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BACHELOR OF SCIENCE EDUCATION HONORS DEGREE IN PHYSICS

INVESTIGATING LEARNER PERFORMANCE IN MECHANICS AT A-LEVEL PHYSICS IN HARARE DISTRICT, ZIMBABWE.

BY

CHIHIYA NYASHADZAISHE

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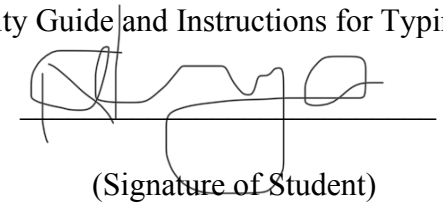

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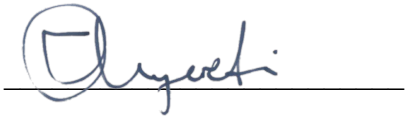

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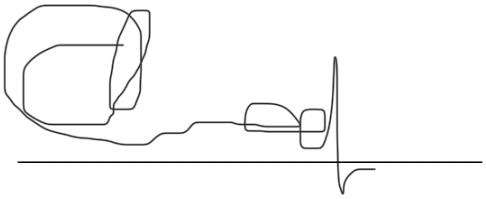

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Name of the student : CHIHIYA NYASHADZAISHE

Registration Number : B1852088

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I feel obliged to our almighty God who gave me strength to accomplish this work. I would like to thank my family for all their sacrifices they made for my benefit. I will forever appreciate and be grateful for their steadfast love. I am where I am today because of their support and encouragement.

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DEDICATION

I dedicate wholeheartedly this study to my family, my aunt, my grandmother; may her soul rest in peace, my wife Lonqina, sister Balbina and my brothers Valentine and Chengetanai for their unwavering and visionary support during hard times encountered and all my colleagues.

ABSTRACT

The study investigated learner performance in mechanics at A-level Physics in Harare district, Zimbabwe. Therefore, the study aimed at exploring the factors that contribute to the difficulties learners face in understanding mechanics concepts and to suggest strategies for improving their performance. To accomplish this, the study addressed the following objectives, how do learners and teachers perceive the teaching and learning of mechanics in A-level Physics, what strategies can be employed to improve the performance of learners in mechanics, and what are the factors that contribute to the poor performance of learners in mechanics? The study has been motivated to investigate the causes of poor performance of learners in mechanics by the fact that A level teachers report difficulties with A level students` learning of concepts and skills associated with the solution of typical basic mechanics problems. The study's significance focused in identifying the factors that contribute to the poor performance of learners in mechanics and suggesting strategies for improving their performance. The study adopted a mixed method approach, whereby both qualitative and quantitative methods were utilized to gather data. The population involved science teachers, Advanced level students, and the heads of science departments in the selected schools who were selected using purposive sampling. Three major categories of factors were identified as contributing to students' low performance in Physics mechanics' section; namely, learning factors, teaching factors, and administrative factors. Learning factors are those factors that emanate from the learners, such as time management skills and background in mathematics; teaching factors are those factors that are attributable to the teacher, such as quality of teacher-student interactions and teacher's content knowledge; while administrative factors are those factors that can be attributed to the administrative context within the school, such as access to resources and quality of guidance provision. Based on the research findings, a number of recommendations are made to practitioners and policy makers. For teacher educators, a proposal is made to include a course on improvisation in physics education during teacher pre-service training. For the school administrators, it is recommended that mechanisms be put in place to ensure that the students' voice is heard and supported during selection of preferred subject combinations. For teachers, it is recommended that the use of practical and interesting learning experiences during lessons be inculcated right from the first year of secondary education so as to engage the learners and sustain their attention.

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CHAPTER 1: INTRODUCTION

1.1 Introduction

This chapter provides an overview of the background of the study, statement of the problem, aim and objectives of the study, significance of the study, delimitations, organization of the study and lastly summary of the chapter.

1.2 Background of the study

Physics is a fundamental science that plays a crucial role in modern society. It provides the foundation for many technological advancements and innovations. However, Physics is often perceived as a difficult subject, and learners often struggle to understand its concepts, particularly in mechanics (Carew and Dwight, 2016). Carew and Dwight (2016) investigated the causes of poor student performance in basic mechanics which shows that even engineering lecturers report difficulties with student learning of concepts and skills associated with the solution of typical basic mechanics problems.

Understanding mechanics concepts is critical for learners who wish to pursue careers in engineering, Physics, and other related fields. Mechanics plays a central role in many different sectors of industry such as telecommunications, architecture, engineering, electricity production and transmission, construction, and transport. It also provides employment for people who are in occupations that are engaged in physics as a scientific discipline – for example teachers, scholars, and other researchers. It is thus an indispensable part of any country's economic development. Furthermore, Physics often provides the foundations for other disciplines such as Biology, medicine and Chemistry. It enables learners to develop analytical skills necessary for problem solving in various situations they encounter in life. In Zimbabwe, Physics education will play a catalysing role in the realization of Vision 2030, the country's national plan to become an industrialized nation by the year 2030. It is therefore important for Zimbabwean students to be well grounded in Physics education to guarantee Zimbabwean's economic development.

Today, science pervades literally every field of human endeavour and plays a fundamental role in the teaching and learning process. However, the issue remains that in most, high schools in

Zimbabwe, there is high rate of failure in the subject. From the past six years the performance pass rate of learners at Ordinary Level in Physics deteriorated from 75.5% to 67.5%. The table below show how pass rate varies from 2015 to 2022 for A level Physics.

Year	Pass rate (% achieving D or above)
2015	75.5
2016	75.4
2017	75.9
2018	67.5
2019	68.0
2020	67.8
2021	70.0
2022	67.5

Figure 1: A level Physics pass rate 2015-2022

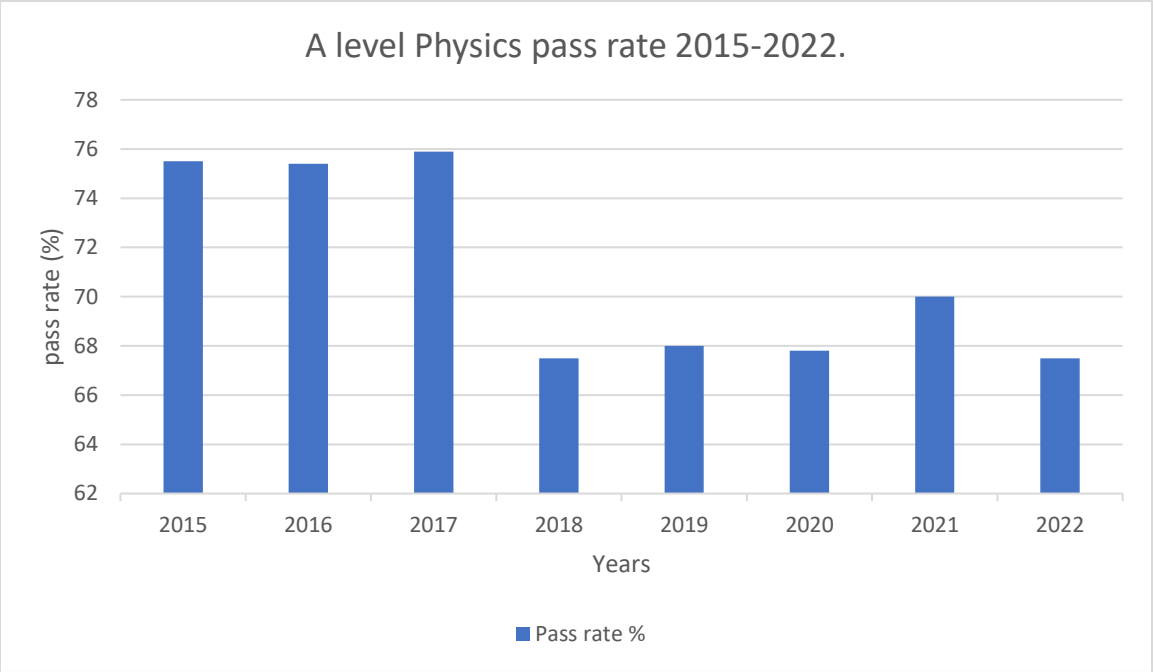

Figure 2: Graph of A level Physics pass rate 2015-2022

The table show a drop of pass rate from 2015 to 2022 in the subject. Carew and Dwight (2016) carry out an investigation on causes of poor performance in basic mechanics and concluded that so many Physics students struggle with learning basic mechanics. Their argument solely based on the view that the poor performance in mechanics is caused by insufficient grounding in maths that is used and manipulation of equations.

