise and working relationships. It is paramount to tackle the issue of how research method is taught because students can only write their thesis if only, they pass this course in most universities.

Supervisor-Student relations

Another aspect to consider under supervision is the relationship between the supervisor and the students. The effectiveness of the supervisor-student relation was one of the characteristics that contributed to successful completion rates among PhD candidates in the Netherlands (Van Rooij et al., 2021). A good relationship that exists between the student and the supervisor is essential to the progress of research (Shariff, Ramli, & Ahmad, 2014; Tahir, Ghani, Atek, & Manaf, 2012). Studies have shown that a good supervisor-student relationship helps students complete their theses on time and with satisfaction (Shin, Lee, Yun, Kim & Lee, 2018), while a bad relationship can result in attrition (Golde, 2005). In addition, other studies on relationships between students and supervisors stressed on the fact that students must get along well with their supervisors in order to complete their studies successfully (Akparep et al., 2017; Cicco, 2014; Goldman & Goodboy, 2017). On the contrary, it was discovered that there is no proper interaction between students and supervisors because supervisors are burdened with a lot of students to supervise (Kimani, 2014).

Additionally, for there to be a positive interaction between supervisors and students, both (the supervisor and the students) should possess some essential qualities. Delany (2013) described some of the qualities of a good supervisor as; being approachable, supportive, tolerant of differences, and admit errors. In the same way being positive, affectionate, intelligible, easy to reach, and having the ability to treat the student as a junior colleague are other traits of an excellent supervisor (Dimitrova, 2016). In order for students to feel comfortable opening up to their supervisors, it should be simple for them to approach them.

Comparatively, a study conducted by Ndayambaje (2018) on how supervision as factor affect completion rate of PhD students in Kenya revealed three basic supervisory factors. The study made use of qualitative data where six postgraduate students were sampled using snowball. These students were interviewed and thematic analysis was used. Among the three hindering factors of supervision, limited interaction between supervisors and students was identified. The other two factors are delayed feedback from supervisors and supervisors' low technical guidance.

Communication

Communication is a contributing factor of completion. It can be in the form of feedbacks with constructive criticism and helpful suggestions, regular meeting and availability. Constructive feedbacks and good communication on the part of both the supervisor and the supervisee affect the completion rate of postgraduate students. According to Yousefi, Bazrafkan and Yamani (2015), effective communication between supervisors and the students is crucial to ensuring that supervision is

effective. This communication can be verbal or by email. Moreover, understanding one another as students and supervisors contribute a lot to a smooth supervision process.

Communication in form of feedback should continually help students to improve on their thesis writing skills. It is paramount for students to receive good feedback (McCallin & Nayar, 2012; Severinsson, 2012) since it serves as a way of supporting students' progress of completion. Communication, and more particularly, feedback on submitted work linked to the research project, is one of the crucial components in the supervisor-student interaction, according to Van Rensburg, Mayers, and Roets (2016). One method that supervisors can help and mentor research students is by promptly offering feedback, however, some supervisors take a very long time to do so (Seidu, 2015). Similarly, Atibuni et al. (2017) claim some supervisors take a lengthy time to provide comments on the students' theses. Taking longer time to give or reply to feedback in a way delays the completion of postgraduate research students.

Again, feedback should not only focus on a student's shortcomings but also on their positive qualities. This serves to motivate the students to keep becoming better at their research work. It also helps the student know that they are progressing well and also serves as motivation for them. Ali *et al*. (2016) also stressed on the fact that supervisors should give students constructive and timely feedback. Students also have a role to play in the sense that when a supervisor give them timeline to do correction, it should be done well and on time. Additionally, Jinarek (2010) also stressed on the

fact that communication and proficiency in language affect the completion rate of students.

Another interesting aspect of supervisors is research monitoring. A study conducted by Olibie, Agu, and Uzoechina (2015) focused on how supervisors monitor education students' research work at the postgraduate level in Sothern Nigeria. The study sampled 180 postgraduate students and "Characteristics and Values of Post Graduate Research in Education Mentoring of Students (CVPGREMS)" questionnaire was used. This questionnaire contained 27 items. The results of the study revealed that supervisors critique the works of the supervisee without insights. They also set expectations and time limit which are not real and this leads to the loss of self-confidence of the students. This could be due to inadequate time on the part of the supervisor to explain critiques to the supervisees and not meeting them at the appointed time.

Institutional-Related Factors

The institution or university is another factor contributing to the completion rate and retention of postgraduate students (Kalsbeek & Zucker, 2013). This means that institutional rules, procedures and culture in a long way influence the successful completion of the students. The phrase "institutional support" has been defined in the literature as the availability of academic resources, a student support system, and guidance both on-campus and online (Rubin, Fernandes, & Avgerinou, 2013). It also refers to the chance to establish a learning community. Ekpoh, (2016) revealed that most of the challenges students face during research and thesis writing are unnecessary departmental delay among other institutional factors.

To add to, a study conducted by Sarwar, Shah and Akram (2018) on the factors leading to delay in research at the postgraduate in Pakistan revealed that management of their departments contributed to their delay. Among the 40 students who participated in the study, 34 were not happy about the role their department played, in terms of assigning supervisors and approval of their research topic. Research forms part of the postgraduate level therefore one need to be able to complete his or her research before completion so departments and the school of Graduate should try their best to approve students research topics at first year and assign their supervisors to them. Some factors to be considered are:

Teaching and Learning Resources

Teaching and learning resources such as books, journals, conference reports and computers in the library are very important in postgraduate studies but according to Okwakol (2008) majority of African universities lack sufficient facilities which made the learning environment not suitable for the students. For postgraduate students to successfully engage in research, Motseke (2016) and Kyvik and Olsen (2014) underline the importance of a supportive research environment and high-quality resources. The academic environment for research should include facilities like lecture halls, offices for the lecturers, laboratories and library. According to Rasul and Singh (2010) access to library resources is a key aspect of the institution's involvement in helping students successfully complete their graduate research courses.

Again, internet connectivity plays so much role in accessing information online during research writing. Accessing information becomes

seamless when there is a good internet connection. Generally, electronic resources have numerous advantages compared to hardcopy resources (Tyner, 2014). Academicians, for that matter, make use of electronic journals to aid them in writing research (Adegbore, 2011). Nowadays, students may prefer getting information online rather than going to the library to get information from hardcopy books. The common tool for accessing information for thesis writing and other academic activities is through electronic resources (Vaishnav, Sonwane & Golwal, 2008). As a result, one important role of the library is to help students have access to electronic resources such as conference reports, theses, journals and books.

A study conducted by Azila-Gbettor, Mensah and Kwodjo (2015) in Ho polytechnic about the challenges that students face in writing their dissertation revealed that students' inability to access journals, textbooks, articles and poor internet connection affect their dissertation writing. This study employed questionnaire in collecting data from both the final year students and the supervisors and these data was analysed by the use of descriptives. Although these finding has been found in Ho polytechnic, this study sought to find out the factors affecting the whole programme completion but not only limited to dissertation alone as in the case of Ho polytechnic. The study of Azila-Gbettor et al., also employed only questionnaire but for deeper understanding of the problem, this study employed both questionnaire and interview. The study suggested that to improve on the completion of students' dissertation, students should improve on how they access relevant literature and supervisors should also provide quick feedback to the students.

Support Services

Support services both by various departments and the university as a whole is a key factor. There are several ways students can be supported but the most important service for students is financial supports. Numerous supervisors have reiteratively expressed their concern over the absence of institutional support and the requirement for greater institutional services and practices to be accessible for postgraduate students' research work (Sidhu, Kaur, Lim & Chan, 2017).

Counselling service is one of the support services which the university offers to students. Counsellors basically guide students. Guidance is key in the early completion of postgraduate students. Although the supervisor serves as a guide for students, every department or institution should at least have a guidance centre. This would help serve as an avenue for complaints when they are faced with problems.

Again, some students have issues with proper planning and time management and these categories of students would need the help of a counsellor. A study was conducted on the completion rate and attrition problem of students. Several factors were identified to be factors influencing completion and attrition but the main factors in this study are lack of resources and lack of guidance service (Abiddin & Ismail, 2011). Most institutions overlooked the guidance session of postgraduate students with the notion that they are matured students. This is not beneficial because students who most often frustrated would just drop the programme because they have no or little advice from the guidance and counselling

unit. In United States (US), one effective means of handling the completion rate of students is through counselling (Boughey, 2015).

Thesis Writing Procedures

Thesis writing plays a major rule in postgraduate education. It starts from proposal defence until the final works goes for internal and external supervision. Again, since writing proposal is the first stage of thesis writing, it should be taken into consideration before admitting students. Proposal defence should be a basic requirement for admission that is why a study by Ameho (2014) suggested that schools request for a detailed proposal from students and interview them on the proposal as a requirement or basis of their admission. During the interview, the proposal should be critiqued constructively to shape the whole proposal and this would put students on their toes since they already have fair idea of their research.

In addition, final thesis is examined by internal and external supervisors. The duration for their feedback contributes to the completion rate of students. As identified earlier, that supervisors should give timely and prompt feedback to the students (Ali, 2016; McCallin & Nayar, 2012), yet some external supervisors may not do so. To address this challenge, Akarep et al (2017) in their study, recommended that the Board of universities should bring external supervisors to the school on appointed days to come and supervise students' thesis. This would solve the issue of delay by external supervisors.

Conceptual framework

The completion rate of postgraduate students was identified in several studies as students, supervisory and institutional factors (Ghatak, et al.,

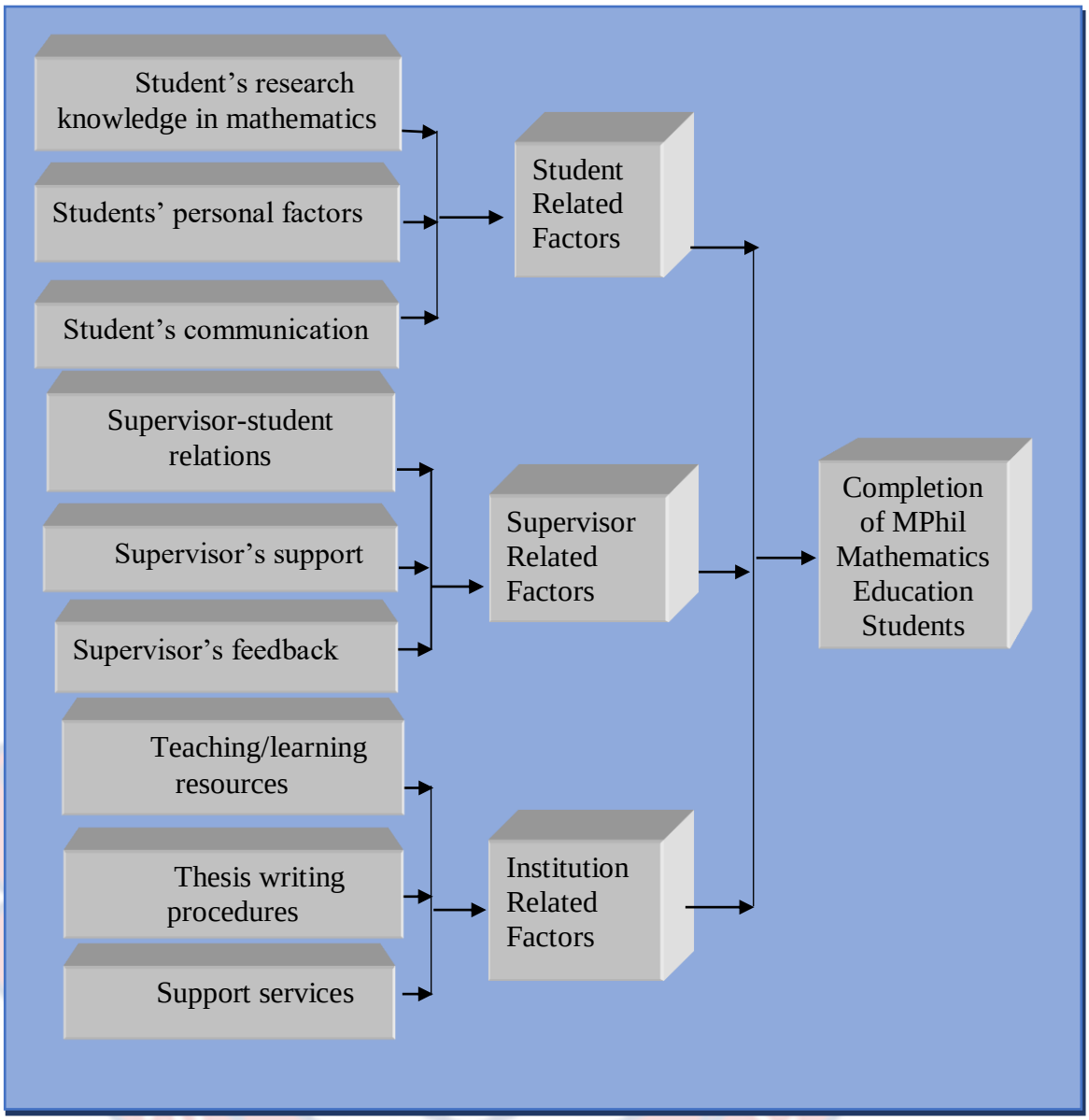


Figure 2: Conceptual framework

The conceptual framework was developed from insights gained from the theories, models and literature reviewed. It was hypothesised in this study that MPhil Mathematics education students' completion was influenced by three broad factors. These factors are student, institutional

