COMPARATIVE ANALYSIS OF FACTORS AFFECTING SECONDARY AND UPPER ELEMENTARY SCHOOL STUDENTS INTEREST IN PHYSICS AT MUNESA DISTRICT, ARSI ZONE, OROMIA REGION.

BY:-Ayano Koji

A Thesis Submitted to

The Department of Applied Physics

School of Applied Natural Science

Presented in Partial Fulfillment of the Requirement for the

Degree of Master's in Physics

Office Of Graduate Studies

Adama Science and Technology University

September 2017

Adama Ethiopia

COMPARATIVE ANALYSIS OF FACTORS AFFECTING SECONDARY AND UPPER ELEMENTARY SCHOOL STUDENTS INTEREST IN PHYSICS AT MUNESA DISTRICT, ARSI ZONE, OROMIA REGION.

BY:

Ayano Koji

Advisor:Alemu Kebede(PhD)

A Thesis Submitted to
The Department of Applied Physics
School of Applied Natural Science
Presented in Partial Fulfillment of the Requirement for the
Degree of Master's in Physics
Office Of Graduate Studies
Adama Science and Technology University

September 2017

Adama , Ethiopia

Declaration

I here by declare that this M.Sc. thesis is my original work and has not been presented for a degree in any other university , and that all sources of material used for the thesis have been properly acknowledged.

Name: Ayano Koji

Signature_____

This M.Sc. thesis has been submitted to for examination with my approval as University advisor.

Name: Alemu Kebede (PhD)

Signiture_____

Place and date of submission:

Applied physics program

Adama Science and Technology University

September 2017

Adama, Ethiopia

Table of Contents

List of Figure

List of Table

Abstract

This study explores the comparative analysis of factors affecting interest of students in physics in Munesa District. The choice of this topic was influenced by the fact that interest and attitude in physics in Ethiopia and particularly in Munesa District has remained low over the years. This study set out to investigate some of the reasons for this state of affairs. The study was carried out in 4 (four) schools sampled from the district, two of which were urban schools, two were rural schools. A total of 200 students were participated in the study. Simple random sampling was used to come up with the study sample **one** physics teacher was selected from each school making a total of 6 teachers. The purpose of this study was to identify factors that affect interest and attitude in physics at secondary and upper elementary school level. The design of the study was descriptive survey. Data was collected using teachers' and students' questionnaires, class observation guide, and head of departments' interview schedule 'and students' achievement tests using SPSS version 20 software. These included achievement test scores, students' gender, and learners' attitude towards physics, availability and use of teaching learning resources, teacher characteristics and teaching methodology. The data obtained was analyzed using both descriptive and inferential statistics. Tables and graphs were used to display data. The study found out that availability and proper use of teaching/learning resources improved achievement in physics. There was a significant higher interest in schools with enough resources compared with those with inadequate resources. All students who were enrolled in physics had a positive attitude towards the subject and those who performed well had a more positive attitude than those whose performance was low. Boys performed better in physics in District Schools but this was not the case in Governmental Schools where the girls performed better than the boys in the said schools. Students whose lessons were conducted frequently in the laboratory performed better than those who were often taught in their classrooms. Finally the study shows the opinion of the students were the leading factors.

ACKNOWLEDGEMENTS

Above all things, I would like to thank almighty God, the Compassionate, the Most Merciful and Source of Knowledge & Wisdom who bestowed upon me the health the power of communication and the audacity to accomplish this thesis.

Next, I would like to express my deepest gratitude to my supervisor Dr. Alemu Kebede. I am thankful for his insightful guidance, patient teachings, valuable constructive criticisms and endless support throughout the duration of my study. He has provided me countless opportunities to grow, mature and improve myself both academically and personally.

Finally, I would like to thinks Science and Technology University for financial support, providing me with a grant that helped me to carry out this thesis work.

Dedication

This thesis is dedicated for my late colleague Jebel Haji who paid a grateful sacrifice for my education starting from the lower class up to the higher institution and also for my late Son Nured in Ayano who was initiating and supporting me for the success of my education. Lastly, I dedicate this thesis work to friends due to the effort in introducing me to the word of God in my life at the time of my thesis writing. May almighty God bless you all!