According to Dhurumraj (2013), poor performance in mechanics can be attributed to a number of factors that include; poor instructional materials, negative teacher attitude, and student's attitude, educator`s poor understanding of the syllabus, a negative attitude and arriving late to class. On this note, Chirume and Chikasha (2014) recommend the teacher to choose the best materials to present to students, try new roles, materials and strategies and make use of individual instruction. Teachers must be familiar with the subject content to be taught.

The country has a huge population in the urban areas with about 70% of total population (Makopa, 2011). Average pass rate amongst urban secondary schools is below the national with many achieving even a zero percent pass rate. It therefore becomes very imperative for educators to unearth the likely causes of low academic achievements. This will enable educators to find causes unique to urban environments and provide solutions. Ibe, Nworgu & Anyaegbunam (2016) assert that higher academic performance is a top priority for educators and various researchers have sought to identify its determinants, some of which are age, gender, family socio-economic factors, pedagogical practices and peer influence. There remains a big gap in the research since societies vary and have specific political, economic and social factors that affect students in their academic performance.

Physics curriculum is planned to enable the teacher use activity oriented, child-centred approach to teach. According to Makopa (2011), the learner must be psychologically, physical and physiologically ready to receive instruction from the teacher. The children of today constitute the leaders of tomorrow, they therefore become the focal point of this research. This course of study is worth studying considering the importance of this level of education to the growth and development of the students. Barrientos (2015) sees learning as a change of behaviour which is more or less permanent in nature and which result from activity, training or observation. That is, learning include matter but also that of habit, attitudes adjustment, preference interest, social

adjustment, still of many types and ideas the first definition was limited and ideas the first definition was to capability developed, through practice or experience.

Therefore, there rise need to survey into the study of causes of poor performance in Physics particularly in the Mechanics section in High schools. Instructional materials, resources and equipment for science are either in short supply or are completely lacking in schools to the extent that most teachers end up with verbal exposition of scientific principles, facts and concepts (Mahler, Groschedl & Harms, 2018). Education is a tool for development area of any country in the world including Zimbabwe. However, it should be noted that in this area very few studies have concentrated efforts in identifying causes of poor students' academic performance such as proximity to the school, teacher-pupil ratio, student-textbook ratio and teacher competence amongst others. It is against this background that this study opted to investigate causes of poor performance in Physics Advanced level in Harare district.

1.3 Statement of the problem

Despite the importance of mechanics in Physics, many learners struggle to understand its concepts, resulting in poor performance in exams. The problem is not unique to the A level student in Zimbabwe only but has been reported in other countries as well. For instance, a study carried out by Kariku and Njiru (2015), at a certain secondary school in Kenya. They identified three major categories of factors that contribute to low performance in physics: factors that emanate from the teacher; factors that emanate from the learners; and factors embedded in the context within which the school system operates. These factors where trimmed down to three categories as, teaching factors, learning factors, and administrative factors, respectively. Of the three categories, teaching factors emerged as the highest contributor to students' low performance in physics. Their findings show that student-participants had expectations of their physics teacher with regards to establishing the classroom environment for effective learning. In particular, the students expected to be engaged during the lesson through practical activities and questioning. This is important because continually engaging students in the lesson would make them feel part of the knowledge generation community, which would get them motivated to learn physics. This is in agreement with Dwight and Carew (2006), who argue that although practical work can sometimes be expensive and time consuming, it has simply to be done if the learners are to advance in their understanding. Kariku and Njiru (2015) put forward a number of

recommendations number of recommendations can be made to improve students' performance in physics. To begin with, there is need to improve on teacher-student ratio so as to improve on the delivery of the physics curriculum. Having enough physics teachers will reduce the teaching load of physics teachers so that they have sufficient time to prepare for physics lessons consequently leading to improvement in the academic performance in physics. In order for teachers to be well prepared to meet the challenges of teaching physics in a school with limited teaching /learning resources, it is important for student-teachers to receive pre-service training on teaching physics through improvisation. This can be achieved through, for example, the introduction of a course on improvisation in physics education. Additionally, teacher educators can organize for an in-service professional development course on improvisation in physics education for practicing physics teachers.

The problems are compounded by the fact that mechanics is a prerequisite for many higher-level physics courses. According to Dwight and Carew (2006), engineering lecturers report difficulties with student learning of concepts and skills associated with the solution of typical basic mechanics problems. Students make a range of typical errors including; the inclusion of internal forces, inadequate distinction between force and moment, couples seen as equivalent to a force, direction of force at connections set by the direction of the connecter, and assumption that the force direction is influenced by the presence of an applied load. Typical approaches to addressing students' difficulties with learning basic mechanics are based around individual academics' informal observations of student learning and anecdotal conclusions on an appropriate solution. The literature contains numerous reports of attempts to improve student learning of mechanics.

With concern that the teaching and learning of physics was susceptible to a wide range of challenges, owing to its compulsory nature in the secondary curriculum and the resultant large classes. It is nothing to write home about due to the adverse effect of the attitude of student. Hence, this study prompted a number of factors like attitude of students to learning, incompetence or negative attitude of teachers and poor teaching habits, lack of instructional materials and teaching aids as well as large classes. This has motivated this study to develop the urge to investigate the causes of poor performance of learners in mechanics. Therefore, it is essential to investigate the reasons behind the poor performance of learners in mechanics to improve their understanding and performance in Physics.

1.4 Aim and Objectives

The study aims to investigate the factors that contribute to the difficulties learners face in understanding mechanics concepts and to suggest strategies for improving their performance.

The study aims to address the following research objectives;

I. How do learners and teachers perceive the teaching and learning of mechanics in A-level physics?
II. What strategies can be employed to improve the performance of learners in mechanics?
III. What are the factors that contribute to the poor performance of learners in mechanics?

1.5 Significance of the study

The study's significance lies in identifying the factors that contribute to the poor performance of learners in mechanics and suggesting strategies for improving their performance. The findings of the study have implications for teaching and learning practices in Physics education. The study provides insights into the challenges that learners face when learning mechanics and highlights the importance of addressing these challenges to improve learners' understanding and performance in Physics. The results of this study suggest possible solutions to make science teaching and learning more meaningful to learners and teachers. The study further aims at suggesting ways to eliminate problems which continue to detract from the performance of mechanics learners at Advanced level.

1.6 Delimitations

The research study used high schools in Harare district which enrols pupils from different socio-economic background that can provide various expected opinions in learners. The district has approximately 43 private high schools and 64 publics high schools. The study includes A level students enrolled at different high schools in Harare. Only A level students participate in the survey. Since the survey was confined to a small number of schools the sample may not be a reflection of all physics students from high schools in Zimbabwe

1.7 Organisation of the study

This research study explores the reasons behind the poor performance of learners in mechanics, specifically in A-level physics. the first chapter concentrated on introducing the main aim of the study, the second chapter focuses on the literature review behind the research study, third chapter concentrated on the research methodology used by this study, fourth chapter focuses on data presentation, analysis and interpretation and the last chapter focuses on summary, conclusion and recommendation made during the study.