and supervisor-related factors. Thus, completion rate results from the dynamic interactions between students, supervisors and their institutions.

Students-related factors in this study are behaviours exhibited by the students which negatively or positively affected their completion. These factors among others have been grouped into three subscales; students' research knowledge in mathematics education, students' characteristics and communication. Students' knowledge in research focused on students' ability to choose researchable topic and the adequate skills needed in reviewing literature. It also concentrated on adequate knowledge of students in data collection, analysis, interpretation and presentation of results. In addition, some factors considered under communication were keeping to meeting times, frequent meeting with supervisor, student actively participating in supervision session and how easy students can approach their supervisors. Also, students' characteristics included work or job schedules, intrinsic motivation, financial support and time management.

Also, attitudes of supervisors which directly or indirectly affected the students are supervisory related factors. These factors were categorized into; supervisor-student relations, research support of supervisors, and supervisors' feedback. The supervisor-student relations included availability of supervisors, frequent meetings organised by supervisor and how easy students approach supervisors. It also focused on supervisors' ability to direct and allow for students' independent work. Notwithstanding, supervisors' helpful corrections and suggestions, constructive criticisms, prompt feedbacks and provision of relevant materials were placed under supervisor's feedback.

Furthermore institutional-related factors refer to the role the department, faculty as well as the university played during the period of study of the students. Teaching/learning resources, thesis writing procedures and support services of the university were the components of institutional related factors. Teaching/learning resources included availability of lecture halls, adequate computer facilities, good internet connectivity and accessibility of institutional repository (previous mathematics thesis). Moreover, thesis writing processes focused on time for thesis completion, application for ethical clearance and assessment of thesis. Together with, financial supports, research seminars and workshops for students and counselling services formed the support services.

From the abstract system theory, various components are seen as whole hence in this study. The various components were limited to student, supervisor, and institutional related factors formed the whole (that is the completion rate). As asserted earlier, the system theory entailed division of goals among staffs in an organization to achieve a common goal. As a result, various roles of the student, supervisor and the university would help in the academic success of the students (early completion). Again, based on Jiraneks' DR model, there exist interconnections among the three factors. For this reason, students and supervisor factors are related and student and institutional factors are also related. In the same way, supervisor and institutional factors are related.

Chapter Summary

The chapter was organized based on the factors affecting the completion rate of postgraduate students. These factors were students,

supervisors and institutional factors. It was noted that good supervision starts when a supervisor has a good knowledge of research which involves identification of the problem and the methodology. Supervisors need to be trained to improve on their services they render to students hence improving on the completion rate of the students. Finances, research knowledge of the students, self-motivation, time management, and background information were discussed to be student-related factors. Finally, for the institutional factors, facilities, internet accessibility, and the support services rendered to students were discussed.

The theoretical frameworks used in this study were General System Theory and Jiranek's Dissertation Completion Triangle model propounded by von Bertalanffy and Vladimir Jiranek respectively. The General system theory identifies organisations as a system with subsystems which works towards the fulfilment of a common goal. This theory was appropriate for this study because the university was the representation of the system while the students and supervisors in the department are the subsystems and the role each of the subsystem play lead to the accomplishment of the goal of the school. The Jiranek Dissertation Completion Triangle model based on other studies brought out three interconnecting factors affecting the completion rate of students. The factors were student factor and personal situation, supervisor's factor and availability of resources and facilities.

CHAPTER THREE

RESEARCH METHODS

Overview

The study aimed to explore the rate at which MPhil mathematics education students complete their studies and the factors that accounted for the completion rate. This chapter involved the methodology used in collecting and analysing data. The chapter also comprised the research design, population, sampling procedures, data collection instruments, data collection procedures, data processing and analysis, ethical clearance, and the chapter summary.

Research Design

The study employed the explanatory sequential mixed-method design. Creswell and Creswell (2018) revealed that the explanatory sequential mixed-method design involved the collection of both quantitative and qualitative data. Hence, this design helped the researcher to collect quantitative data on the completion rate of MME students in the university and the factors that affect the completion rate of the students. The quantitative data was collected and analysed. Later, the qualitative data was collected through interviews to complement the quantitative result. In summary, the qualitative data gave an in-depth explanation of the quantitative data.

The research design employed in the study helped the researcher to use the questionnaire to explore the factors that contribute to the completion rate. This is because questionnaires provide answers to the research questions in the study (Creswell & Clark, 2017). The students were required

to provide additional clarification on the factors that accounted for their completion rate.

Study Area

Among the several universities in Ghana, this study was conducted in one of them. The original mandate of the university was to train graduate professional teachers for Ghana's second cycle institutions such as the senior high schools and also in teacher training colleges and technical institutions.

The university has added to its functions, by training doctors and health care professionals, as well as education planners, administrators and agriculturalists. However, with the expansion of some of its faculties and the diversification of programmes, the university currently has the capacity to meet the manpower needs of other ministries and industries in the country, besides that of the Ministry of Education.

The academic activities of the university can be organised under five main colleges. They include also has College of Education Studies, College of Distance Education, College of Humanities and Legal Studies, College of Agriculture and Natural Sciences and College of Health and Allied Sciences. These colleges consist of various faculties, each representing a specific academic field. The faculties are further divided into departments that focus on more specialised areas within the respective discipline.

The Department of Mathematics and ICT Education (DMICTE) is under the college of Education Studies. The establishment of this department in 2016 marked a significant milestone in the college. Prior to its establishment, the department had operated as the computer science

education unit, which was part of Department of Science and Mathematics Education. The primary objective of DMICTE is to train and prepare future educators who specialize in mathematics and ICT. The department offers a range of undergraduate and postgraduate programmes such as Bachelor of Education (B.Ed) in mathematics, Bachelor of Education in ICT, Master of Education (M.Ed) in Mathematics (sandwich programme), Master of Education in information technology, Master of Philosophy (MPhil) in Mathematics education and Doctor of Philosophy (PhD) in Mathematics education.

Population

In this study, the population involved all MPhil Mathematics education students who enrolled from 2015 to 2019 academic year. The study had a total population of 88. The breakdown of the population is in Table 1.

Table 1: Population of respondents

Year of enrolment	Number of students
2015	9
2016	5
2017	14
2018	29
2019	31
Total	88

Source: University's student records

Sample and Sampling Procedure

The sampling procedure in this study was census method. This means that, population is the same as the sample. Hence the sample size for the study includes all students who enrolled from 2015 to 2019 academic year.

However, 79 respondents participated in responding to the questionnaire, therefore the sample size comprised 79 students. Afterwards, a purposeful sampling technique was used to select eight participants for the semi-structured interview (Creswell & Creswell, 2018).

The selection of participants was greatly dependent on individuals who can provide rich information about the study. It was because of this reason that the researcher purposefully selected students specifically those who have completed their study to give in-depth information about factors affecting completion rate of MPhil mathematics education students. The sample size was determined when the saturation point was reached: a point at which the interviewer was not getting new information (Fugard & Potts, 2015). In this study, the researcher noticed from the interview session that saturation point was attained after interviewing the eighth participant. Thus, eight participants constituted the qualitative phase of the study.

Data Collection Instruments

A questionnaire, documents, and a semi-structured interview guide were used in this study to gather data. The questionnaires helped to gather primary data directly from research participants and a semi-structured interview guide also aided to gather in-depth understanding of the research. The documents included students' enrolment and graduation statistics from the Department of Mathematics and ICT Education. The documents helped the researcher to determine the completion rate of MME students.

Questionnaire

Questionnaire is a commonly used instrument that helped the researcher gathers enough data compared to other data instruments.

According to Taherdoost (2019), questionnaire is much simpler to create and tends to be more accurate. The questionnaire enabled respondents to reply close-ended items on a scale by indicating from predetermined Likert scale responses (Harris & Brown, 2010). The items in the questionnaire covered all the research questions. It was designed based on insights gained from literature on completion rate of graduate students.

The questionnaire (Appendix A) was adapted from a set of instruments used by Ameho (2014), Lessing and Lessing (2004), Lessing and Schultze (2002), and Albertyn et al. (2008). Some aspects were from the research instrument 'Challenges of Postgraduate Research Questionnaire' (COPGRQ) which was developed by Ainley (2001). The questionnaire entailed both open-ended and closed-ended items. The closed-ended items included the student, supervisory and institutional factors provided by the researcher. Respondents were instructed to choose only one response from the options given.

Additionally, the questionnaire was in sections. Section A entailed background information of the respondents (sex, year of enrolment, age, marital status, and employment status), section B covered funding of the MME programme and sections C, D and E requested the respondents to choose one option, the factors (student, supervisory and institutional factors) that can affect their completion. The items in sections C, D and E were constructed based on a five-point Likert scale response (1 = Strongly Disagree, 2 = Disagree, 3 = Undecided, 4 = Agree and 5 = Strongly Agree).

The questionnaire was administered through google form, which made the process less expensive because no travel was required. The

questionnaire provided an immense amount of data for this research. It could be associated with the notion that; the researcher contacted the course representatives of each academic year to speak with their programme mates on their availability to respond to the questionnaire.

Semi-structured Interview Guide

A semi-structured interview guide helped the researcher to collect qualitative data. The researcher used a semi-structured interview guide because it allowed her to ask follow-up questions that were not part of the guide. In summary, this guide helped the researcher to probe. Although the questionnaire provided proof of patterns prevalent among the general population, the interview guide helped gather in-depth data on the factors that affect the completion rate of postgraduate mathematics education students (Kendall, 2008).

The interview guide contained seven open-ended questions (Appendix B). It covered all the research question, ranging from completion rate of students, factors (student, supervisory and institutional) contributing to the completion rate. Because the interview guide was semi-structured, the researcher could delve deeper into the participants' responses.

Reliability and Validity of Research Instruments

According to Willson-Kristen (2012) is reliability is when the same results are obtained if a process is repeated, while validity means the ability to measure what research intends to measure. The instrument was subjected to scrutiny to ensure content and face validity. Also, the supervisor and other lecturers checked the items of the questionnaire to ensure they addressed all the research questions. This ensures the content validity. To

increase the content validity, modification and recommendations were included in the questionnaire and the interview guide.