Table of **Contents**

List of Figure-

List of Table

Abstract

This study explores the comparative analysis of factors affecting interest of students in physics in Munesa District. The choice of this topic was influenced by the fact that interest and attitude in physics in Ethiopia and particularly in Munesa District has remained low over the years. This study set out to investigate some of the reasons for this state of affairs. The study was carried out in 4 (four) schools sampled from the district, two of which were urban schools, two were rural schools. A total of 200 students were participated in the study. Simple random sampling was used to come up with the study sample **one** physics teacher was selected from each school making a total of 6 teachers. The purpose of this study was to identify factors that affect interest and attitude in physics at secondary and upper elementary school level. The design of the study was descriptive survey. Data was collected using teachers' and students' questionnaires, class observation guide, and head of departments' interview schedule 'and students' achievement tests using SPSS version 20 software. These included achievement test scores, students' gender, and learners' attitude towards physics, availability and use of teaching learning resources, teacher characteristics and teaching methodology. The data obtained was analyzed using both descriptive and inferential statistics. Tables and graphs were used to display data. The study found out that availability and proper use of teaching/learning resources improved achievement in physics. There was a significant higher interest in schools with enough resources compared with those with inadequate resources. All students who were enrolled in physics had a positive attitude towards the subject and those who performed well had a more positive attitude than those whose performance was low. Boys performed better in physics in District Schools but this was not the case in Governmental Schools where the girls performed better than the boys in the said schools. Students whose lessons were conducted frequently in the laboratory performed better than those who were often taught in their classrooms. Finally the study shows the opinion of the students were the leading factors.

Chapter One

1. Introduction

1.1. Background to the study

Physics is believed to be one of the oldest and probably the most developed of all the sciences (Keith 1996). It addresses the most fundamental questions regarding the nature of the physical universe. It asks questions such as; what is the nature of the universe? What is matter made of? What are the fundamental forces of nature? etc. Because physics is the study of these and other basic questions, it provides the underpinnings for all other physical sciences. 'The ultimate description of all physical systems is based on the laws of physical universe usually referred to as 'the laws of physics' (Nathan 1995). Two dominant themes run through the development of physics; (1) matter and energy (2) the search for order and patterns. Secondary school physics is therefore, concerned with the study of these two very important themes.

In almost every aspect of life we encounter basic concepts such as matter, heat and pressure. It is therefore not possible to ignore these very important concepts whose knowledge helps to improve peoples' lifestyle. It is unfortunate that our young scientists, especially those in the rural areas, have ignored Physics in favors of Chemistry and Biology (Iraki 1994). The greatest worry is; why are they shying away from this very important subject? What are the consequences of this trend? Is learning the subject is not enjoyable? Is it because they do not understand the concepts and principles taught in physics, or is it because they do not understand the importance and relevance of physics in their future career?

One very important reason why physics form part of the curriculum all over the world is due to its ability to give personal intellectual and physical skills, knowledge and value to the learner. In learning physics, students acquire process and manipulative skills that enable them to predict accurately the outcome of various events such as the occurrence of the eclipse, effect of gravity and other forces and phases of the moon. A learner with a physics background is able to think both deductively and inductively and approach new situations with a high degree of precision and accuracy. To achieve millennium development goals (MDGs) and realize vision 2030, quality teaching of physics to more young learners has become even more critical. It is with this in mind that central province secondary school heads association came up 'effective 40' program to effectively manage the 40 minutes lesson and hence improve performance in all subjects; physics included(Baker ,1975).

Many science educators attribute great importance to the affective domain (Baker,1975); (Tamir 1988) argued that the affective outcomes of science instruction are at least as important as their cognitive

counterparts. The affective domain is characterized by a variety of constructs such as attitudes, preferences, and interests. Different researchers' definitions of these constructs vary and consequently may be confusing. As reported extensively in the literature, students' originally positive attitudes toward science subjects change markedly in the upper grades, especially in chemistry and physics Simpson *et al.* (1994) published an extensive review of students' attitudes toward different science subjects. Generally, a negative attitude toward a given subject leads to lack of interest and, when subjects can be selected, as in senior high school, to avoiding the subject or course. Furthermore, a positive attitude toward science "leads to a positive commitment to science that influences lifelong interest and learning in science" (Simpson and Oliver, 1990). This is one reason why major science education reform efforts have emphasized the improvement of students' attitudes. For instance, *Project 2061*, a multiple-year project in science education, suggests "science education should contribute to the development in young people of positive attitudes toward learning science" (American Association for the Advancement of Science 1990).

Several studies have identified a number of factors affecting students' attitudes towards science in general. These can be largely categorized as gender, personality traits, structural variables, and curriculum variables. Of these, the most significant is gender for, as Gardner (1975) stated "sex is probably the most important variable related to pupils' attitudes to science". Many studies (e.g., (Francis 1999) have reported that males have more positive attitudes to- ward science than females, while others found no statistically significant gender differences (selim 1983). (Ormerod 1975) in decanted the importance of distinguishing between the physical and biological sciences in respect of gender differences in attitudes toward science.

Despite the fact that physics has made a significant contribution to life in today's society, a decline in enrolment and performance has been registered over the years (KNEC 2002 to 2011). This trend is more significant especially in schools where the subject has been made optional. Probably there is luck of correlation between what is learnt in class and the real application in everyday life (A.A.P.T 1999). This lack of or little relationship between theoretical physics and application physics may contribute towards the low enrolment and poor performance of physics among secondary school students.