1.8 Chapter summary

The chapter centred on the general overview of the whole study. This entails: the factors that motivated to partake this study, the statement of the problem, the aims of the research, as well as the objectives of the study. The Chapter also examined the significance of the study to various stakeholders, delimitations and organisation of the study. The next chapter will review the literature related to the study.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Mechanics is one of the most important topics in A-level Physics and plays a crucial role in the understanding of many other areas of Physics. Despite its importance, learners often struggle to understand and apply the principles of mechanics in their studies. This literature review devotes itself to presenting the existing international, national and regional literatures in the arena of factors that influence learners' poor performance in mechanics in A-level Physics.

2.2 Learner performance

Physics is mystified to be a tough and abstract discipline, and A level Physics course do little to change this negative attitude towards physics (Blickenstaff, 2010). Yet, there has been research studies showing that students usually enjoy working in the laboratory (Deacon and Hajek, 2011). This could mean that laboratory sessions may be a chance to dispel the bad reputation of Physics. High schools invest considerable funds in building laboratories, furnishing them, buying sets of appropriate equipment for the experiments, and writing laboratory manuals. However, traditionally very little attention is paid to the teachers of the laboratory courses. Even though laboratories are expensive insofar as resources and the time spent by students and teachers, laboratory sessions generally are not considered to be a valuable learning experience (Kirshner and Meester,2016). One of the primary goals in Physics education is to identify potential and obstacles to student learning, and then to address these obstacles in a way that leads to more effective learning. These obstacles include factors that originate during instruction - such as instructional method as well as those that relate to students' pre-instruction preparation, with mathematics skills being the most common factor (Lacambra, 2016).

Mechanics heavily relies on mathematical and physics concepts, and learners who lack a solid foundation in these subjects may struggle to understand mechanics. For example, learners who are weak in algebra may find it challenging to manipulate equations and solve problems that involve variables. Vectors can be used as an example; they consist of both mathematical and physics concepts. At advanced level learners will be asked to find the resultant vector joining two or more vectors acting on a point with an angle between them, which are called coplanar vectors. A learner should have strong mathematical background the cosine and sine rule from

mathematics for him to be able to understand this section properly. Learners therefore find these mechanics section troublesome because of its prerequired techniques from mathematics Crouch & Mazur, 2014)

2.3 Factors which affect learner performance at Advanced level

Several factors contribute to learners' poor performance in mechanics. These include the abstract nature of mechanic's concepts, learner attitude, teacher attitude, gender, inadequate preparation in mathematics and Physics, inadequate pedagogical approaches, and a lack of interest and motivation in learning the subject to mention just a few.

2.3.1 Learner attitude

Investigating the attitude of learners towards science was the other factor that Baker and Jones (2015) explored. They reported that the generation of a positive attitude towards science, is an important and integral goal of science education. Many learners tend to avoid science subjects because of their fear of the subject and a lack of self-confidence. This negative attitude can result learner underperformance and as a result being unable to get the required results for university entrance (Mullins 2017). The fear of science subjects has resulted in a decrease in the number of learners taking the subjects both at the secondary and tertiary level (Gough 2019).

Despite the fact that science informs our thoughts and behaviours, many people do not seem to place a high value on science. Studies show that the general public (non-science majors) do not generally have positive feelings towards science and scientists (Rogers & Ford 1997). A positive attitude towards science may improve students' academic performance not only in science classes, but also in other subjects as well. It is therefore in the interests of the society, and the responsibility of educators, to improve students' attitude towards science and to prepare students to live in a highly technological society. The future of our society will be determined by citizens who are able to understand and help shape the complex influences of science and technology on our world (Ungar, 2010). If the students change their attitude towards science subjects, the performance in their results will definitely improve since they will dedicate more time towards learning the science subjects.

Baker and Jones (2015), mentions that those learners who come from a higher socio-economic status family are more motivated to study and show a positive attitude towards their studies. The

socio-economic background of learners also affects their attitude towards Physics. According to Baker and Jones (2015), there is an association between low socio-economic status and poor performance in science in school. However, evidence has suggested that it is not the socio-economic status per se but factors associated with home resources and background experiences that affect the learners‟ performance in science. According to Saiduddin (2013), factors such as unstable homes, drug abuse and teenage pregnancy contribute to poor performance among learners so as affecting learners' performance towards science subjects.

2.3.2 Teachers attitude

The impact of the teachers on performance in any subject is very high. The teachers are the facilitators who are to impact the theories and concepts into the students. The teacher is the major manpower saddled with the responsibility of imparting the concepts considered fundamental to technology through the teaching of these basic concepts in the secondary schools. The objectives of the education sector of any country cannot be attained when the students are taught by incompetent teachers. Such teachers would not be able to properly and adequately disseminate the concepts to the students. The professional qualities of a well-trained teacher (Ajayi, 2009) include: mastery of the subject matter, sense of organisation, ability to clarify ideas, ability to motivate students, good imagination, ability to involve the students in meaningful activities throughout the period of teaching, management of the details of learning and frequent monitoring of students' progress through tests and examinations.

Teven (2014) argues that, a vital requisite to effective teaching is establishing a climate of warmth, understanding, and caring within the classroom. Due to the nature of classroom instruction, length of time spent with students, issues of cultural and cognitive diversity, it is essential that teachers develop a caring atmosphere in which to work with their students. Students who feel that teachers care for them tend to achieve academically. Also, a descriptive correlation study by Velez et al (2008) examined the relationships between teacher immediacy and student motivation from a selected class of freshmen enrolled in a college of agriculture course in USA. Results indicated that immediacy does have an association with student motivation. Teacher's motivation in his/her teaching job contributes much to student's good examination performance. If a teacher is not interested in the teaching profession that means

he/she is not intrinsically motivated, thus he/she will not be eager to motivate his/her students to learn. Hence teacher`s attitude towards learners will lead to poor examination performance.

2.3.3 Gender

Research on Gender and Education has focused on unearthing the underlying causes of gender disparities and factors that hinder attempts to reduce and eventually eliminate disparities. Studies reveal that key factors include social, cultural and religious beliefs, attitudes and practices, poverty, child labour, poor learning environment, lack of role models and learners' attitude among others. Performance and enrolment in Physics is caused by among other factors, girls being unable to have well-developed manipulating skills good enough to handle practical examinations, Thomas (2019), when researching for girls in science and technology found that boys persistently intimidated girls in science laboratory and denied them access to equipment. As a result, girls "loose out" in the use of apparatus and materials and hesitate to take risks that may seem dangerous with apparatus, The gender disparity will then cause poor performance in Physics at high level.

2.3.4 Inadequate preparation in mathematics and Physics

Inadequate preparation in mathematics and Physics can be classified under cognitive factors which relate to learners' mental processes, such as perception, memory, and reasoning. Learners may find mechanics challenging due to the abstract nature of the concepts, which may not be directly observable. Learners may also struggle with mathematical calculations involved in mechanic's problems. Additionally, learners may have misconceptions about mechanic's concepts, which can hinder their understanding. Inadequate preparation in mathematics can cause inadequate prior knowledge for mechanics. Mechanics builds on concepts learned in lower-level Physics courses, such as kinematics and Newton's laws of motion. If learners do not have a solid understanding of these foundational concepts, they may struggle to comprehend more advanced topics in mechanics. A study by Singh (2016) found that prior knowledge of kinematics significantly influenced learners' performance in mechanics. Another reason for poor performance in mechanics is a lack of problem-solving skills. Mechanics requires learners to apply mathematical principles to solve problems, and many learners struggle with this aspect of the subject. A study by Osodo and Indoshi (2020) found that learners who lacked problem-solving skills performed poorly in mechanics.

2.4 Advanced level mechanics

The Mechanics A-Level section covers: acceleration, newton's laws, vectors, using newton's laws, moments, impulse and momentum, coefficient of friction, projectiles, work, energy and power, newton's law of restitution, centre of mass, toppling, elastic strings, simple harmonic motion, motion in a circle and motion in a vertical circle. The topics of mechanics are mostly included in paper 1, 2, and 3 covering a high percentage of the papers.