In addition, the instruments were given to some colleagues and graduates from the department who are vested in the questionnaire's development to determine its face validity. This ensured that items addressed the research questions and those that did not address any research question were deleted per the comment and suggestion. The constructive suggestions and corrections helped to improve the instruments.

Pilot Testing

The reliability of the questionnaire was determined by pilot testing it. This was done to ensure that data was dependable for collecting data. The instrument was pilot tested using 2020 MPhil Mathematics Education students who enrolled in the university since they have similar characteristics with the population. The pilot testing was done to identify problems with the content of the questionnaire and the interview guide. The necessary correction, deleting and modifications of the items on the instruments were done to ensure reliability of the items. For example, several open-ended questions were deleted based on the comments from the students.

The internal consistency reliability of the instrument was determined using the Cronbach alpha coefficient. The responses were analysed based on the subscales in the questionnaire. According to Hair, Matthews, Matthews and Sarstedt (2017) and Kline (2005) the Cronbach alpha coefficient should range from 0.7 upwards. Kline reported that an alpha coefficient of 0.70 is acceptable, 0.80 is very good, and 0.90 is excellent.

The analysis produced the Cronbach alpha coefficient of 0.73 for the subscale of student-related factors, 0.84 for supervisor-related factors and 0.85 for the subscale of institutional-related factors. Table 2 presents Cronbach's Alpha coefficients for each sub-scale for the questionnaire from the pilot test to the actual study.

Table 2: Reliability coefficients from pilot test and actual study

scale	Subscales	Number of items	Pilot test	Actual Study
Student-related factors	Research knowledge of students in Mathematics	4	0.85	0.89
	Student's characteristics	4	0.72	0.71
	Communication	4	0.84	0.74
Supervisory-related factors	Supervisor-student relations	4	0.72	0.75
	Supervisors' research support	5	0.81	0.86
	Supervisors' feedback	5	0.82	0.88
Institutional-related factors	Teaching/Learning resources	5	0.73	0.80
	Procedures in thesis writing	4	0.77	0.81
	Support services	5	0.75	0.79

Source: Field Survey (2022)

Trustworthiness

According to Amehoe (2014), a tranquil environment for the interview and strong relationships with your interviewees, as well as lending a listening ear to them and asking probing questions, are necessary for the validity and dependability of interviews. The reliability of the qualitative

data was based on some approaches listed by Lincoln and Guba. According to Lincoln and Guba (1985) there are four universal criteria a researcher should rely on to ensure the trustworthiness of the qualitative data. The criteria include credibility, transferability, dependability and conformability. When respondents' opinions and the researcher's description of them "fit," then the data is credible (Tobin & Begley, 2004).

Some ways to ensure credibility are triangulation, prolonged engagement, and peer debriefing (Lincoln & Guba, 1985). However, according to Creswell (2014) at least two methods should be used. In this study, the researcher applied data triangulation where more than one source of data (questionnaire and semi- structured interview) was used to establish a finding. Additionally, member checking operationalizes credibility by having participants to test the findings and interpretations (Lincoln & Guba, 1985). Again, the researcher used member checking, where data from the interviews were verified in the qualitative phase of this study. Participants who were involved in the interview were sent verbatim transcripts of the interviews conducted with them. This is to verify that the transcription is the same as what the researcher recorded or provide additional information if need be.

Participants involved in the interview were sampled from respondents who responded to the questionnaires at the quantitative stage. This is to ensure the credibility of the results or findings. Creswell and Creswell (2018) admonished researchers that choosing two different sets of people for both the quantitative and qualitative phases of mixed-method research might lead to producing invalid results.

Data Collection Procedures

The first step in the data collection procedure was to apply for an ethical clearance form. The researcher applied for the ethical clearance form from the Institutional Review Board (IRB), University of Cape Coast (see Appendix B). Again, an introductory letter from the Department of Mathematics and ICT Education was also applied for to help in the smooth data collection process (see Appendix B). The enrolment data was taken from the student records and the completion data from the department. The e-mail and contacts of the students were included in this data to enable the researcher to contact them for further data collection.

Before asking for their informed consent to participate in the study, the respondents were briefed on the purpose of the study. Patton (2002) proposed a model of seeking consent and this entails what, how, and why of the study, and how the information provided would be confidential. Since several students have finished their coursework, they no longer reside on campus. Therefore, the questionnaires were through their e-mail.

Some of the students who completed the programme of study were also subjected to interview. The participants comprised those who responded to the questionnaire. This ensures the validity of the findings. Before the interview sessions, the researcher explained the purpose of the study to the participants. Again, the researcher sought for consent of the participants, hence the interviews were recorded. On average, each interview session lasted for 20 minutes.

Data Processing and Analysis

The interview data was saved in Excel since the data was collected through google forms. The data was then imported into Statistical Package for Social Science (SPSS version 22) and cleaned. Coding of the responses was done once the data had been cleaned. It was also subjected to further examination to determine any case of missing data.

All the research questions were analysed using descriptive statistics such as frequencies, percentages, mean and standard deviation. Polit and Beck (2004) revealed that descriptive statistics helps the researcher give a summary and reduce interview data as well as the ability to describe the data from empirical evidence.

Frequencies and percentages were used in analysing the background information of the respondents. Also, means and standard deviations were employed to analyse the data in response to research questions two, three and four. The options for the questionnaire were on a five-point Likert scale, with one (1) signifying low agreement with the statement and option five (5) implying that students strongly agree with that item on the questionnaire. The benchmark which was proposed by Pimentel and Pimentel (2019) was employed to interpret the mean values obtained from the analysis of the Likert scale. Thus, the mean value of 1.00 to 1.79 is strongly disagreed, 1.80 to 2.59 is disagreed, 2.60 to 3.39 is neutral, 3.40 to 4.19 is agreed and strongly agree is from 4.20 to 5.00.

The qualitative aspect of the data was analysed using thematic analysis approach (Braun and Clarke, 2019; Vaismoradi, Turunen & Bondas, 2013). A technique for finding, analyzing, and reporting themes in data is called

thematic analysis (Braun & Clarke, 2019). Hence in this study, the researcher listened to the recordings from the interview repetitively to familiarise with the emerging patterns in the data. Secondly, the recordings were transcribed and analysed based on the research questions. The data were classified under themes for analysis based on the research questions. Using the font colour option in Microsoft Word, colour codes were allocated to the patterns that were found in the data. After that, the transcriptions were uploaded into HyperRESEARCH 4.5. 3 for coding and analysis. To support and clarify the findings from the quantitative phase, reports for the qualitative findings were created using participant comments and phrases (Creswell, 2014) and to provide the data in narrative form, direct quotation and paraphrase were used (Orodho, et al., 2016).

Eight participants were involved in the semi-structured interview. For anonymity, participants were identified with pseudonyms concerning their programme of study, MPhil mathematics education (MME). Hence the eight participants were identified with MME-STU1, MME-STU2, MME-STU3, and so on. It helped to attribute the comments to the particular student who made them.

Ethical Considerations

Social researchers have a moral and professional commitment to be ethical since study findings are about society, and ethics define what is or is not permissible to undertake (Neuman, 2007). For this reason, the researcher applied for ethical clearance from the Institutional Review Board of the University of Cape Coast to authorise the researcher for data collection (see Appendix C).

Pilot testing of the instruments was an essential step before the actual data collection. The purpose of the study was clarified to the respondents: factors contributing to the completion rate of MME students. Additionally, before participating in this study, respondents gave their informed consent. The respondents were notified that the data was for research purposes only, hence their information would only be shared on research purposes.

Moreover, respondents were not allowed to write their names on the instruments. That is to ensure the anonymity of the respondents. Again, for anonymity, interviewees of the qualitative aspect of the data collection were identified with pseudonyms. Participation in the data collection was voluntary for respondents. Data analysis, interpretation, and presentation of results were without any bias.

Chapter Summary

The research design employed in this study was an explanatory sequential design which is a mixed-method design. All MPhil Mathematics education students who enrolled from 2015 through to 2019 academic year—a total of 88 students— were included in the population of this study. The population was used as the sample because the census sampling technique was employed in this study. The instruments in this study included a questionnaire, enrolment and completion statistics, and an interview guide. The questionnaire was reliable since the reliability coefficients for all the sub-scales were over 0.7 in both the pilot test and the actual study. All the research questions were analysed using percentages, mean, and standard deviation.

CHAPTER FOUR

RESULTS AND DISCUSSION

Overview

This chapter presents the results and discussions of the study based on the research questions. The purpose of the study was to make analysis of the completion rate as well as factors affecting the completion of MME students in a Ghanaian university. In achieving this purpose, four research questions guided the study. Data collection instruments for this study were questionnaire and semi-structured interview guide. The quantitative data were analysed using frequencies, percentages, means, and standard deviations. Also, the qualitative data were analysed using thematic analysis. The results were presented based on the research questions.

Respondents' Background Information

The information about students' backgrounds included their sex, age, marital status, employment status, and how respondents funded or are funding their programme of study. The demographic information of the respondents was analysed using frequencies, percentages and charts. Table 3 displays an overview of the background information for the MME students and graduates who participated in the study.

Table 3: Respondents' Background Information

Variable	Subcategories	Frequency	Percentage
Age	20 – 29years	34	43%
	30 – 39years	38	48.1%
	Above 39	7	8.9%
Marital status	Single	40	50.6%
	Married	39	49.4%
Gender	Male	64	81%
	Female	15	19%

Source: Field Survey (2022)

From Table 3, the proportions of respondents between the ages of 20 and 29 and 30 and 39 were 34 (43%) and 38 (48.1%), respectively, while only seven (8.9%) respondents were over the age of 39. This information demonstrates that a significant portion of MME students were in their twenties and thirties at their time of enrollment. Also, Table 3 pointed out that 50.6% of the respondents were single, while 49.4% were married at the time of admission. Figure 3 depicts information regarding the respondents' employment status.

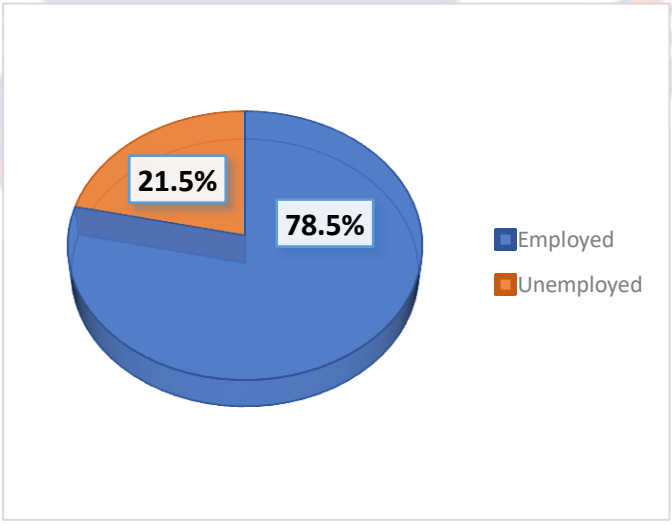


Figure 3: Employment status of respondents

From Figure 3, 78.5% of the total was employed in various jobs while pursuing their studies. Since these students were receiving monthly incomes, it presupposes that their financial challenges would be addressed. However, another aspect for consideration would be whether students would have enough time for their study and be able to complete their research work within the stipulated time.

Additionally noted was whether or not their programme of study was self-funded. Figure 4 provides an overview of these data.