Physics helps the learners to develop critical thinking due to its high reliance on mathematical concepts and logics. The fact that mathematics is not a favorite subject for most low performing students could be a reason why they shy away from physics. Students who perform well in mathematics are likely to enroll and perform better in physics; this could be the reason why the students who enroll in physics have an overall better performance. Physics helps the learners to develop critical thinking due to its high reliance on mathematical concepts and logics.

Research shows that secondary school students must be able to design instructions and creative science experiences that incorporate their needs, interests, abilities and results in for positive outcome (Athman 2003). Instruction in science and science education is a process through which teachers enhance learning by matching student characteristics to instruction and assessment. The education quality improvement packages developed by the Ministry of Education has also underlined the need of implementing these modern methods of classroom instructions so as to achieve the intention of producing qualified graduates at all levels (Ministry of Education [MoE] 2003). It has been suggested that science specialists at the elementary and secondary school levels may be employed to improve the quality of children's and adult's science learning experiences (Abell 1990).

Performance of physics in Munesa secondary schools is always less than that of other science subjects namely chemistry and biology. This trend is even more significant among schools in rural areas than in urban areas (Kersa Woreda Education office 2016). Likewise, students in high performing schools are more likely to enroll and perform better in physics than low performing schools some schools in the district are in the rural setting and enrollment in physics is significantly low as illustrated in Table 1.1

Table 1.1 National examination results from 2014-2016 of Kersa senior secondary school for grade 10th in three subjects.

Year	NEAEA Results of Students														
	Physics					Biology					Chemistry				
	A	B	C	D	F	A	B	C	D	F	A	B	C	D	F
2006	10	75	400	165	150	50	150	500	80	20	45	120	300	200	135
2007	20	85	420	200	125	60	350	220	195	25	35	145	365	250	55
2008	15	175	565	145	100	130	320	350	150	50	90	420	365	100	25

Table 1.2. Grade Eight Regional examination Results of promoted.

Year	Grade Eight Regional examination Results of promoted Stud. In %Junior School					
	Merkaz			Gera Cike		
	Physics	Biology	Chemistry	Physics	Biology	Chemistry
2006	55%	75%	65%	35%	75%	55%
2007	45%	80%	72%	50%	85%	70%
2008	60%	90%	75%	65%	75%	68%

(Kersa Woreda Education office 2016)

1.2. Statement of the Problem

A population without a physics background may fail to understand and make use of every day's phenomena such as understanding the causes of wind, solar system, high dams and geothermal energy. This may lead to a low level of technology and therefore a low standard of living among the people. The fact that a small percentage of students opt to enroll for physics in selected schools despite all the three science subjects being treated as equal in terms of time allocation and mode of assessment, poses a great challenge to the overall qualification of the general work force. Despite the fact that attitude toward physics has been very low, performance has been consistently poor. The fact that selection of a course has a direct relationship with the student's achievement in the subject could be the reason why physics is less appealing to many students especially the weak ones. Poor performance and low enrolment has adversely affected particularly girls than boys with the trend being that, very few girls opt to pursue physics and the few who enroll generally perform poorer than their male counterparts (Ministry of Education [MoE] 2003). This fact alone might have contributed to the gender disparity in Natural and social science courses among secondary school students. This trend is also reflected in the work place where we have very few female physics teachers, scientists and engineers (Lyons 2005). Despite a general increase in low attitude, interested in society due the failureat grade eight and secondary and preparatory school. Enrolment in physics has remained low all over the district and Munesa district has not been an exception.

In experience terms, low active participant students at secondary school level is bound to affect the production of creative, innovative man at higher levels. Indeed, this is the case in many schools across the country ((Nderitu 2007). A few schools that do not have an experience, interest and good attitude toward

physics have not completely a good idea about application of physics in world. In fact, out of the 58 schools that registered for MOE in 2016 in Munesa District, 57 schools did not present any candidate who discovers any best result regarding in physics. This trend is worrying and should be urgently addressed. This study will therefore look into the factors that are associated with interest and performance of student's to ward physics subject in Munesa District which would be assumed to be a replicate of many other schools in the rural areas in the country. It is a general expectation that the findings of this study could be used to improve attitude and performance of physics in the district and possibly throughout the country.

1.3.Objectives of the Study

1.3.1.General objective

The general purpose of this study was to examine the comparative analysis of factors affecting students' interest in physics at secondary and upper elementary school level.

1.3.2.Specific objective

The specific objectives were;

- ✓ To identify the factors affecting secondary and upper elementary school students interest in physics
- ✓ To examine the students opinion and their experiences out of school in physics
- ✓ To evaluate the their interest, knowledge, attitudes and skills in physics education
- ✓ To describe the roll of students in comparative analysis of factors affecting students interest in physics
- ✓ To look into what extent the students' gender affect interest and performance in physics

1.4 Research Questions

The study sought to answer the following research questions

I. Does students' attitude towards physics affect their performance?

II. Is there a significant difference in performance in physics between girls and boys?

III. What are the comparative analysis of factors that affect secondary and upper elementary school students interest in physics.