2.5 Chapter summary

This chapter looked at learners' poor performance in mechanics in A-level physics, poor performance which can be attributed to several factors, including inadequate prior knowledge, a lack of problem-solving skills, ineffective teaching strategies, and a lack of interest and motivation. The review of literature was guided by research aim and objectives. The next chapter shall focus on research and methodology.

CHAPTER 3: RESEARCH METHODOLOGY

1.1. Introduction

This chapter presents the research methodology, the research design, the study site and population, the sample size and sampling technique, the procedures of data collection, the data gathering tools, the methods of data analysis and Ethical considerations.

3.2 Research design

Triangular research design was used in this study. The purpose of this design is to obtain different but complementary data on the same topic to best understand the research problem (Morse, 2015). The intent in using this design is to bring together the differing strengths and nonoverlapping weaknesses of quantitative methods (large sample size, trends, generalization) with those of qualitative methods (small *N*, details, in depth) (Patton, 2010). This design is used when a researcher wants to directly compare and contrast quantitative statistical results with qualitative findings or to validate or expand quantitative results with qualitative data. The Triangulation Design is a one-phase design in which researchers implement the quantitative and qualitative methods during the same timeframe and with equal weight. The single-phase timing of this design is the reason it has also been referred to as the "concurrent triangulation design" (Creswell, Clark, et al., 2013). It generally involves the concurrent, but separate, collection and analysis of quantitative and qualitative data so that the research problem may best understood. The study attempts to merge the two data sets, typically by bringing the separate results together in the interpretation or by transforming data to facilitate integrating the two data types during the analysis.

3.3 Research paradigm

This study employs a mixed method methodology. Creswell and Plano Clark (2011), a mixed-methods research design is a research design that has its own philosophical assumptions and methods of inquiry. As a methodology, it includes philosophical assumptions to provide directions for the collection and analysis of data from multiple sources in a single study. A mixed-methods design offers a number of benefits to approaching complex research issues as it integrates philosophical frameworks of both post-positivism and interpretivism (Fetters, 2016) interweaving qualitative and quantitative data in such a way that research issues are

meaningfully explained. It also offers a logical ground, methodological flexibility and an in-depth understanding of smaller cases (Maxwell, 2016). In other words, the use of mixed-methods enables researchers to answer research questions with sufficient depth and breadth (Enosh, Tzafrir, & Stolovy, 2014) and helps generalise findings and implications of the researched issues to the whole population. For example, the quantitative approach helps a researcher to collect the data from a large number of participants; thus, increasing the possibility to generalise the findings to a wider population. The qualitative approach, on the other hand, provides a deeper understanding of the issue being investigated, honouring the voices of its participants. In other words, whereas quantitative data bring breadth to the study and qualitative data provides depth to it. Moreover, quantitative results can be triangulated with qualitative findings and vice versa. Triangulation, as a qualitative research strategy, is the use of multiple methods or data sources to develop a comprehensive understanding of a research problem or to test validity through the convergence of information from different sources (Carter et al., 2014). A mixed-methods design, therefore, offers the best chance of answering research questions by combining two sets of strengths while compensating at the same time for the weaknesses of each method (Johnson & Onwuegbuzie, 2004). Consequently, "mixed-method research designs are becoming increasingly relevant to addressing impact research questions" (Saville, 2012).

3.4 Research methods

3.4.1 Targeted population

The participant schools were drawn from five schools; Umaa secondary school, Shining Smiles secondary school, Sandringham secondary school, Tynward secondary school and St Mary's which were selected through random sampling taking into consideration the availability of science laboratories and other learning materials in these schools. The population included the A-level students following the Zimbabwean national curriculum. Schools in Harare district are shown on a map in the Appendix section.

3.4.2 Sample

The study population involved science teachers, Advanced level students, and the heads of science departments in the selected schools as shown in Fig 3;

Name of school	Number of students	
	Boys	Girls
Umaa ss	5	3
Shining Smiles ss	10	
Sandringham ss	7	8
Tynward ss	4	2
St Mary's	10	5
Total	36	18

Figure 3: Sample Size

Harare district has a total of 107 Secondary schools; 43 are private secondary schools and 64 are public (government) secondary schools.40% of the private secondary schools and 60% of the public schools to comprise the sample of the whole population. The selected students were involved in this research through answering a questionnaire. The science teachers and the heads of science departments from these schools answered a questionnaire and the heads of science departments were interviewed.

3.4.3 Sampling method

The study employed purposive sampling technique for its convenience as it saved time, labour and affordable as there is no cost for searching for informants. The technique also afforded the study a chance to select key resourceful informants for the study. The sampling method was used in selecting students as well as teachers. Students were selected those who admit to have challenges in mechanics' section and teachers were those who have experience of about five in the field teaching the subject.

3.4.4 Data collection methods

This study employed two major tools to collect the relevant data; structured interviews and questionnaires; science teachers and heads of science departments in the various schools were interviewed while the students answered the questionnaires and also interviewed in focus groups.

3.4.4.1 Questionnaire

Questionnaires were prepared for the participants to collect data on the students and teachers' feelings towards the causes of poor performance and reasons that contribute towards the poor performance in the science subjects. Questionnaires were preferred since they are not time consuming and are easy to administer to a large population. They also simplified the task of categorizing, tabulating and summarizing reactions or responses from the respondents. Questionnaires contained both open ended items and closed ended ones (Likert type items).

3.4.4.2 Interviews

A structured interview is essentially a questionnaire which is mediated or administered. In this study the structured interview was used to increase response rates and to help to get an in-depth understanding of the student's responses in the questionnaires. Interview schedules were conducted with the participants of the sample group. This helped the study to determine the motivation level that makes students opt for science subjects instead of other art related subjects.

This study aimed at interviewing science teachers and heads of science departments of the selected secondary schools within the municipality. The aim of these interviews was to establish the main cause of poor performance of science subjects and get their views regarding what should done in order to improve the performance. Some of the advantages of interviews are; they enabled the study to obtain useful information about personal feelings, Perceptions and opinions, they also gave room for more detailed questions to be asked, they enhanced a high respond rate, the respondents' own words were recorded, and it was easy to clarify ambiguities and follow the incomplete answers. The disadvantages include; they at time consume a lot of time; setting up interviewing, feedback and reporting is a long process, they tend to be costly and the interviewer may understand and translate the interview in a different way.

3.5 Reliability and validity

Reliability and validity are two essential concepts in research methodology that ensure the accuracy, consistency, and credibility of research findings (Shuttleworth, 2015). Reliability which is the consistency and stability of measurements or data collection procedures (Heali, 2019). A reliable research study produces consistent results when the same measurements are repeated under similar conditions. It ensures that the findings are not influenced by random

errors or fluctuations. Researchers strive to achieve high reliability by using reliable measurement tools, employing standardized protocols, and ensuring consistent data collection procedures. High reliability enhances the confidence in the study's results and allows for meaningful comparisons and generalizations. Validity, on the other hand, refers to the accuracy and truthfulness of the research findings (Twycross, 2019). It ensures that the study measures what it intends to measure and accurately represents the phenomenon under investigation. Validity is crucial in ensuring that the conclusions drawn from the research are sound and trustworthy. Researchers employ various strategies to establish validity, such as using appropriate measurement instruments, conducting thorough pilot testing, and employing rigorous research designs. By ensuring validity, researchers can confidently draw meaningful conclusions and make accurate inferences based on their findings.

Both reliability and validity are interconnected and mutually reinforcing. A study can be reliable but lack validity if it consistently measures the wrong thing. Conversely, a study may have high validity but lack reliability if the measurements produce inconsistent results. Therefore, researchers need to address both reliability and validity concerns to ensure the robustness and credibility of their research findings.