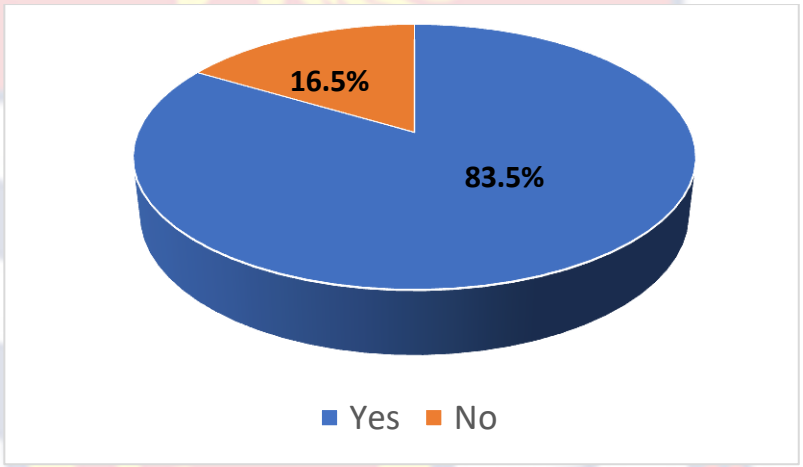


Figure 4: Self sponsorship of study

According to Figure 4, 83.5% agreed that they self-sponsored their programme of study. This figure presupposed that majority of MME students were workers. It also suggested that the students combine studying with work and may need to sacrifice some of their working time for their academic activities. Again, concerning funding students' studies, Figure 5 displays students' accessibility to government bursary.

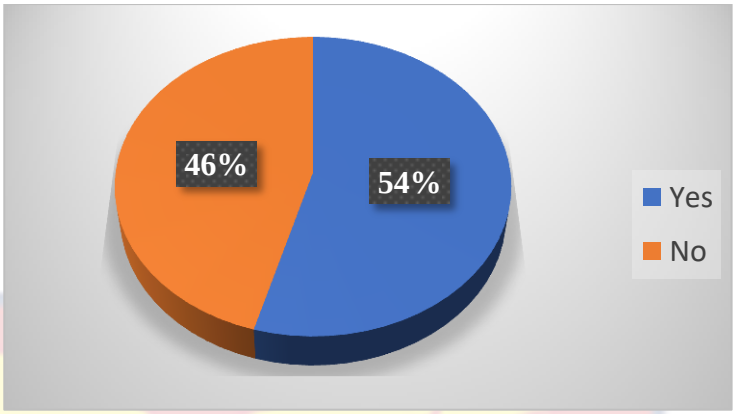


Figure 5: Access to government bursary

Figure 5 revealed that a higher proportion of respondents got government bursaries as a source of income for their academic programme. Although most of the students self-funded their programs of study, 54% of them got government bursaries, compared to 46% who did not. This information indicates that more than half of the respondents who participated in the study benefited from the government scholarship. Figure 6 depicts a summary of student loan accessibility.

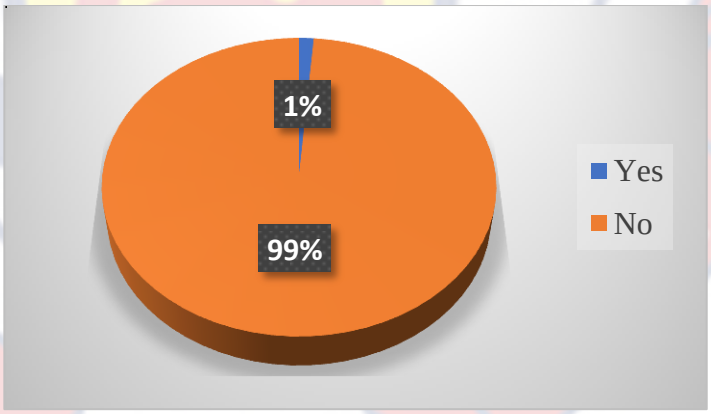


Figure 6: Student loan accessibility

Figure 6 shows that 99% of respondents practically never obtain student loans. The data could be because several respondents had jobs, as shown in Figure 5 earlier. Again, this could be that the process involved in applying for a student loan was laborious.

The following section presents the results and discussion of the data analysis of the factors that can facilitate the completion of MME students. The data analysis was under the research questions formulated for the study.

Completion of M.Phil. Mathematics Education students

This study sought to explore the percentage of MME students from a given cohort (a given academic year) who got their MPhil degree and again, those who completed within specified period of time: within the expected two years, within 1year extension period and beyond the 3 years period from enrolment. Based on the enrolment and completion statistics from Department of Mathematics and ICT Education, the completion time was determined. The year the final oral examination (viva) took place was considered the year of completion. Table 4 shows the number of students who completed from each academic year.

Table 4: Distribution of students' completion from a given academic year

Academic year	Enrolled	Those who completed	%
2015/16	9	4	44
2016/17	5	4	80
2017/18	14	10	71
2018/19	29	14	48
2019/20	31	2	6
Total	88	34	

Source: Computed from enrollment and completion statistics from Department of Mathematics and ICT Education

Table 4 revealed that only 34 of the 88 MPhil mathematics education students who enrolled from the 2015–2019 academic year successfully

finished the programme of study. What stands out from Table 5 is that 80% of those who enrolled in the 2016 academic year completed their studies. Considering the 2019 academic year, just two out of 31 students (6.5%) succeeded in earning their degree. It presupposes that the remaining students were still working on their theses.

Additional analysis was done to display the distribution of students who completed within the specified period of time: within the expected two years, within 1year extension period and beyond the 3 years period from enrolment. The data in Table 5 indicates that several students spent three years or more to finish the MPhil mathematics education programme.

Table 5: Distribution of students who completed within specified period of time

Academic year	Students enrolled	Graduates within the expected 2year period	Completion within 1year extension period	Completion beyond 3years period from enrollment	Number yet to complete from the enrolled
2015/16	9	0 (0%)	1 (11%)	3 (33%)	5 (56%)
2016/17	5	0 (0%)	0 (0%)	4(80%)	1 (20%)
2017/18	14	2 (14%)	3 (21%)	5(36%)	4 (29%)
2018/19	29	5 (17%)	7 (24%)	2 (10%)	15(52%)
2019/20	31	0 (0%)	2 (6%)	0 (0%)	29(94%)
	88	7 (8%)	13 (15%)	14(16%)	54(61%)

Source: Computed from enrolment and completion statistics from Department of Mathematics and ICT Education

It is apparent from Table 5 that only in the 2017 and 2018 academic years did students complete their degrees within the expected 2year period,

that is, two and five, respectively. Also, it can be seen from Table 5, with regards to the completion period, only 8 % completed within the expected period of two years; and additional 15% completed in the 1year extension. Again, majority (that is 54 out of 88, 61%) are yet to complete their study. These remaining students were assumed to be working on their theses, although some may have dropped out of the programme. Thus, their completion would beyond the 3 years period from enrolment period.

Some of the students who completed their studies were interviewed on how they can describe completion based on the total number of years they sent. According to the interview data, MPhil students studying mathematics education failed to complete their course of study within the expected 2year period. This indicates that students spend more time writing their theses.

MME-STU5 explained during the interview that, *"In fact for my batch I can say that the completion was good but the Covid 19 had a great impact on us…so a lot of us completed within the 3rd year"*. MME-STU8 also mentioned that: "*I was the only person who graduated within two years. I also remembered three others completed after three years*". In addition, MME-STU1 said, "*I think the rate is low. We don't complete within stipulated time. It took me about four years to complete my study, from 2017 to 2021*".

The excerpts from the interview imply that MPhil students studying mathematics education failed to finish their degree within the stipulated two years and instead needed to spend additional years.

Once more, the information from the interview session matched the data on Table 5, which is 8% completed within the stipulated 2year period.

Again, students spent three years or more to finishing the MPhil programme in mathematics instruction. MME-STU4 confirmed that, "*The first person that completed in my batch used three years.*" This indicates that the remaining pupils needed or would need at least four years to complete their education.

In summary, Research Question One revealed that 61% of the 88 enrolled from 2015 to 2019 academic year have not yet completed their programme of study. Also, only 8 % completed within the expected period of two years In general, the MME students completion within the stipulated two year period was low.

Student-related factors that affect the Completion of MME students

Also, the study looked at student-related factors that respondents perceived to contribute to the completion of MME programme of study. In view of this, the respondents indicated how each factor can affect completion by choosing one of the options based on a Likert Scale where 1=SD, 2=D, 3=U, 4=A and 5= SA. The results are presented under the following sub-themes: **s**tudents' research knowledge in mathematics, **s**tudents' personal factors and **s**tudents' communication with their supervisor.

Students' research knowledge in mathematics

In order to determine the student-related factors perceived to affect completion rate, respondents were made to respond to items regarding their research knowledge in mathematics. The findings showed MME students agreed that sufficient knowledge in data collection affect completion. The results are presented in Table 6.

Table 6: Research knowledge in mathematics education

Knowledge in Research	M	SD
Sufficient knowledge in data collection contributes to completion.	3.58	1.105
The adequate knowledge in interpreting data analysis affects completion.	3.33	1.071
Adequate skill in reviewing literature contributes to completion.	3.23	1.176
Sufficient knowledge in data analysis is a contributing factor to completion.	3.20	1.192

Source: Field Survey (2022)

Based on the mean value on Table 6, the MPhil mathematics education students agreed that sufficient knowledge in data collection (M=3.58, SD=1.104) is a contributing factor to completion their programme of study.

Personal factors of MME students

Again, in answering research question two, the students were also required to rate how their personal characteristics can contribute to finishing their MPhil programme. It was clear that intrinsic motivation and work schedules contribute to the MPhil mathematics education programme's completion. Table 7 gives a summary of the results.

Table 7: Personal factors of MME students

Personal factors	M	SD
Intrinsic motivation contributes to the progress of completion.	3.71	1.178
The work schedules of students reduce the time they spend on their thesis.	3.47	1.125
The financial support for MPhil mathematics education programme delays completion.	2.45	1.125
Poor time management of students slow down completion.	2.82	1.196

Source: Field Survey (2022)

It is evident from Table 7 that students strongly agreed that intrinsic motivation is a contributing factor to finishing their programme of study (M=3.71, SD=1.178). Again, an inspection of the data in Table 7 revealed that work schedules of the students reduce the time spent on their thesis writing (M=3.47, SD=1.153). So, the MME students identified intrinsic motivation and job or work schedules as student characteristics that affects their completion. On the other hand, students disagreed with the statement 'financial support for MPhil mathematics education programme delays completion' (M=2.45, SD=1.196).

To buttress the results in Table 7, participants were interviewed to give their opinion on how work schedules reduced their time on thesis writing, and how motivation contributed to the completion. Out of the eight graduates who were interviewed, seven of them shared similar ideas on how their job schedules negatively influenced their completion that is they spend

much of their time at work. MME-STU1 and MME-STU2 mentioned that their work reduced the time they spent on the thesis writing. This is because almost every day they have to be at work. MME-STU4 also gave his opinion that,

> I would say it did [work affected completion] because of where I work. At my workplace, there is a little bit of pressure so it was quite difficult for me to absent myself from work. I have to most at times postpone my meeting with my supervisor because I couldn't get permission for the set date, I have to meet him. Aside from that, by the time I close from work, I am already tired so working on the thesis becomes difficult so that is how my job affected my thesis writing.

On the contrary, one of the participants, MME-STU6 gave a divergent response about how job affected his completion. He said:

> Okay, in my case, I won't say my work affected my thesis because of how I balanced writing my thesis and doing my job. My thesis writing times mostly were at night because I always close from work around 4 o'clock. So, my work does not interfere with my thesis writing.

The above comments showed that mathematics education students who were working while on the programme of study had their work as a factor which contributed to their completion. For instance, the comment from MME-STU6 suggests that the job he does would have affected his thesis writing but he was able to balance the two. He needed to sacrifice by

working on his thesis at dawn. Thus, balancing thesis writing and work is very important to completion. This can be done by putting in extra effort through sacrifice.

Motivation was identified from the quantitative result in Table 7 as a contributing factor to completion, hence participants during the interview session were asked how motivation contributed to the completion. MME-STU5 indicated that:

> For me, intrinsic motivation helped me a lot. Without it, I would have stopped the study. The issue of paying extra school fees after spending more than two years in the programme was one major thing that nearly caused me to stop my studies. But I encouraged myself not to give up.