1.5.Significance of the Study

The aim of this study was to contribute towards the improvement of attitude and interest of learning physics at secondary and upper elementary school level. The impetus of the study was derived from the fact that, the extent of students' opportunity to learn physics bears a direct relationship to the factors that were considered in this study. The results of this study was provided an insight on the necessity of modifying the said factors to enhance interest and attitude in physics. Most of the previous studies were based on limited outcome measures and recommended more research on other areas, subjects, and using different approach ((Orodho 1996), (Nderitu 2007).Education stakeholders was find the findings of the study beneficial in the course of 5developing and improving the curriculum especially at Oromia Education Beroeu. On the other hand, MoE in conjunction with Munesa district was used the findings of the study to improve students attitude and interest of learning physics as a resources.

1.6.Scopes and Limitation

The research was carried out in 2 secondary and 2 upper elementary schools of Munesa District and data collected from Woreda office, School administration and the selected 200 students in June 2017. Due to the limited time that was allocated in researching for the significance of these factors, this study might fail to be exhaustive and could leave out some important variables that could be relevant in this research. The sample selected for the study might fail to be the true representative of the whole population of Munesa District. Since all the schools in the district are in the rural areas and the terrain is very rough, traveling might be difficult and this may affect the final outcome of the study. Financial constraint is another factor that might adversely affect the depth of this study. With enough resources, this study could be more comprehensive and the sample size increased to improve reliability.

1.7.Assumptions of the study

The sample of schools, students and teachers selected for this study was assumed to be the true representative of the whole population of the said stakeholders in the district. It was also assumed that the participants responded to the research items in all the research instruments accurately and honestly. The research items selected in all the research instruments used was assumed to accurately measure the extent to which the identified factors contribute towards comparative analysis of factors affecting student's interest in physics. It was also assumed that the time allocated for the study of physics is uniform across all the sampled schools.

1.8.Operational Definition of Terms

Constructivism -Knowledge must be constructed on the existing experiences by establishment of new associations, transformations and processes.

Factors -Determinants that will be identified and assumed to affect enrolment and performance in physics.

Other sciences -This will mean Biology and Chemistry

Performance -Used interchangeably with achievement to mean the level of acquisition of knowledge based on examination and achievement test score.

Gross Enrolment ratio (GER) The ratio of total enrolment regardless of age to the population of the age group that officially corresponds to the level of education.

MoE-Minister of Education

SPSS Version 20: Statistical Program for social science

Chapter Two

2. Literature Review

2.1 Enrolment in physics

Previous studies have shown that fewer numbers of students are opting to study physics beyond junior high school level (Nderitu 2007). This trend is reflected at the university level where very few students enroll to study physics and engineering related courses (Lyons 2005). For many students, physics is a subject that is perceived to be difficult and that should be dropped as fast as possible ((Lyons 2005). Low enrolment is therefore a course of worry not just for physics educators but also for other stakeholders in the economic sector. The number of girls who enroll in physics is significantly lower than that of boys. Gender right activists have however succeeded in enshrining a law to the effect that school subjects should not be stereotyped (P.K. 1986). Though this does not completely seal the gap, educators are trying to improve the situation by encouraging the girls to take chemistry and physics (MOEST 2007 in Gender policy in education) The problem of low enrolment in physics has persisted for decades as was reported by times magazine on 24th may 1993; Young Turks of every generation for the past 100 years have proclaimed the imminent end of physics but every advance has only opened new vistas of mysteries. There is no reason to think we even know the right question leave alone ultimate answer. The currency of science is not truth but doubt.

In a study carried out by (Lyons 2005)in Australia, many students regarded junior high school science as irrelevant, uninteresting and difficult leaving them with few intrinsic reasons for enrolling in senior school physics courses. The decline in enrolment in science subject in general and physics in particular, is promoting question about the future level of scientific literacy and technological expertise (UNESCO 1973). There is a significant relationship between science enrolment pattern and eclectic rage of factors including achievement levels and social economic status ((Lyons 2005). This therefore begs the question; which other factors affect enrolment and performance?

2.2 Performances in physics

Despite the fact that the physics syllabus has constantly been revised with a view to make it more appealing to the students, performance in the subject has not improved (KNEC 2007). There is a very close

relationship between performance and enrolment (Nderitu 2007) student's poor performance in a national exam is likely to cause a low enrolment in the preceding classes. Probably this is the reason why there has been a low enrolment in physics. Over the years, there has been low performance in physics though the mean score for chemistry has been slightly lower than physics; there has been a great disparity in enrolment between the two subjects in favour of chemistry. (KNEC 2002). It may not be clear whether performance in a subject enrolment but perception of difficulty in a subject is also likely to affect enrolment.