3.5.1 Pilot study

Instruments such as questionnaires and interviews need to be tested before being administered on the real respondents. This is done to avoid errors, ambiguities as well as to test one's instruments whether or not they are understandable. Cresswel (2017) asserts that a pilot study is a small-scale preliminary study conducted before the main study. According to David and Dodd (2015) a pilot study is a small-scale preliminary study conducted before the main research in order to check the flexibility to improve the design of the research. Bell and Bryman (2017) define it as a small study to test research protocols, data collection instruments, sample recruitment strategies, and other research techniques in preparation for a larger study and is one of the important stages in a research project. Therefore, pilot study is a small-scale trial prior to the main survey that tests the entire question planning. Pilot study is crucial element of a good study design, is conducted to evaluate the feasibility of some crucial components of the full-scale study and to identify potential problem areas. The process of pretesting data collection instruments will help researcher to rephrase some questions which were ambiguous.

3.5.2 Reliability of data

Reliability is the degree to which an assessment tool produces stable and constant results. The idea behind reliability is that any significant results must be more than a one off finding and be inherently repeatable. Other researchers must be able to perform exactly the same experiment under the same conditions and generate the same results (Moskal et al, 2000). While reliability is necessary, it alone is not sufficient. For a study or a test to be reliable it also needs to be valid (Moskal et al, 2000).

3.5.3 Validity of data

Validity refers to how well a test measures what it is purported to measure. Validity encompasses the entire experimental concept and establishes whether the results obtained meet all the requirements of the scientific research method. To test the reliability and validity of the data, the same questionnaires were taken to other three selected schools, outside the research area. The students and teachers filled the questionnaires and the results were compared to ensure that the results were replicable if applied elsewhere. This was in order to ensure that there is consistency with the results if a similar methodology is used elsewhere. The three schools were; Nyahuni secondary school, Murewa secondary school and Macheke secondary,

3.6 Ethical issues

This study was done within the realms of ethics of research. Proper permission was sought from all interested stakeholders before conducting the study. The Ministry of Primary and Secondary Education, as well as the head of schools where the study was done, granted permission to carry out the study. Rukwaru (2015) defines ethics as what is morally good and bad behaviour. This study dealt with people in both quantitative and qualitative approaches, and as a result, the study exhibited some high morality. It prioritized the following ethical considerations: anonymity and confidentiality, voluntary participation, as well as. informed consent.

3.6.1 Anonymity and Confidentiality

Both confidentiality and anonymity were not underestimated in this study. Bell (2019) submits that the participants need not to be told or insinuate which responses should they give. Thus, on the questionnaire that was availed to teachers, there was no space for them to write names,

credentials, or any identification features. The study also maintained high confidentiality, by assuring respondents that their responses were solely applied in the educational domain. This gave the respondents vast freedom to expound their feelings.

3.6.2 Voluntary Participation

Before partaking of this study, the respondents were notified that participation was entirely voluntary, and there were no reprisals to those subjects who were reluctant to continue participating in the study halfway. This means that, participation in this study was not by coercive force, as individuals did it on their own volition. This gave the respondents a greater opportunity to express their inner feelings, as they participated with free will.

3.6.3 Informed Consent

Informed consent refers to the revelation of the purpose, aims, as well as the study objectives to the participants by the study (McMillan and Schumacher, 2017). Additionally, the participants of this study signed a consent form, explaining all the details pertaining to the relevance of the study to various stakeholders. This inevitably enabled the participants to feel valued, and to proffer authentic and credible information.

3.7 Chapter summary

The chapter has addressed the methodology aspect of the study that included qualitative paradigm, descriptive case study, data collection namely questionnaire, target population, sampling methods, data analysis and ethical considerations were also explored and subsequently the chapter summary. The next chapter, chapter 4, will present, analyse, and interpret data collected from the research field.

CHAPTER 4: DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter presents data analysis which was done concurrently with data collection using an iterative analysis technique to ensure that the data already collected guided subsequent data collection. Data was collected using research instruments discussed in the previous chapter, reading and re-reading of the transcripts from questionnaires and transcription of the audio-recorded data from interview was done to identify the main ideas based on the similarities and differences in the data collected, and to compare the qualitative and quantitative data. During this process, the responses were coded based on the research questions. Codes were used to generate themes for answering the research question. The data analysis was done iteratively to ensure that the themes that emerged were saturated.

4.2 Data presentation, analysis and interpretation

Data analysis identified three major categories of factors that contribute to low performance in mechanics at A-level Physics: factors that emanate from the teacher; factors that emanate from the learners; and factors embedded in the context within which the school system operates. These three categories were termed as, teaching factors, learning factors, and administrative factors, respectively. Of the three categories, teaching factors emerged as the highest contributor to students' low performance in mechanics at A-level Physics. In the following section, the three categories of factors were discussed in detail.

4.2.1 Teaching factors

As noted above, teaching factors refer to those factors that emanate from the teacher's personality and disposition, their style of teaching, their style of interaction with the learners, and their pedagogical content knowledge of mechanics

Interviews with the students revealed that the students were taught Physics in the laboratory through the lecture method. Some of the student-participants indicated that they had never had a physics practical lesson since they enrolled in their schools. This situation disadvantaged students who appeared to be inclined to learn better through practical activities as one student-

participant revealed during the interview by saying that, *"if physics was taught practically all students would like the subject and get straight A's"*. Additionally, during the interviews with the teacher-participants, it emerged that the physics teachers were not incorporating practical activities in their teaching due to lack of enough time to prepare because of the huge workload. In the sampled school, there were only two teachers handling physics from form one to form four. Figure 4.1 shows that about 69% (37 out of 54) of the student-participants during the survey either agreed or strongly agreed with the attribution of low performance in mechanics to few or no practical physics lessons. Fig 4 shows student-participants' agreement with the assertion that few or no physics practical lessons contributed to low performance in mechanics.

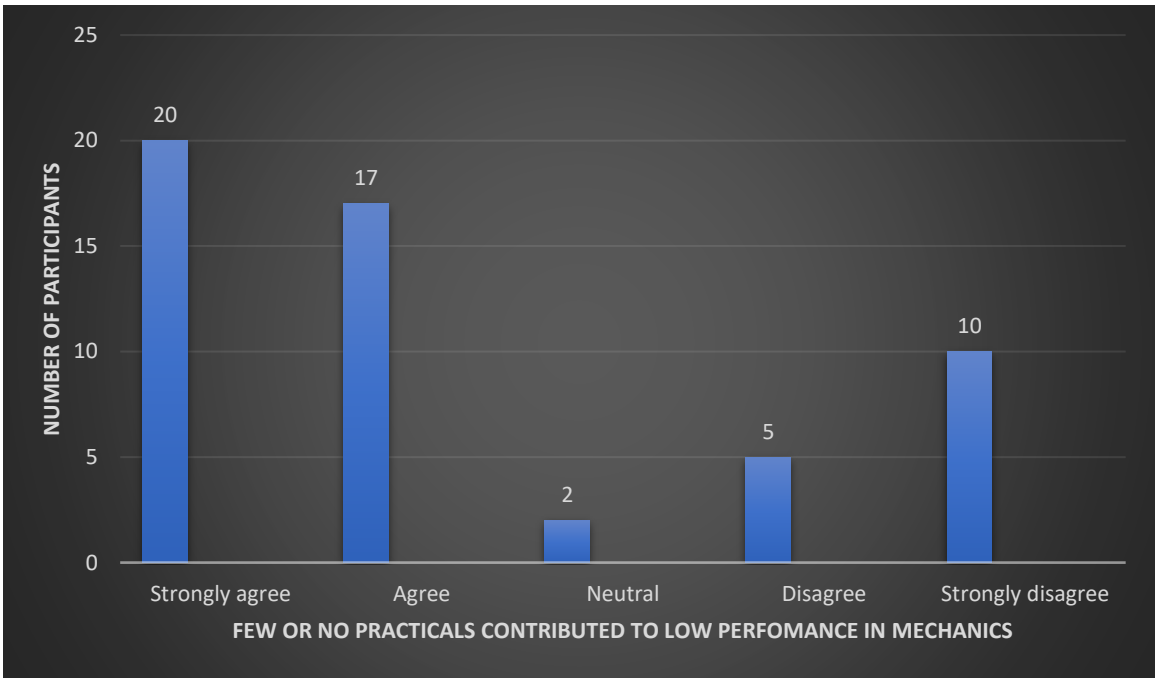

Figure 4: Student-participants' agreement with the assertion that few or no physics practical lessons contributed to low performance in mechanics.