MME-ST4 also shared similar opinion that, "*To me it [motivation] kept me going. Especially when the pressures are coming; spent more than 3 years, family, work and your additional fees. So, the personal focus really helped.*" MME-STU8 also responded that, "*I told myself so far as others have been able to make it, I can also make it. I took all the challenges as an opportunity to learn.*" From the responses, the participants had diverse reasons to stop the study but motivation held them to strive to finish their MPhil degree. Some of the reasons include payment of additional school fees, family issues, work and challenges during writing of the thesis. These responses suggest that when MME students are motivated intrinsically, they endeavour to complete their studies even if they encounter problems.

Furthermore, from the interview, all the eight participants indicated that financing their programme of study did not delay their completion because they prepared financially. The following excerpts indicate why financial support of their study did not delay their completion. The explanation from MME-STU7 was that, *"Since I planned to do the MPhil programme, I prepared financially; therefore, I had no problem financing my education."* Furthermore, MME-STU5 was also of the view that:

> The first thing is, if I was not financially sound, I cannot enroll on the MPhil programme. Therefore, the ability to finance my education did not contribute to my late completion. What I did was to make inquiries about the school fees and other financial obligations. So, on average, I had a fair idea about the financial cost of my study. Not forgetting my parents, they also supported me financially.

MME-STU6 also affirmed that:

> In my case, I would disagree that finance affects our completion. I am aware of how expensive education is. It was challenging for me even though I financed my studies and accommodation. Since I had intended to pursue my master's, I had saved money for it, which allowed me to succeed in achieving this.

From the excerpts from the interview session, it can be interpreted that the MPhil mathematics education students prepared financially before applying for the programme of study. The participants also mentioned two

ways they were able to finance their studies; personal savings and parental supports. To summarise, results from the quantitative survey as well as the interview session are convergent, that is both results disagreed that financing MPhil mathematics education did not contribute to delay in completion.

Apart from the three dominating factors identified from the interview which was also part of the quantitative results, two additional personal factors were identified; external motivation and combining family duties with thesis writing. These additional two factors were coded two times respectively an indication that only two participants commented on it. For the external motivation, MME-STU5 mentioned in her interview that, "*I had encouraging words from my colleagues and my husband so motivation helped me to complete my study*". MME-STU3 also said "*I would have stepped down but I motivated myself and my some of my course mates too encouraged me".* The two excerpts for combining family duties with thesis also came from MME-STU3 and MME-STU5. They were of the view that attending to family needs delayed the finishing of their thesis. For instance, MME-STU3 lamented that "*marriage and childbirth set in during studies and so it really affected me*".

Students' communication with their supervisors

Again, as part of Research Question two, respondents were asked to rate how communication with their supervisors can impact their completion. The results in Table 8 revealed that MPhil mathematics education students' communication con contribute to their completion.

Table 8: Students' communication with their supervisors

Communication	M	SD
Active participation during supervision contributes to completion.	3.82	0.888
Regularly consulting supervisors affect completion of the MME programme.	3.76	0.990
Keeping to meeting times of the supervisors contribute to completion.	3.72	1.132
Untimely submission of corrections to supervisors affects completion.	2.61	1.203

Source: Field Survey (2022)

It is apparent from Table 8 that the active involvement of MPhil mathematics education students during supervision with their supervisors contribute to the rate of completion (M=3.82, SD=0.888). The result was also suggestive that regularly consulting supervisors (M=3.76, SD=0.990) and keeping to meeting times of supervisors (M=3.72, SD=1.132) affect their duration of completion.

All in all, the analysis regarding research question two revealed that the sufficient research knowledge students have in data collection contribute to the successful end of their thesis writing. Although financial support was not a contributing factor, student work schedules and intrinsic motivation were personal characteristics that account for their completion. In addition to the personal factors identified in the quantitative data, external motivation and combining family duties with thesis writing were also identified from the interview. Again, the results showed MPhil mathematics education students' communication with their supervisors can affect their completion.

Supervisory-related factors that affect the Completion of MME students

In order to determine the supervisory factors that can affect students' completion, respondents were asked to choose only one option for each statement based on their own experience. The results on the supervisory-related factors are presented under sub-themes (supervisor-student relation, research knowledge support and feedback) as follows:

Supervisor-student relation

This research question examined how MPhil mathematics education supervisors relate with their students. A summary of the results in Table 9 revealed that supervisors' relations with their students contribute to completion.

Table 9: Supervisor-student relation

Supervisor-student relations	M	SD
The freedom supervisors give their students to work independently affects completion.	3.78	1.021
How students easily approach their supervisors contribute to their completion.	3.61	1.192
The availability of supervisors affects the completion of students.	2.91	1.389
The limited meeting times with supervisors affects completion.	3.28	1.120

Source: Field Survey (2022)

From Table 9, the respondents agreed that the freedom from their supervisor to work independently affects their completion (M=3.78, SD=1.021). In addition, the MPhil mathematics education students reported that how easy they approach their supervisors affects the progress of their programme of study (M=3.61, SD=1.192). However, respondents disagreed that limited meeting times with their supervisor affect their completion. (M=3.28, SD=1.120).

To buttress the quantitative findings on how students relate with their supervisors, interview session was held for some of the students who completed their studies. Interestingly, evidence from all the participants during the interview session affirmed that they relate freely with their supervisors. Three major themes were identified from the interview. They include: students easily approached their supervisors, students used diverse means to communicate with their supervisors and students were guided by their supervisors to write their thesis independently (Figure 7).

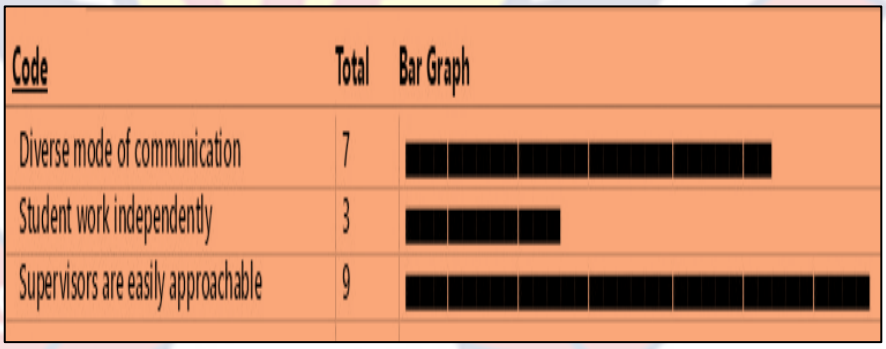


Figure 7: Supervisor-student relation

The following excerpts illustrate how MME-STU2, STU4, STU7 and STU8 interact with their supervisors. MME-STU2 mentioned during the interview that "*Anytime I give him a call that I am coming around he does*

not complain, even if he is working, he would create time for me to come. His doors are always open for explanation and question". Likewise, MME-STU7 also share similar view that, "*he [supervisor] always allotted time to take me through my thesis write-up. Again, I always feel at peace when I go to his office for discussion. In fact, he was friendly*." MME-STU4 also responded to the question that, *"I did not meet my supervisor often but we schedule date to meet. He actually created the atmosphere for me to seek clarification on things I don't understand especially during the data collection stage".* Again, MME-STU8 commented that *"I find it easy to go to my supervisor, he was friendly and we meet at my supervisors' convenient time. My respect for time also made my supervisor admire me. However, we did not meet regularly as I wished*".

From the above comments, MPhil mathematics education supervisors created time for their students. The students found it easy to contact their supervisors whenever they needed help. Again, some students were not privileged to interact with their supervisors regularly as they wished. This could be because their supervisors were occupied with other academic activities. But based on a scheduled time, students were able to meet their supervisors. Also, the comments imply that supervisors were friendly so students were able to ask for explanation without any panic. In summary, there are two categories of supervisors when it comes to supervisor-student relationship; supervisors who accept and interact with their students at any time and the other category are the supervisors who only meet their students based on a scheduled time.

Regarding the diverse mode of communication, both MME-STU5 and MME-STU7 shared similar view on the various ways they interacted with their supervisors. *They* freely communicated with their supervisors through either through phone calls or Whatsapp chats. Also, their supervisors call them when necessary. MME-STU7 added that in case his supervisor missed his calls, he would definitely call him back. In the same regard, MME-STU6 added that "*I called my supervisor whenever I needed his help, and he always responded to my calls. My supervisor also replied my emails and Whatsapp messages".*

These comments seemed reveal one important character of MPhil mathematics education supervisors - they were receptive to their students. Again, from the comments, supervisors allowed their students to communicate with them through several means; phone calls, email, and *WhatsApp* messages. This means that supervisors did not limit their students to one channel of communication.

Furthermore, the interview responses revealed that MPhil mathematics education supervisors did not impose things on the students. The supervisor and students work independently with the guidance of their supervisors. The following excerpts illustrate how mathematics education students worked independently with the help of the supervisor. MME-STU3 shared his opinion that "*My supervisor guided me in doing the correction. He briefed me on the issues at stake. Again, he ordered me to go and fish out for more information and report back if I encountered any challenges."* In addition, MME-STU2 commented that *"my supervisor did not impose*

corrections on me; instead, he suggested different options for me to choose from."

The comments indicate that supervisors allowed their students to learn during the thesis writing process. This means the process was learner-centered but the supervisor serves as a guide to the students. The comments also suggest that supervisors did impose suggestions on their students.

Research support from supervisors

This is the second sub-theme under the supervisory-related factors. The students completed a self-reported scale on how the research support of their supervisors affects their completion. The summary of the results is summarized in Table 10.

Table 10: Research support from supervisors

Research support	M	SD
Supervisor's interest in research topic of students is a contributing factor to completion.	3.66	1.096
Provision of alternative designs by supervisors during thesis writing affects completion.	3.22	1.237
Supervisor's guidance in selecting thesis topic affects the progress of study.	3.23	1.330
Relevant thesis materials provided by supervisors are a contributing factor to completion.	3.13	1.390
Supervisors' guide in getting divert sources of literature affect completion.	3.11	1.396

Source: Field Survey (2022)

Concerning the research knowledge of supervisors, it is interesting to note that participants only agreed that supervisor's interest in research topic of students is a contributing factor to completion (M=3.66, SD=1.096).

Supervisors' Feedback

As part of the supervisory-related factors, students responded to four items on how feedback from their supervisors affect or has affected their completion. The results provided in Table 11 revealed that feedback from supervisors concerning students' thesis contribute to finishing my programme of study.

Table 11: Supervisors' feedback

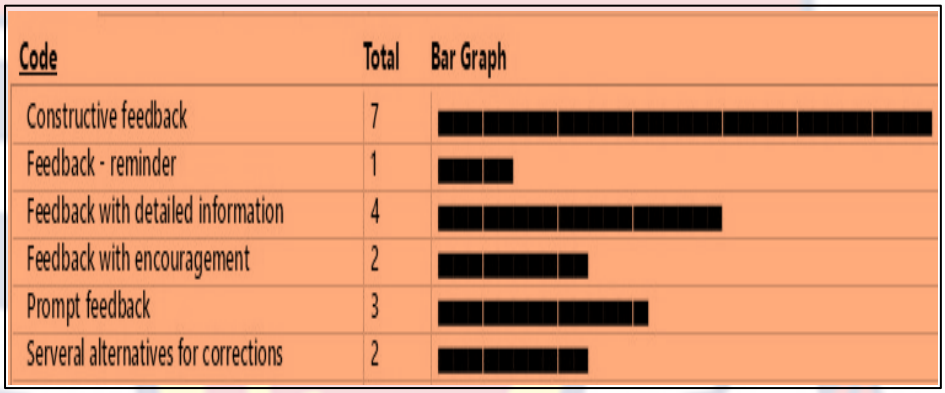
Supervisors' Feedback	M	SD
Supervisor's constructive criticisms about students' thesis contribute to completion.	3.85	1.099
Helpful suggestions by supervisors about students' thesis affect the progress of study.	3.82	1.107
The written comments of supervisors contribute to the programme completion.	3.48	1.142
The delayed feedback provided by supervisors affect the programme completion.	3.15	1.321

Source: Field Survey (2022)

From the data in Table 11, respondents established that, constructive criticisms given by supervisors about their thesis contributes to completion (M=3.85, SD=1.099). It is also clear from the results that a lot of the respondents agreed to the following items, "Helpful suggestions by

supervisors about students' thesis affect the progress of the study." (M=3.82, SD=1.107); and "Written comments of supervisors contribute to the programme completion." (M=3.48, SD=1.142).