2.3. Student Perception Obstacles: Irrelevance of Physics

Owen, Dickson, Stanisstreet &Boyes (2008) noted that high school students enter high school with a generally positive attitude towards science. These students, who are new to high school streaming, still see the subject of science as a whole and not as specific sciences such as physics or biology. The authors discovered a trend in which this favourable opinion depreciated over the high school experience. Beyond this, the authors noted that as the students began to differentiate between the sciences; their opinions of physics were lower than those of the other sciences. Their study of high school students' opinions of physics showed that by the end of the secondary level, students perceive physics as boring, irrelevant and difficult (p. 114). In a similar study, (Lyons 2005)showed that Australian high school students also saw physics as difficult, uninteresting, and irrelevant (p. 285). Unfortunately, neither of the studies compared physics students' perceptions to non physics students'. (Angell 2004) also found that some students perceived physics to be boring and irrelevant. They, however, showed that it was students that did not study physics that felt this way; those that were taking physics classes actually claimed it was relevant and interesting (p. 690). The major obstacle to enrolment in physics may be getting students through the door of a physics classroom; once there, perhaps the students' negative perceptions can change. Alternatively, it may demonstrate that only those students who have positive preconceptions of physics are enrolling in physics.

Dawson (2000) did a long-term study of junior high students in South Australia in which the author examined the students' interest in the sciences in 1980 as compared to 1997. The findings of the author's study echoed that of much of the literature; both boys and girls have lost interest in science in general over the past few decades and that girls have less interest than boys (p. 561). Again, like the majority of the literature, Dawson (2000) also highlighted the importance of making physics relevant to the students and adapting to their interests when delivering lessons (p. 557).

2.4 The Epistemological Barrier

Lising and Elby (2005) examined the impact of students' ideas about knowledge and learning, their epistemology, in regards to physics. This is an important factor that needs to be examined, as it could impact

a student's success within physics and their desire to pursue it. Lising and Elby (2005) showed us that students often have conflicting ideas about how physics operates. Some see it as a cluster of unrelated topics and formulas while others understand that it is an attempt to unify our understanding of nature and is therefore interrelated (p. 372). The authors demonstrated that students can also have conflict between their social and individual epistemologies – their views on the learning process and collective knowledge of the physics community can differ from their interpretation of their own knowledge and learning process. In further exploration of this divide, the authors claimed that the students' individual epistemologies seemed to have a bigger impact on their learning and Lising and Elby (2005) focused their study on this idea (p. 373). The authors demonstrated that the human subject has a divide in her epistemology with regards to understanding physics. The human subject demonstrated an opinion that physics can either be explained quantitatively with formal reasoning and techniques or qualitatively through common sense but she failed to see the connection between the two (p. 396). This leads to a barrier in her learning as she attempts to explain physical problems in one realm or the other. If one realm is not working, she abandons that realm and attempts to explain it in the other. If she finds success in one realm that is good enough; she does not see a need to bridge her understanding. The authors showed that the only time she demonstrated an understanding of the relationship between the quantitative and qualitative, she is regurgitating knowledge passed on from her professor.

The disconnect between what students see as their own common sense and the explanation physicists give is also explored by Gray, Adams, Wieman and Perkins (2008). These authors discussed the impact of students' ideas about physics and physics knowledge on their learning. The authors demonstrated that students know what physicists' explanations are, that they can reiterate the knowledge they've studied, but that many of them do not agree with these ideas and therefore do not have a true understanding of the material. This again speaks to an epistemological barrier between what students see as common sense and what they accept as the knowledge of the physics community.

2.5 Teacher Perceptions

If understanding students' epistemological barrier is important to encouraging students to take physics, then having an understanding of where students' epistemologies come from is also vital. Mualem and Eylon (2009) discussed the effects of teachers' perceptions on their students, an important area to address when contemplating where students get their preconceptions of physics from. Mualem and Eylon (2009) showed us that although the western educational community believes in the importance of exposing students to physics at the junior high level (p. 135), many junior high students have difficulty understanding physics conceptually and have a fear of physics at the junior high level (p. 136). he authors offered that a plausible

explanation for this condition of junior high students in Israel is that many of their teachers also share a fear of physics (p. 136). Mualem and Eylon (2009) noted the importance of knowledgeable and enthusiastic teachers in all subject areas, but admitted that within Israel, junior high teachers lack this characteristic with regards to teaching physics. According to the authors, 80% of junior high science teachers have a background in biological science, and these teachers admittedly have a small knowledge base in physics. These teachers reported that their lack of background knowledge in physics creates difficulty in delivering the curriculum (p. 135). Teachers' content knowledge and curriculum background, especially post-secondary experience can have a major effect on the achievement of students (Telese, 2008, p.11). Mualem and Eylon (2009) showed that at the junior high level in Israel there is a real lack of teacher content knowledge in physics. The authors showed the impact of this deficiency on one the interviewed science teachers they interviewed:

When I teach biology, I can easily bring my students many examples extending the specific topic. My expertise in this domain (biology) allows me to enter my class calmly. This is not the case when I teach physics...I spend many hours in preparing myself for every single lesson and I need to prepare myself for the prospect that I will not be able to answer many of my students' questions in related fields myself, confidence is low and I feel stressed and even nervous. When I'm forced to solve problems that are raised during instruction, I project uncertainty in my answer...I don't like to teach this domain! (Mualem & Eylon, 2009, p. 135)

This has obvious implications on a student's epistemology; if a teacher has fears about physics, is this not projected onto their students? Mualem and Eylon (2009) explored this idea within their research. The authors did interviews with and gave questionnaires to teachers before, during, and after a professional development opportunity designed to improve the teachers' conceptual (or qualitative) understanding of the physics they teach (p.142). The results of the study had some interesting implications. The commonalities the authors found in the preconceptions of the teachers were that the teachers did not feel that students could relate physics to the students' own worlds, that students do not (or cannot) find physics interesting, and that the subject matter is too abstract for the students to understand (p. 144). It is very important to note that the teachers reported these same interpretations about their own learning and understanding of physics – that they had trouble relating to, being interested in, and understanding physics (p. 144). The implications of the teachers post conceptions were just as interesting. The teachers had changed their opinions drastically after the professional development sessions. No longer did they feel that physics was boring – they could now relate it to their own world; and they no longer saw it as an abstract subject that was difficult to understand (p. 146). There was also the possibility of these teachers applying these new insights about physics to their beliefs about how their students learn. Mualem and Eylon (2009)

demonstrated that as the teachers' beliefs about their students' learning matched the teachers' feelings about their own learning in their preconception interviews and questionnaires, their beliefs about their students' learning in the post professional development opportunity surveys also matched their new outlooks. After the professional development sessions, the teachers assumed that their new positive outlook on physics would be possible for their students as well (p. 146). From these findings we see that a teacher's perception of physics will at least have an impact on how they view their students' abilities to learn physics, if not on the students' own perceptions.

2.6 The Societal Factor

In addition to the impact of the teacher's image of physics on a student's perception I would also like to explore the impact of societal images, and popular culture, on the student. Popular culture is defined by The Crystal reference encyclopedia (2005) as:a term which, used in a narrow sense, describes mass cultural phenomena, such as soap operas, spectator sports, and pop music; more broadly, it describes the mentality and way of life of most people as opposed to elites. Popular culture is now the subject of serious study, with museums and university courses devoted to it.

The effects of mass media depictions of physics and physicists is something that is necessary to explore, as the average student is exposed to more hours of media in a week than hours of school or time spent with their parents (Ward 2003). Mass media has depicted scientists in many different forms, from heroes to villains, but there are a handful of norms, some that could put a positive spin on science and scientists and others that have a more negative tone. (Ward 2003) looked at the portrayal of scientists in all forms of media form literature and film to cartoons. In summary of their findings, there are four major types of scientists depicted: First, the hero scientist, who determines the cure for a poison, or a means of defeating an enemy, or perhaps a method of getting to a destination. In any form, the hero scientist is the triumph of intellect over evil. Second is the evil genius, who uses his intellect in coherence with evil to plot against the protagonist(s). Third is the mad scientist, whose discovery invention becomes too powerful for him to control and ends up becoming the problem of the layman, who of course finds victory through force. Last is the socially inept scientist, who may have the gift of intellect but cannot figure out the social norms of society (pp. 179-182). The concern here is that three out of four depictions (that generalized) are negative. What is the implication of students being bombarded with images that depict science and physics as either evil or "for nerds"? Does this impact a student's decision to take physics? This is something I explored in my interviews.

The authors also explore the societal impact of these depictions; they discuss the reality of how people can become turned off towards science due to the portrayal of science in fictional media. In film we see an

immediate turn around, the reality of the scientific process is fast-forwarded for the sake of the script. When scientific research has a breakthrough in a field like cancer, the expectation is that a cure and its pharmaceutical agent will be available in weeks. This leads to a societal expectation that science should be quick and overnight, where the reality is that it can take years to transform a breakthrough into medicine that can be used to combat disease (Schibeci 2003). It makes me think of popular crime dramas on television in which DNA analysis is depicted as being a procedure that can be computed in an afternoon. The reality in Canada is that it takes RCMP weeks to analyze DNA properly (*CBC News Online*, 2006).

Chapter Three

3. Research Design and Methodology

In this chapter, the methodology and the research design that was used in the data collection and analysis would be discussed. The chapter was also describe the location where the study was carried out, population,

sample and sample selection. The research instruments that were used and how they were administered would also be discussed. An attempt would also be made to describe how both piloting and actual data collection was done.