Apart from the non-use of practical activities in delivery of the Physics lessons, the study revealed that the prevalent use of teacher-centred instructional methods was another factor that contributed to students' low performance in mechanics. During the interviews and focus group discussions, the student-participants indicated that the teachers taught the lessons with minimal involvement of the students. The students remained passive throughout the better part of the lesson which made them lose concentration, with majority not understanding the Physics content being delivered in the lesson. During the survey, majority participants agreed with the assertion that low performance in Physics was as a result of physics lessons being boring, few or no

practical lessons and poor teaching methods. A good number of student-participants indicated that their physics teacher lacked Physics subject mastery. For example, some students reported that when they asked questions during the lesson, the teacher would not answer right away. Instead, the teacher would promise to provide the answer in the next lesson, which he would never do. In addition, occasionally the students would request for clarification in the areas which were not clear to them during the physics lessons but instead of helping them, the teacher would ask the students to consult textbooks. Other teacher-participants indicated that their preferred teaching subject was not physics and they were not comfortable teaching it. They indicated that they taught physics because they were the only teachers in the school who had taken physics as their second teaching subject during their pre-service training. Given a choice, the teachers indicated that they would opt to teach their first preferred subject. The interview with the students revealed that during the Physics lessons the teacher gave exercises and occasionally marked for the particular bright students and then continued with the lesson leaving the majority of the students' work unmarked. Majority of the participants revealed that Physics teachers were attending lessons late and failed to give remedial work to the weak students. According to the participants lack of teacher commitment led to low performance in mechanics in the internal and external assessments. Some of the interviewed students reported that they did not like mechanics because their career aspirations did not require them to pursue Physics. According to them, the only reason as to why they selected Physics is because they wanted to escape from the biology teacher. The participants revealed that the biology teacher was very strict and occasionally gave students punishment due to incompletion of biology assignments. The Physics teacher on the other hand rarely gave students assignments and therefore never gave students punishments. Figure 5 shows that about 74% of the participants in the survey indicated that physics teacher did not give remedial work to the weak students

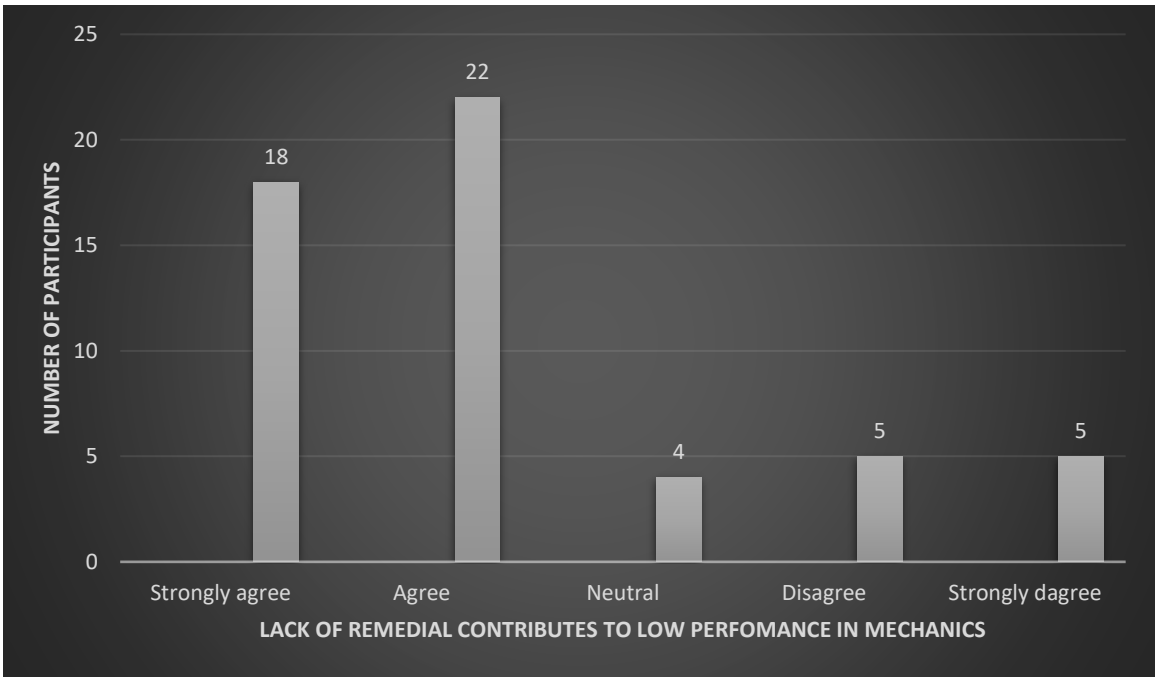

Figure 5: Student -participants` agreement with assertion that lack of remedial help to weak students was one of the factors which contributed to low performance in mechanics.

All the student-participants were in agreement that a teacher's relation with his or her students plays a crucial role in students' learning. If the teacher is unfriendly to students, they fear him/her and find it difficult to seek clarification of the concepts they have not understood during the lesson. Besides, from the interviews, students liked teachers who were free with them. An unfriendly teacher's disposition towards students can discourage the students from approaching the teacher for further guidance on areas they are having problems with in the Physics syllabus.

4.2.2 Learning factors

The data revealed a number of learning factors that contribute to low performance in mechanics at Advanced Level. These factors are: student's background in mathematics, peer influence and student's time management.

Mathematics is extensively used in Physics mostly in mechanics section to communicate concepts. The study revealed that students with good mathematical background performed well in mechanics. Figure 6 shows that during the survey, about 73% of the participants indicated that poor performance in mathematics contributed to low performance in mechanics.