In summary, supervisors' feedback affects MPhil mathematics students' completion. In addition, participants were questioned to share their views on how they can describe the content of the feedback of their supervisors. Figure 8 shows the various ways the content of supervisors' feedback was described. The column two (Total) represents the number of times each theme was coded during the interview.



Code	Total	Bar Graph
Constructive feedback	7	
Feedback - reminder	1	
Feedback with detailed information	4	
Feedback with encouragement	2	
Prompt feedback	3	
Serveral alternatives for corrections	2	

Figure 8: Description of supervisors' feedback

From Figure 8, two major themes were identified from the responses of the participants. That is, content of the feedback being constructive or helpful and feedback provided by their supervisors entailed detailed information. The constructive feedback was coded seven times indicating that out of the eight participants seven of them shared on that view. The following excerpts indicate how supervisors' feedback was helpful to students. MME-STU7 acknowledged that "*for the feedback of my supervisor, you must diligently effect the corrections otherwise he [supervisor] would be angry with you. I think that made some of us*

knowledgeable in terms of how to carry out certain aspects of thesis. The feedback was very helpful". MME-STU6 also shared that *"With the feedback between my supervisor and I, it was very positive and encouraging. I learnt a lot thing from the feedback of my supervisor*". Similarly, MME-STU8 recalled that "*We [supervisor and students] had face to face discussions and that was a good learning opportunity for me to ask questions where I was not clear"*.

The comments seemed to suggest that MPhil mathematics education supervisors provided helpful corrections and suggestions, and that students tend to learn to be grounded in writing thesis. Thus, receiving feedback serve as a learning process for the students. Again, the comments suggest that, supervisors engaged their students in face-to-face discussion aside the online feedback.

Regarding the second major theme, four participants revealed that the feedback provided by their supervisors entailed detailed information. They indicated that the suggestions and corrections of their supervisors were clear and well-understood. During the interview, MME-STU2 revealed that *"when I read the comments of my supervisor I don't struggle to understand. He would plainly write in detail the corrections I have to do*". MME-STU6 gave his opinion on supervisors' feedback that "*my supervisor would specifically underline sentences which need to be worked on with the comment attached*". MME-STU3 also acknowledged that his supervisors' feedback was detailed. He said,

> He would critically read the work and give you feedback. I mostly ask for explanation after his suggestions

> so he always have the patience to elaborate on the suggestions. He would always engage me during discussions so that I understand the suggestions and how I can do those corrections.

The above comments seemed to suggest that MPhil mathematics education supervisors provided feedback which the students easily understand. Again, the comments suggest that supervisors engaged the students during their discussion time so that they can grasp the needed information for improving on their thesis write up. In addition, supervisors also gave students specific comments as indicated by MME-STU6.

In general, examination of research question three showed that students' ability to approach their supervisors and work independently affects the rate at which MME students finished their studies. The interview session also confirmed these findings from the quantitative data. The results again pointed supervisor's interest in their research topics as contributing factor to completion. Moreover, the students have identified constructive criticisms, helpful suggestions and written comments supervisors about thesis were identified as factors that affect the completion of the programme of study.

Institutional-related factors that affect the Completion of MME students

The study explores the institutional factors that can contribute to the completion of the MME programme. These factors are into three subscales: teaching or learning resources, thesis writing procedures and support services.

Teaching/Learning Resources

Ascertaining the teaching and learning resources that affect the progress of students' completion, respondents filled out a self-reported scale. Table 12 gives a summary of the result.

Table 12: Teaching and learning resources of the university

Teaching/Learning Resources	M	SD
Access to computer facilities effectively supports the completion of the programme of study.	3.77	1.012
Enough lecture halls for the postgraduate students aid in learning.	3.47	.972
Access to good internet connectivity supports students' thesis writing.	3.38	1.136
Access to institutional repository (past theses) supports students' completion.	3.39	1.067
Access to research books and other mathematics related materials in the library contribute to completion.	3.34	1.120

Source: Field Survey (2022)

An inspection of the data in Table 12 revealed the respondents agreed access to computer facilities effectively supports the completion of the programme of study (M = 3.77, SD = 1.012). Also, MME students agreed that having enough lecture halls for the postgraduate students aid in learning (M = 3.47, SD = .972). Thus, is a contributing factor to completion.

Thesis writing procedures

As part of the answer to Research question four, students responded to items in the questionnaire regarding the procedures in thesis writing. The findings acknowledged that the processes involved in thesis writing affect the completion of MME students. Table 13 shows the summary of the data analysis.

Table 13: Thesis writing procedures of the university

Thesis writing procedures	M	SD
Prolonged assessment (examination) of thesis contributes to completion.	3.66	.932
Lengthy process of acquiring ethical clearance for data collection affects completion.	3.58	1.205
The introductory courses organized by the university develop thesis writing skills of MME students.	3.44	1.035
Delay in defending research proposals affects completion.	3.38	1.147

Source: Field Survey (2022)

Table 13 established that prolonged assessment (examination) of thesis contributes to MME students' completion (M=3.66, SD=0.932). It is also apparent from Table 13 that enormous portion of the respondents agreed with the statement, "The lengthy process of acquiring ethical clearance for data collection" (M=3.58, SD=1.205) and "The introductory courses organized by the university develop my thesis writing skills" (M=3.44, SD=1.035) as a factor contributing to completion rate.

Support services

The students completed a self-reported scale on the support services the university provide which contribute to finishing their programme of study. According to Table 14, the university's support services affect MPhil mathematics education students' completion rates.

Table 14: Support services from the university

Support services	M	SD
The workshops organised on thesis writing is a contributing factor to completion.	3.67	1.059
The research seminars on time management affect completion.	3.39	1.018
Distribution of research guideline books for students help in thesis writing.	3.24	1.201
Counselling services provided by the university affects completion.	2.68	1.183
The financial supports received from the university contribute to completion.	2.33	1.248

Source: Field Survey (2022)

The most striking result from the data analysis in Table 14 was that respondents disagreed with the item, “The financial supports received from the university contributes to completion” (M=2.33, SD=1.248). However, respondents pointed out thesis writing workshops organized by the university as one of the support services that contribute to their completion rate (M=3.67, SD=1.059).

Subsequently, an interview was held to ascertain why financial support from the institution did not contribute to their completion. From the responses of the participants, one major reason that MPhil mathematics education students revealed was that the money used in supporting them was not sufficient to lessen their financial burdens. The following excerpts illustrate participants who explicitly shared their views. MME-STU3 shared his opinion that "*The research grant was not enough at all so it didn't have any influence on the time I completed my studies. It [the money] couldn't even cater for my book expenses*". MME-STU4 were of the same view that, "*The research grant was not sufficient to impact their completion rate; the university should increase it.*" MME-STU7 was of the view that "*The thesis grant was not anything, it was just a token. It was for only two years and I spent four years, what about the remaining years? No support. I would plead the university increase the amount for the grant*". MME- STU6 also shared similar notion that:

> Personally, the financial support I received from the university had no influence on finishing my programme of study. This is because the financial support was not enough. Again, I planned financially. Considering the number of postgraduate students, I would say that one scholarship grant was not enough to serve all of us. Scholarship opportunities should be opened within the university to help students financially.

A possible explanation for these comments might be that the research grant was insufficient to decrease the students' financial load. Another

possible interpretation of the remarks might be that students planned financially towards the study of their MPhil programme. Thus, the number of years they used in finishing the MPhil mathematics education programme did not have anything to do with the inadequate research grants. In addition, the comments also supposed that the university should increase the amount of the research grant for the students. This means that possibly if the research grant is increased, it would lessen students' financial.

The other prevalent reason that emerged from the interview was that application for the grant was not flexible for that matter some students did not apply for the grant. The following excerpts illustrate how some of the participants describe the process of acquiring the research grants: MME-STU2 shared that "*He was not interested in the research grant because of the processes involved. It involved a lot of requirements*". MME-STU4 also elaborated on the requirement for the grant application that *"the requirement included all results from our course works, but at the time of the application, all our results were not ready."*

As suggested by the opinion of the participants, several items may have been required for the application of the research funding, as mentioned by the participants. Again, it seemed students found it a bit difficult to get all these requirements on time hence being unable to apply for the grants. In summary, the data from the interview revealed that the research grant did not influence the completion rate of the MPhil mathematics education students.

On the whole, analysis regarding research question four revealed that teaching and learning resources – access to computer facilities and enough

lecture halls for the postgraduate students – contribute to completion of the programme of study. Additionally, the results showed that introductory courses organized by the university developed the thesis writing skills of students. Furthermore, prolonged assessment (examination) of thesis and lengthy process of acquiring ethical clearance for data collection contributes to MME students' completion. In addition, workshops organised on thesis writing is a contributing factor to completion. On the contrary, financial support from the university was not identified as a contributing factor of completion of MPhil mathematics education students.

Discussion of Results

The study explores the rate at which MME students complete their study within the specified period of time by the university. Also, the study explores factors that students perceived to affect completion of the MME programme. This section discusses key findings of the research questions in the subsequent section.

Completion of MPhil mathematics education students

The study established that MPhil mathematics education students take more time to complete their programme of study rather than the expected two years. It suggests that the MPhil mathematics education students spent over three years finishing their MPhil programme. It could be because the students were working alongside their studies. Hence, students devoted insufficient time to thesis writing, although thesis writing requires maximum time. In line with this finding, several kinds of literature have revealed that the majority of postgraduate students take more years than necessary for their programme completion (Akparep et al., 2017;

Burmeister, 2015; Ghatak et al., 2021; Nouri, Larsson & Saqr, 2019). The study also established that students who completed within the stipulated time (two years) were a handful, which is 8%. This result supports an earlier finding by Bopape (2018), who revealed that in South Africa, the tendency among students is that only a few percent of postgraduate students (15%) finish their courses on time.

Student-related factors affecting MME students' completion

The findings showed one of the student-related factors that respondents perceived to affect completion of MPhil mathematics education students is sufficient knowledge in data collection. It suggests that students with good research knowledge especially in data collection could work on their thesis with ease hence complete within the expected two years. The result builds on the existing evidence from Barnard and Fourie (2013) affirmed that teaching research and the student's ability to learn the research contribute to the completion rate of their study.

Another literature revealed that students face problems writing thesis due to insufficient knowledge about research (Martin & Khan, 2017; Ssegawa & Rwelamila, 2015). Similarly, the study of Manchishi, Ndhlovu, and Mwanza (2015) discovered that students do not know the basis of understanding their thesis topic. It suggests that students with sufficient research knowledge can write their thesis. Therefore, research knowledge in mathematics is necessary to complete the MME programme of study.

Among the student's characteristics, the analysis pointed out that the intrinsic motivation of MPhil mathematics education students can contribute to finishing their study. Also, the result from the interview session affirmed

the quantitative finding. From the interview, intrinsic motivation helped the MPhil mathematics education students who graduated to remain focused amidst the challenges. This finding is consistent with that of Bednall (2018). Bednall established that intrinsically motivated students tend to complete their postgraduate studies on time. To support this finding, supervisors in the study by Armstrong (2013) indicated lack of motivation as a problem for postgraduate students. That means motivation is a necessary factor that helps in completing the MME programme of study on time. This result again is in line with the earlier findings reported in some studies (Rauf, 2016; Kyvik & Olsen, 2014; Zhou, 2015). They revealed that intrinsic or extrinsic motivation affects the pace of completion of postgraduate students in Kenyan universities.