3.1 Research design and process

The research was designed as a descriptive survey to look in to the factors that influence interest and attitude of students in physics at secondary and upper elementary school level. The researcher started by piloting the research instruments in four schools to test their validity, relevant changes were then made on the instruments and improvements made to increase reliability. A simple random sampling of the schools in Munesa district was done to come up with the schools that were involved in the study. The reason for using simple random sample was to allow the researcher to include different categories of schools. At least one practicing physics teacher in the selected schools participated in the study by filling in a questionnaire. School administer participated through an interview. The collected data was then analyzed, discussed and then presented in the form of graphs, charts and tables. A summary, conclusion and recommendations were then drawn from the study (Fig 3.1)

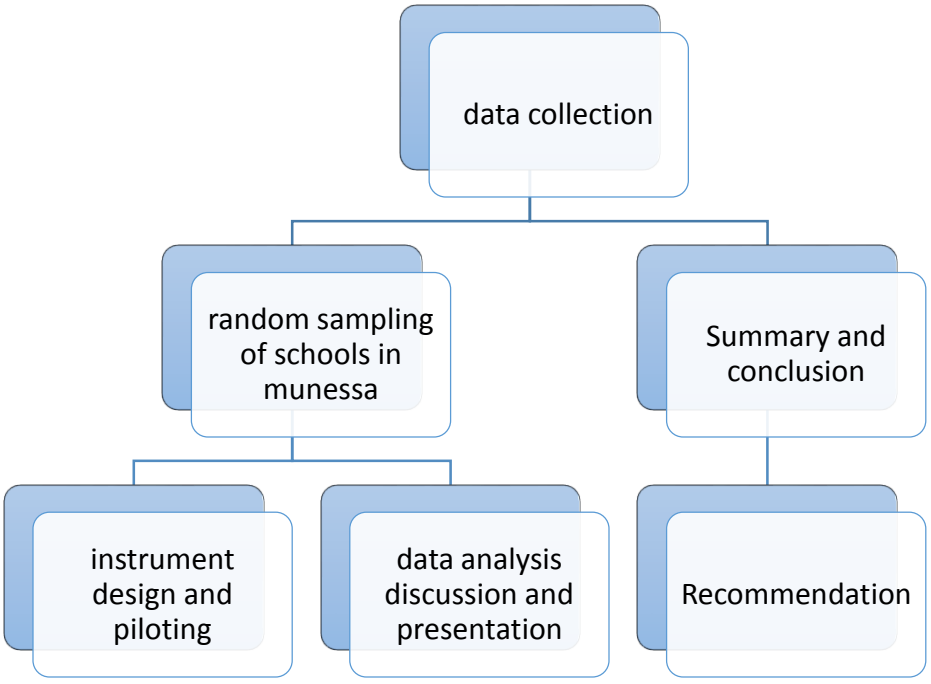


Fig 3.1 A Concept Map of the Research Design and Process

3.2. Location of the study

As stated earlier, the study was carried out in Munesa District of Arsi Zone about 232 Km from Addis Ababa, The district comprises two newly created districts; Digalu and tiyo North and Kore South. Both districts have common cultural and economic background. The main economic activities are barely, wheat and rearing of livestock. The reason for selecting Munesa District is due to its accessibility to the researcher and the fact that most of the schools in the district have a low enrolment in physics and the performance in the subject has been poor over the years. All the schools in this district are in the rural areas. Out of the 58 schools in the district, only two are provincial schools all the others are either district day or district boarding Most of these schools have had a dismal performance in the past physics NEAEA and the finding of this study will go a long way in assisting educationists in the district improve enrolment and performance in physics in the district.