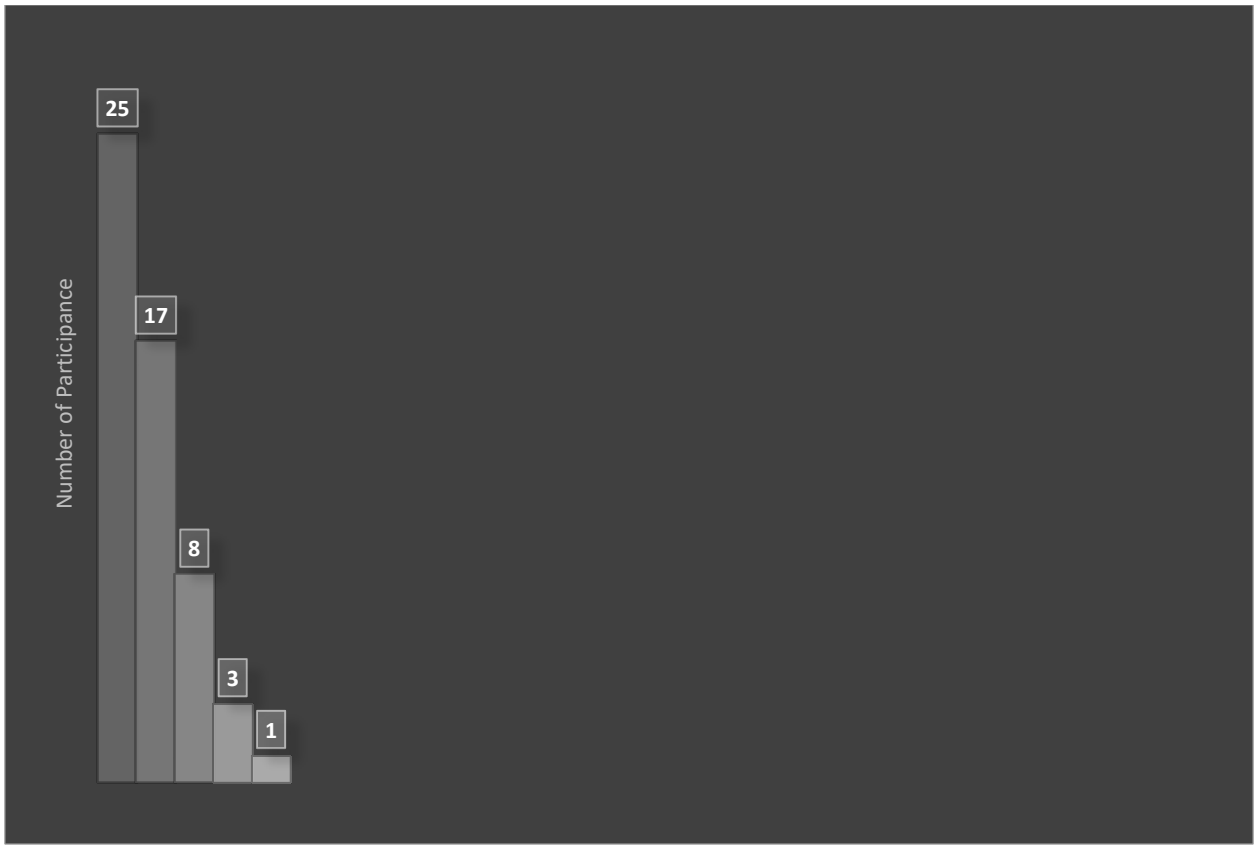

Figure 6: Student-participants' agreement with the assertion that poor performance in mathematics was one of the factors contributing to low performance in mechanics.

Some of the students attributed their poor performance in Physics in mechanics section to their poor mathematics background. Student participants who had not selected to study mechanics in form three indicated that they had performed poorly in this section because of their poor mathematics background such that they had no idea on how to answer mathematical questions in mechanics examination.

Students spend a lot of time with peers and the discussion among the students becomes a major source of information concerning academic issues in the school. The study revealed that when new students join the school, they get most of the guidance from the senior students and whatever they are told they take it as the truth. It appears that students' low performance in Physics as a whole subject was as a result of discouragement from the other students who never selected Physics in form three. According to the student-participants, the senior students constantly reminded their junior peers that physics is generally hard and their performance cannot be like in other science subjects, and therefore they should not dream of performing well in the subject. This made the Physics students comfortable with their low score in mechanics.

Moreover, some students would discourage Physics students from working hard by telling them that if they concentrate a lot in studying Physics, they will turn mad in future or become a social misfit. The data revealed that students' poor time management accounted to their low performance in physics. Figure 7 shows that about 57% of the participants in the survey indicated that students' poor time management was among the factors that contributed to their low performance in mechanics

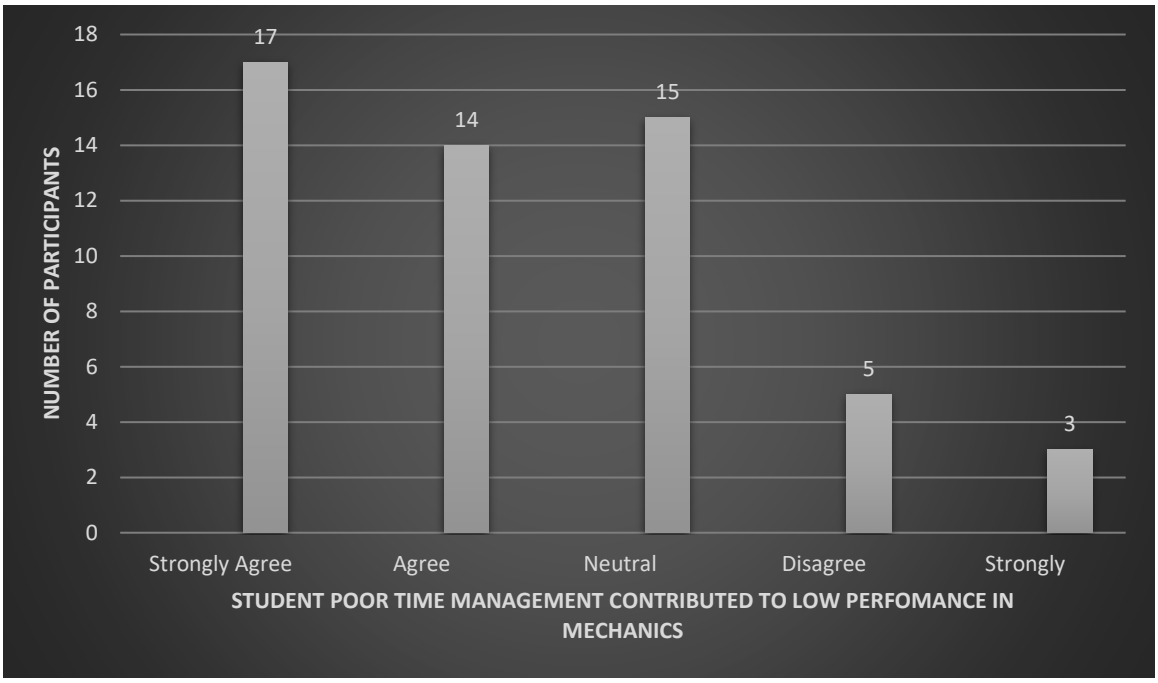

Figure 7: Student-participants' agreement with the assertion that students' poor time management was one of the factors that contributed to low performance in mechanics.

Time management requires the students to spend time in the most effective way to avoid spending more time in one subject than the other. During the focus group discussion, it was revealed that majority of the students spend little time studying Physics unlike other subjects. For example, Grace one of the student-participants said, *"I have no time to read Physics because at the same time I have assignments to write for other subjects. Either you do not work on the assignments and read or you work on the assignments and fail to read because one cannot do both because at the end of the day one will be very tired".* Further, the study revealed that as the students wrote the assignments for other subjects, they studied them but since they were rarely given Physics assignments, they rarely studied Physics.

4.2.3 Administrative Factors

Three administrative factors emerged from this study; namely, subject selection process, few Physics teachers and inadequate provision of teaching/learning resources. In the study it emerged that students were not well guided on selection of subjects in form two, which probably contributed to low performance in mechanics and also Physics as a subject. The student-participants revealed that the process was hurriedly done with some learners whose performance was above average in Physics forced to proceed with it in form three. The participants argued that they were supposed to be well guided on subject selection process and the decision on which subjects to choose should be left to them. One student-participant said: *"I do not know what I am doing in the Physics class. I never selected Physics. The selection was a flawed process"*. An interview with one of the teachers revealed that very few students select Physics and, therefore, to increase the number, students who had comparatively good grades in Physics were automatically included in the Physics class. This implies that some of those students forced to be in Physics might not be motivated to study the subject resulting in low performance in mechanics and Physics as a whole subject. During the interview one of the teacher-participant said, *"In the school we lack good guidance to the students on the subjects offered and their opportunities in life when students are in form one. This affects the choice of subjects by students in form three"*.