Again, the results showed that work schedules reduced the time MPhil mathematics education students spend on their thesis writing. This result corresponds with the responses of the graduates during the interview session. In agreement with the present finding, a previous study by Rauf (2016) demonstrated that several postgraduate students find it challenging to effectively combine duties to one's family, work, and education. The results corroborate earlier research by Botha (2016), who claimed that the postgraduate completion rate is continuing to decline for several reasons, including the inability of students to take study leaves. That implies that students have to work alongside their programme of study. It could be because the majority (78.5%) of the respondents had jobs during their programme of study. It presupposes that student work alongside studying and writing their thesis. Thus, students do not have the maximum time to

write their thesis, hence causing the completion rate of the study to be affected.

Moreover, the findings discovered that financial support was not a factor that contributes to the completion of MME students. It suggests that the student's ability to sustain themselves financially does not affect the completion rate of MME students. This might be because the majority (78.5%) of the respondents were employed, and they had planned financially for the programme. However, the finding in this study is contrary to the study of Nevill and Chen (2017), Mugendi and Githae (2021), and Zewotir, North and Murray (2015). They identified financial difficulties as a significant factor that lowers graduate students' completion rates. In the same way, this discovery contradicts earlier research of Mngomezulu, Dhunpath and Munro (2017) identified a lack of financial support as one factor which affected students' progression and completion

The study further revealed that communication in various ways, such as students actively participating during supervision sessions, regularly consulting supervisors, and keeping to meeting times of supervisors, affects the completion rate of the study of MPhil mathematics education. The result also concurs with Yousefi et al. (2015) asserted that efficient communication (oral or via email) between the supervisors and the students is essential, as it impacts the success of supervision. Van Rensburg et al. (2016) also affirmed that communication, and more particularly, comments on submitted thesis, is one of the critical components in the supervisor-student interaction. The result also reflects that of Delamont, Atkinson, and Parry (2004), who emphasized the importance of communication by

advising students to keep in touch with their supervisors during their studies. They also demonstrated that excellent communication was the best approach for supervisors to direct their students. In conclusion, communication plays a significant role in the completion of postgraduate students.

Supervisory-related factors affecting completion

While the study of Slethaug and Manjula (2012) characterised supervisors as being unwelcoming, distant, unsympathetic, and disconnected from students' work, the results of this study contradict this idea. In this study, students' flexibility to work independently under the guidance of their supervisors, and how easily students approach their supervisors were identified as factors that can contribute to finishing the programme of study. This suggests that supervisors were welcoming and accommodating. The findings are consistent with Shariff, Ramli and Ahmad (2014), who revealed that a good relationship between the student and the supervisor is essential in postgraduate studies.

Again, the result of this study is in line with the study of Van Rooij et al. (2021) who established that the student-supervisor quality relationship is necessary since it is most likely to be a contributing factor to the completion of students' programme of study. In addition, other studies on relationships between students and supervisors emphasised that students must get along well with their supervisors to complete their studies successfully (Akparep et al., 2017; Cicco, 2014; Goldman & Goodboy, 2017).

As indicated earlier, the findings identified freedom given to students by their supervisors to work independently as one way MPhil mathematics education supervisors relate with their students, hence contributes to completion. In addition, the graduates established from the interview that their supervisors guided or coached them although they were allowed to work independently. This result presupposes that allowing students to work independently comes along with the duty of supervisors coaching them. In line with this finding, Keane (2016) indicated that a successful approach to ensure that students are independent and confident to complete tasks and achieve their planned goals is known as coaching. Also, the result is consistent with other research, which found that providing a balance between direction and independence is an aspect of the relationship between supervisors and students (Drennan & Clarke, 2009).

It emerged in this survey that the easy approachability of MPhil mathematics education supervisors contributes to the completion of the students. In addition, the study found that all the participants who took part in the interview affirmed the results from the survey. This is parallel with the study of Dimitrova (2016) who identified some characteristics of supervisors – being friendly, easily approachable, and passionate about the work and seeing supervisees as junior colleagues – as enhancing the completion rate of theses. The result further supports the idea of Delany (2013) who described some of the qualities of a good supervisor as; being approachable, supportive, tolerant of differences, and admitting errors

Furthermore, it was from the analysis that the interest MPhil mathematics education supervisors have in the research topics of their

students contribute to the progress of completion. This finding suggests that if supervisors have no or little interest in students' thesis topics, supervising that student may become a problem, thus delay the progress of students' completion. The result reflects that of Ali et al. (2016) that both supervisors and students agreed that supervisors should have an interest in the research that students do. The result seems to be parallel to the study of Lee (2010) who revealed that supervisors should be vested in research, be experienced, and have an interest in the thesis topic of students.

In addition, the findings indicated that feedback from MPhil mathematics education supervisors to their students affect completion of the programme of study. Also, the qualitative results showed that the feedback from supervisors contributed to the completion of MPhil mathematics education students who finished their studies. The findings support the earlier findings by McCallin and Nayar (2012), who reported that good and quality feedback is necessary for students. The results of this study also concur with the literature of Seidu (2015). Seidu identified providing prompt responses about students' research work as one way of helping and mentoring students, however, some supervisors take a long time to do so.

Precisely the result indicated that constructive criticisms and as well as helpful suggestions given by MPhil mathematics education supervisors about students' thesis contribute to the completion of the programme of study. This finding contrasts with that of Garwe (2015) who found that most students felt that their supervisors did not constructively review their writing or swiftly offer feedback on written contributions. Again, the finding differs from that of Weaver (2006) who discovered that supervisors'

written evaluation is ambiguous and solely emphasizes the negative qualities of pupils. In addition, it was established under the feedback that written comments of supervisors in a way encourage students, hence affects their completion. The finding is also divergent from previous studies that revealed that some supervisors always provide negative comments that do not motivate the students (Sonn, 2016).

Institutional-related factors affecting completion

The analysis revealed that access to computer facilities and enough lecture halls for postgraduate students supports students' learning. This result presupposes that access to computer facilities enhances the thesis-writing abilities of the students, hence contributing to their completion rate. This result mirrors the previous study by Hadi and Muhammad (2019) who examined the institutional factors that influence students' ability to complete their studies. They identified factors such as adequate library facilities, financial assistance, and research tools being available and accessible to students served as contributing factors to the completion rate of postgraduate programmes.

One of the institutional factors that can affect completion is the introductory courses mounted for students and how it develops their thesis writing skills. In addition, the study showed that prolonged assessments of students' thesis and lengthy process of acquiring ethical clearance for data collection are contributing factors to the completion of the MPhil programme. The finding suggests examination of MME students' theses take longer period, which could cause a delay in their completion. It could be because lecturers still perform other duties such as lecturing, attending

meetings, and marking examinations alongside supervision. All these activities are time-involving and hence might prolong the assessment process of the supervisors.

The findings support earlier findings by Akarep et al. (2017) where they recommended that the Board of universities could bring external supervisors to the university on appointed days to come and supervise students' thesis. It presupposes that the assessment comes along with other duties like lecturing. Thus, supervisors may have ample time to evaluate students' thesis if the supervision takes place on a day designated by the university.

The study further revealed institutional supports that can contribute to completion of the MPhil students. One of the supports established from the result as a contributing factor to completion was workshops on thesis writing. This presupposed that the workshops in a way equipped the MPhil mathematics education students to write their thesis well. On the contrary, the respondents disagreed that financial support from the university contributes to their completion. The qualitative findings also highlighted that the financial assistance from the institution was insufficient to affect their completion. A possible explanation for these results may be that students had prepared financially for their programme of study. However, one major reason given by the graduates was that the money was insufficient to lessen their financial burdens.

Again, the current result differs from that of MacKeracher, Suart and Potter (2006) who found lack of funding from the universities, lack of resources for educational activities and non-recognition of credentials from

past learning as problems of educational institutions. To solve students' lack of funding, Singh (2018) supported the idea that institutions should offer financial support and sponsor conferences students attend. In so doing, students can focus on their studies and this improves upon their completion.

Chapter Summary

This chapter presented results from the data analysis and discussion of key findings. The study established that MME students take more time to complete their programme of study rather than the expected two years, and those who finished within the expected two years were a handful. The study also highlighted that students' work schedules reduce the time spent on their thesis while intrinsic motivation positively affects their completion. In addition, the freedom given to students by their supervisors to work independently and the ability of students to approach their supervisors affect their completion. The study again discovered that organization of workshops by the department and the university on thesis writing is a contributing factor to completion. Moreso, prolonged assessment of theses and the lengthy process of acquiring ethical clearance for data collection affects completion.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Overview

This chapter presents the summary, key findings and conclusions of the study. Again, the implication of the key findings for policy and practice, recommendations and suggestions for further studies were discussed.

Summary

The study sought to investigate the completion rate and the factors influencing this completion rate of MME students in a Ghanaian university. With the General System theory and Jiranek's Dissertation Completion Triangle model as a guide to achieving this purpose, the following research questions and a research hypothesis were formulated:

1. What is the completion rate of MME students?
2. What student-related factors affect completion of MME students?
3. What supervisory-related factors affect completion of MME students?
4. What institutional-related factors affect completion of MME students?

The study adopted an explanatory sequential mixed design. Data gathering tools included a questionnaire and a semi-structured interview guide. Purposive sampling was employed to select the participants for the interview, while semi-structured interviews and questionnaires were adopted to collect quantitative and qualitative data, respectively. For this study, 88 MME students from the chosen university in Ghana were selected using the census sampling technique. The response rate for the questionnaire was 85%, indicating that 79 students participated in the study.

Percentages, mean and standard deviation formed the analytical tools for the quantitative data, but the qualitative data was analysed using thematic analysis. Through the thematic analysis, interviews were transcribed and organized according to themes to complement and explain the findings from the quantitative analysis.

Findings

The findings from research question one showed that MPhil mathematics education students who completed their programme of study used more than three years. Only a few of the students enrolled completed within the stipulated time. For instance, from 2015 to 2019 academic year, just seven students representing 8%, completed within the stipulated two-year period. However, considering those who completed for a particular batch, 80% completed their programme of study in the year in which few students enrolled, that is 2016/2017 academic year.

Also, the findings discovered that intrinsic motivation as a contributing factor to completion of the MME programme. More so, the research indicated that the work schedules of MPhil mathematics education students reduced the time they spent on their thesis. Thus, it contributed to their completion negatively. However, students disclosed from the study that financial support for MPhil mathematics education programme did not delay their completion since they prepared financially well for their programme of study. In addition, students' active participation during supervision, regularly consulting supervisors and keeping to meeting times of supervisors can affect the successful finishing of the MPhil programme.

Furthermore, regarding research question three, the findings pointed out that the freedom given to students by their supervisors to work independently and how students easily approach their supervisors can contribute to the completion of their programme of study. In addition, supervisors' constructive criticisms and helpful suggestions about the thesis and supervisor's interest in research topic of their students are contributing factors to completion.

The last research question explored institutional-related factors that can affect the completion of MME students. The study discovered that workshops organized by the department and the university on thesis writing aided students in writing their theses. Moreover, prolonged assessment (examination) of thesis and the lengthy process of acquiring ethical clearance for data collection can contribute to completion. However, students pointed out that financial support from the university did not contribute to the completion of their programme of study because the support was not enough.

Conclusions

From the findings, the completion of MME students within the stipulated two-year period is low. Majority of students who completed their studies used more than three years. It means students take more than the maximum duration (three years) to complete their studies. However, when few students were enrolled, majority of them completed their programme of study that year.

Again, personal characteristics that can enormously contribute to the completion of MME students were intrinsic motivation and their job.

Students' work schedules can reduce the time they spend on their thesis, hence can delay their completion It can also be concluded that the financial support for the MME students during their programme of study can not affect their time of completion. Again, based on the findings, a good relationship between supervisors and their students, supervisors' helpful feedback and research support from supervisors can affect students' completion.

Furthermore, the university can contribute to the completion of the MME students programme by organising workshops on thesis writing. More so, it can be concluded that prolonged assessment (examination) of thesis and the lengthy process of acquiring ethical clearance for data collection can contribute to completion. This in a way can delay the completion of the MPhil mathematics education programme.

Recommendations for policy and practice

Based on the findings and conclusions, the study made the following recommendations for educational policy and practice.

The findings showed that few MME students completed their degrees within the expected two-year period, and most took longer than three years. This may imply that a number of students went beyond the allotted period for their studies, which could have diminished interest on the part of both students and supervisor. As a result, supervisors would be overworked, which would impede the supervision process. Students may also bear additional financial responsibility. Hence, the university and the department should reinforce orientation for students on the disadvantages of

delaying thesis writing. Again, students should be conscientised about the duration of the programme of study.

From the findings, intrinsic motivation can contribute to MME students' completion. The inference is that a student's ability to complete the MPhil mathematics education programme depends greatly on the goals they set before starting their studies. Therefore, before granting students admission, the department should consider the reasons for selecting mathematics education. Again, students should be encouraged to have internal motivation toward the MPhil mathematics education programme.

The findings indicated that the work schedules of MPhil mathematics education students reduce the time they spend on their thesis. In a way, it implies that students do not have enough time to complete their research projects, which would cause their completion time to prolong. Therefore, department should intensify workshops for student-workers on how they can effectively combine studies and their jobs. Once more, students studying mathematics education should be encouraged to make sacrifices to finish their studies on time.

More so, the study reported that the freedom supervisors give their students to work independently can contribute to their contribution. Possibly, this factor can compel and encourage students to search for more information concerning their research. Hence the students gain more knowledge in thesis writing and research. Therefore, supervisors should discourage students from being too dependent on them but rather be encouraged to organize their thoughts by guiding them. Again, the

department should encourage supervisors to continue to maintain affability with their students.

Furthermore, since supervisors' helpful suggestions emerged as a contributing factor to the completion of MPhil mathematics education students, the department need to motivate supervisors to continue exhibiting this character since it helps in writing the thesis. It implies that supervisors should constantly update their knowledge in research to keep up with their tasks. To effectively help students, supervisors should be encouraged to continue using their knowledge.

In addition, the finding indicated that workshops on thesis writing can affect the completion of the MPhil mathematics education students. The finding suggests that apart from the first-year course work students attend, they also acquire additional knowledge from the workshops the university and the department organise. Therefore, it is recommended that the university and the department should intensify the workshops for all postgraduate education students.

In addition, the MPhil mathematics education students pointed out that financial support from the university would not contribute to the completion rate of the students because the support was not enough. One implication of this finding is that if the financial support was to be sufficient, it would have lessened their financial burden. Hence, the university is encouraged to increase its financial support for the postgraduate students.

More so, the finding discovered that the lengthy process of acquiring ethical clearance for data collection affects completion. The implication of this finding is that students would delay in collecting data for their work, so

it would possibly prolong their completion since all postgraduate students in the university apply for the ethical clearance through only one office. It is therefore recommended that the university could decentralize the application of ethical clearance to the faculty levels instead. That, in a way, could lessen the pressure on the resource staff, hence making the ethical clearance application process flexible, and this would resolve issues with delay in accessing ethical clearance processes.

None the less, the findings revealed that prolonged assessment of thesis contributes to completion. This possibly implies that the completion of students' studies would be prolonged. This may also imply that if students receive early feedback it would account to their early completion if all other factors remain equal. Therefore, it is recommended that suitable structures could be established by the university so that the SGS can check the progress of a student's thesis when it goes out for assessment.

Suggestions for Further Research

The following suggestions could be considered for further research:

1. It was noted from the findings that the year in which few students enrolled (2016), majority of them (80%) completed their programme of study. Hence further study could be done to explore the relationship between the number of students enrolled on a programme and their completion rate.
2. The findings revealed that the lengthy process of acquiring ethical clearance for data collection affects completion. Hence further study could be done to find out what makes ethical clearance acquisition process, among other institutional factors, time-consuming.

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APPENDICES

APPENDIX A

STUDENTS' QUESTIONNAIRE

(THESIS TOPIC: FACTORS AFFECTING THE COMPLETION OF POSTGRADUATE MATHEMATICS EDUCATION STUDENTS IN A GHANAIAN UNIVERSITY)

Dear Respondent,

I would like to seek your permission to solicit your views on the factors that account for the completion rate of MPhil Mathematics Education students. Sharing your experiences would help identify factors affecting completion rate of MPhil (Mathematics Education) students and ways to improve on the completion rate. This study is basically for academic purpose only. For the sake of confidentiality, you are **not** required to indicate your name.

(A) BACKGROUND INFORMATION

For each statement, indicate by ticking [√] in the box that applies to you.

1. Sex

   Male [ ] Female[ ]

2. The year in which you enrolled.

   ……

3. Age during admission

   …… years

4. Marital status during your programme of study

   Single [ ] Married [ ]

5. Employment status during your programme of study.

   Employed [ ] Unemployed [ ]

(B) FUNDING YOUR MPHIL PROGRAMME

6. Did you receive any government bursary?

Yes [ ]

No [ ]

7. Did you receive student loan?

Yes [ ]

No [ ]

8. Was your MPhil programme self-sponsored?

Yes [ ]

No [ ]

(C) STUDENT RELATED FACTORS

In the table are student related factors that are likely to facilitate the completion of MME programme in a Ghanaian university. On the scale of 1 to 5 where 1= Strongly Disagree (SD), 2=Disagree (D), 3=Undecided (U), 4=Agree (A) and 5= Strongly agree (SA). Rate your agreement to these statements by choosing ONLY one option.

S/N	STATEMENTS	SD	D	U	A	SA
	Research knowledge in mathematics					
i.	Sufficient knowledge in data collection contributes to completion.					
ii.	The adequate knowledge in interpreting data analysis affects completion.					
iii.	Adequate skill in reviewing literature contributes to completion.					
iv.	Sufficient knowledge in data analysis is a contributing factor to completion.					
	Student's Personal Factors					
v.	Intrinsic motivation is a contributing factor to completion.					
vi.	Work schedules of students reduce the time they spend on their thesis.					
vii.	The financial support for MPhil mathematics education programme delays completion.					
viii.	Poor time management of students slows down completion.					
	Communication with supervisors					
ix.	Active participation during supervision contributes to completion.					
x.	Regularly consulting supervisors affect completion of the MME programme.					
xi.	Keeping to meeting times of the supervisors contribute to completion.					
xii.	Untimely submission of corrections to supervisors affects completion.					

(D) SUPERVISORY RELATED FACTORS

In the table are supervisory factors that are likely to facilitate the completion of MME programme in a Ghanaian university. On the scale of 1 to 5 where 1= Strongly Disagree (SD), 2=Disagree (D), 3=Undecided (U), 4=Agree (A) and 5=strongly agree (SA). Rate your agreement to these statements by choosing ONLY one option.

S/N	ITEMS	SD	D	U	A	SA
	Supervisor-student relations					
i	The freedom supervisors give their students to work independently affects completion.					
ii	How students easily approach their supervisors contribute to their completion.					
iii	The availability of supervisors affects the completion of students.					
iv	The limited meeting times with supervisors affects completion.					
	Research support from supervisors					
v	Supervisor's interest in research topic of students is a contributing factor to completion.					
vi	Provision of alternative designs by supervisors during thesis writing affects completion.					
vii	Supervisor's guidance in selecting thesis topic affects the progress of study.					
viii	Relevant thesis materials provided by supervisors are a contributing factor to completion.					
ix	Supervisors' guide in getting divert sources of literature affect completion.					
	Supervisors' Feedback					
x	Supervisor's constructive criticisms about students' thesis contribute to completion.					
xi	Helpful suggestions by supervisors about students' thesis affect the progress of study.					
xii	The written comments of supervisors contribute to the programme completion.					
xiii	The delayed feedback provided by supervisors affect the programme completion.					

(E) INSTITUTIONAL RELATED FACTORS

In the table are institutional factors that are likely to facilitate the completion of MME programme in a Ghanaian university. On the scale of 1 to 5 where 1= Strongly Disagree (SD), 2=Disagree (D), 3=Undecided (U), 4=Agree (A) and 5= Strongly agree (SA). Rate your agreement to these statements by choosing ONLY one option.

S/N	STATEMENTS	SD	D	U	A	SA
	Teaching/Learning Resources					
i.	Access to computer facilities effectively supports completion of the programme of study.					
ii.	Enough lecture halls for the postgraduate students aid in learning.					
iii.	Access to good internet connectivity supports students' thesis writing.					
iv.	Access to institutional repository (past theses) supports students' completion.					
v.	Access to research books and other mathematics related materials in the library contribute to completion.					
	Thesis Writing Procedures					
vi.	Prolonged assessment (examination) of thesis contributes to completion.					
vii.	Lengthy process of acquiring ethical clearance for data collection affects completion.					
viii.	The introductory courses organized by the university develop thesis writing skills of MME students.					
ix.	Delay in defending research proposals affects completion.					
	Support services					
x.	The workshops organised on thesis writing is a contributing factor to completion.					
xi.	The research seminars on time management affect completion.					
xii.	Distribution of research guideline books for students help in thesis writing.					
xiii.	Counselling services provided by the university affects completion.					
xiv.	The financial supports received from the university contribute to completion.					

Thank you

APPENDIX B

SEMI-STRUCTURED INTERVIEW GUIDE

1. How would you describe the completion of your batch, taking into account the number of years required to finish?
2. How did your employment during your MPhil education contribute to your completion?
3. In what manner did intrinsic motivation impact your ability to complete your degree?
4. How did funding of your study influence your programme completion?
5. What were the things your supervisor did which contributed to your completion?
6. What is your opinion of the financial assistance provided by the university to students?

APPENDIX C

UNIVERSITY OF CAPE COAST

INSTITUTIONAL REVIEW BOARD SECRETARIAT

TEL: 0558093143 / 0508878309
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OUR REF: IRB/C3/Vol.1/0047
YOUR REF:
OMB NO: 0990-0279
IORG #: IORG0011497

17TH FEBRUARY 2023

Ms Praise Vera Agbelengor
Department of Mathematics and ICT Education
University of Cape Coast

Dear Ms Agbelengor,

ETHICAL CLEARANCE – ID (UCCIRB/CES/2022/61)

The University of Cape Coast Institutional Review Board (UCCIRB) has granted Provisional Approval for the implementation of your research on ***Completion Rate of Postgraduate Mathematics Education Students in a Ghanaian University.*** This approval is valid from 17th February 2023 to 16th February 2024. You may apply for a renewal subject to the submission of all the required documents that will be prescribed by the UCCIRB.

Please note that any modification to the project must be submitted to the UCCIRB for review and approval before its implementation. You are required to submit a periodic review of the protocol to the Board and a final full review to the UCCIRB on completion of the research. The UCCIRB may observe or cause to be observed procedures and records of the research during and after implementation.

You are also required to report all serious adverse events related to this study to the UCCIRB within seven days verbally and fourteen days in writing.

Always quote the protocol identification number in all future correspondence with us in relation to this protocol.

Yours faithfully,

Kofi F. Amuquandoh

Ag. UCCIRB Administrator

ADMINISTRATOR
INSTITUTIONAL REVIEW BOARD
UNIVERSITY OF CAPE COAST