Lack of enough Physics teachers also emerged as one of the factors that contribute to low performance in mechanics. The teacher-participants argued that they needed a manageable teaching load to be effective in their teaching; otherwise, they had inadequate time for lesson preparation. They further argued that with more Physics teachers in the Physics department, they would be assisting each other through peer teaching, mentoring and team teaching on topics or sections which are bi challenging especially mechanics' section. While expressing concern about lack of teaching/learning resources in the school one teacher-participant remarked: *"How do you expect student to attain good grades in physics when the school has only one laboratory which is not well equipped and there is other apparatus which cannot be bought because electricity has not been installed?"* The teachers reported that they had only one type of Physics textbook. They argued that they ought to have a variety of Physics reference books for effective teaching. The student-participants also agreed with this. About 63% of the student-participants either agreed or

strongly agreed that lack of physics textbooks contributed to their low performance in mechanics.

Three major categories of factors were identified as contributing to students' low performance in Physics mechanics' section; namely, teaching factors, learning factors and administrative factors. Learning factors are those factors that emanate from the learners, such as time management skills and background in mathematics; teaching factors are those factors that are attributable to the teacher, such as quality of teacher-student interactions and teacher's content knowledge; while administrative factors are those factors that can be attributed to the administrative context within the school, such as access to resources and quality of guidance provision. Having identified these factors, learning factors seems to contribute to a greater extent in poor performance in Physics mechanic`s section as mathematical skills and learner attitude towards mechanics section are the basis of mustering this section.

4.3 Chapter summary

This chapter presented data, analysis and interpretation of the study on the low performance in mechanics at A-level Physics focusing mainly on three major category factors which are teaching factors, learning factors and administrative factors. The next chapter will present summary of the study, conclusion and recommendations.

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 introduction

This chapter presents a summary of the study. It also makes some conclusions in relation to the findings. Finally, recommendations are made both for action and for further studies on factors that influence poor examination performance in learner performance in mechanics at A-level in Harare district.

5.2 Summary and Conclusions of the study

This study sought to explore that factors that contribute to students' poor performance in mechanics. Findings show that student-participants had expectations of their physics teacher with regards to establishing the classroom environment for effective learning. In particular, the students expected to be engaged during the lesson through practical activities and questioning. This is important because continually engaging students in the lesson would make them feel part of the knowledge generation community, which would get them motivated to learn physics. This is in agreement with Wellington, (2012) and Brooks (2015), who argue that although practical work can sometimes be expensive and time consuming, it has simply to be done if the learners are to advance in their understanding.

Clearly, the student-participants expected that their teachers would mediate the textbook to help them understand mechanics in a better way. In line with the findings of Adipo (2012), this study suggests that some physics teachers in Harare district lack subject mastery, which contributes to students' poor performance in mechanics. It is very difficult for the students to understand that which a teacher with poor content mastery is transmitting to them. Indeed, according to Olabode and Olugbenga (2017), a teacher's qualification level has impact on students' performance in mechanics. The importance of teacher commitment to the teaching of mechanics cannot be overemphasized. As revealed in this study, lack of such commitment can only contribute to poor student performance. In line with the argument by Makewa, Role and Biego (2012), results from this study indicate that low levels of teacher commitment translate into poor learner achievement. This is because the teacher should lead the learners in activities that promote learning. These activities include attending lessons punctually, giving and marking students' assessment tasks,

and providing remedial help to struggling students. Poor student-teacher interactions can hinder the attainment of good grades in mechanics mastery as revealed in the study. As noted by Adeyemo (2010), Physics teachers can facilitate student learning by facilitating a co-operative and friendly atmosphere. It is clear from the study that students' poor mathematical foundation is one of the factors that contributed to poor performance in mechanics. This is in line with findings of the study by Tuminaro and Redish (2014), as well as that by Meltzer (2012), which showed that a complete understanding of the concepts in mechanics requires fluency in the mathematical language in which these concepts are couched. This means that the Physics teacher should support the students in both theory and mathematical aspects of mechanics. Sa'adatu (2012), observes that good mathematics foundation facilitates students' ability to solve mechanics problems. Peer influence has both positive and negative effects on a student's academic performance. The data from this study revealed negative effects of peer influence on student academic performance in mechanics. It is important to be aware those students are particularly vulnerable to all forms of peer influence which affects their academic achievement in school and, as such, it is important for Physics teachers to proactively find ways of combating negative peer influence. It is clear from this study that there were some students' self-inhibiting behaviours which acted as a barrier to good academic performance in mechanics. These behaviours were lack of proper reading schedule and hanging out with friends during the time they were supposed to be having their private study. These behaviours made them lag behind in academic performance in mechanics. The situation was exacerbated by students having no assignments to work on during their free time. Therefore, having few or no assignments in mechanics prompted them to allocate little time for Physics as a subject, resulted in poor performance in the subject. Therefore, there is need for teachers to guide students on proper study time management.

This study has also revealed that students' low performance in mechanics can be partly be ascribed to lack of professional guidance on subject selection in the school. This led to students selecting the subjects without being well informed, which in turn affected students' performance. In view of this, the school administration should devise ways and means of providing professional advice to students during the subject selection process, and giving students an opportunity to make their own independent choices. This would make students choose subjects in line with their career aspirations thereby motivating them to study the subject translating to good performance in the subject. In line with the findings of Victoria (2001), as well as those of

Musasia, Abacha and Biyoyo (2012), this study revealed that low enrolment and poor performance in Physics can be linked to a shortage of inspirational and well-trained Physics teachers. Furthermore, this study revealed that a lack of adequate resource materials for the teaching and learning of Physics contributed to poor performance in mechanics' section. These findings are related to those of Nyamba and Mwajombe (2012), which showed that lack of teaching/learning materials influences students' preference and performance in mechanics. According to Aina (2013), the teaching of Physics in schools has not been encouraging due to the abstract nature of the subject. As such, the use of instructional materials is essential in facilitating students' learning in physics especially in mechanics` section. There is also a need for in-service professional development to empower teachers on improvisation of teaching-learning materials in Physics, so that in contexts where there is inadequacy in teaching/learning resources, the teachers can be able to improvise.

5.3 Recommendations

Based on the findings of this research a number of recommendations can be made to improve students' performance in mechanics. To begin with, there is need to improve on teacher-student ratio so as to improve on the delivery of the Physics curriculum. Having enough Physics teachers will reduce the teaching load of Physics teachers so that they have sufficient time to prepare for Physics lessons consequently leading to improvement in the academic performance in mechanics particular. In order for teachers to be well prepared to meet the challenges of teaching Physics in a school with limited teaching /learning resources, it is important for student-teachers to receive pre-service training on teaching Physics through improvisation. This can be achieved through, for example, the introduction of a course on improvisation in Physics education. Additionally, teacher educators can organize for an in-service professional development course on improvisation in Physics education for practicing Physics teachers. In the same vein, the school administration should work with Physics teachers to minimize the problem of shortage of relevant teaching/learning resources in Physics. This can be done through, for instance, procurement or borrowing some of the resources from such resource centres as University of Zimbabwe centres or neighbouring schools. The school administration should also ensure that the subjects' selection exercise in form two is not only helpful to the students but also democratic. The students need to be well guided on how to make the right subject choices based

on their career aspirations and personal interests. The school administration should also ensure that the curriculum is implemented as intended by supervising the teachers to ensure that the intended curriculum is covered in good time. Physics teachers should use practical activities in physics lessons to engage the learners and to sustain their attention. In addition, the use of student-cantered pedagogies in Physics classrooms should be the norm rather than an exception. Besides, the Physics teachers need to have good student–teacher relationships where students are free to interact with teachers. During the interactions students open up on the challenges they face in academics and teachers get an opportunity to guide them on how to overcome those challenges Finally, Physics teachers should sensitize the students on the importance of Physics in career choices as soon they are admitted in the school instead of learning from their peers who discourage them from studying physics. There is also need to motivate students to study mechanics by linking it to real life contexts so that they can see its relevance in their lives and in national development.

APPENDICES

Appendix 1: Distribution of Schools in Harare District

Figure 8:Schools in Harare District (Adopted from Mapcarta)

Appendix 1.1: Distribution of Schools in Harare District

Figure 9: schools in Harare District (Adopted from Mapcarta)

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