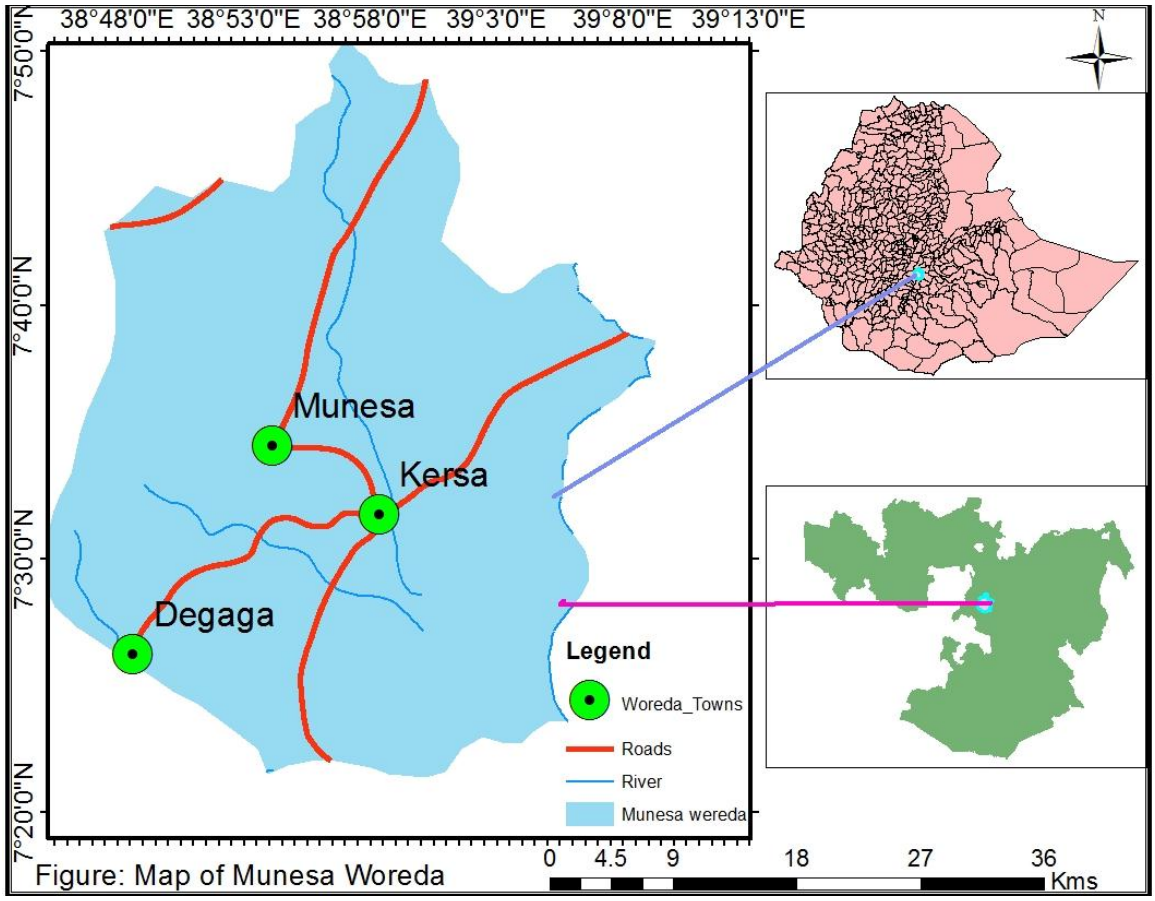


Figure 3.2 Map of Munesa Woreda source [munesa administration office]

3.3 Target population

The subject of the survey comprised samples that were drawn from the population of trained practicing teachers and their students. The selected sample was considered to be a representative of the population in the whole district. A total of 4 (10%) schools out of the 58 schools in the district were sampled for the purpose of this study. The respondents included heads of departments, physics teachers and students so as to make the study diverse and representative. Actual data collection took place in March 2017 and the previous exam results were taken as the end of year exam result from 2014-2016.

3.4 Sample and sampling procedure

As has been stated earlier, the study involved all practicing physics teachers in the sampled secondary schools, all science HODs and randomly sampled students from four-selected school. We used simple random sampling since both urban and rural schools participated in the study. A sample size of 10% to 20% is acceptable in a descriptive survey (Generserth 1987). This study used 10% of the total population of the schools in the district. It was then assumed that the sample collected was representative of the whole

population in the district. The justification of using simple random sampling was to ensure clear variation of independent variables in order to find out whether the said factors affect interesting and attitude in physics in the same way for the different kind of schools.

Table 3.1 Sample size selected from each school

School	Sex		
	Male	Female	Total
Kersa secondary school	25	15	40
Ego Secondary School	35	27	62
Merkaz upper elementary school	25	20	45
Gera cikeupper elementary school	30	23	53
Total	115	85	200

3.5 Research instruments

The research instruments comprised questionnaires for teachers and students, class observation schedule, students' achievement test and HOD's interview schedule. The interview guide was administered to HOD sciences while the observation guides collected information on teachers characteristics and teaching methodology and how it influences interest and attitude in physics. Use of multiple instruments was necessary to limit the bias that would have resulted from using data obtained from using one type of instrument.

3.5.1 Students' questionnaire

The students' questionnaire was administered to Form Two and Form Three physics students and was used to collect data on students' gender, attitude towards physics, their entry behavior and their opinion on teacher characteristics and teaching methodology. This instrument also collected data on students' performance in the previous examination (app A Item 13) the answer to this question and the results of the

achievement test formed the basis for performance.

3.5.2 Teachers' questionnaire

This instrument sought information on students' and teachers' attitude, characteristics, teaching methodology and availability of teaching/learning resources in the school. The instrument also collected data on the extent of gender disparity in physics classes and an opinion sought on improving the same.

3.5.3 Physics lesson observation schedule

Through this instrument, information on teacher characteristic and resource utilization in class was sought. We, through this instrument collected data on how well teachers were prepared to teach physics. Mastery of content and how well the lesson was delivered to the students were also sought. This instrument collected information on teacher's teaching style, teaching approach and methodology.

3.5.4 Science HOD Interview schedule

This instrument collected information on students' entry behavior, teachers' and students' attitude towards physics, and teacher characteristics. The HOD gave information pertaining to the school administration and how it affected enrolment and performance. End of term departmental results on science and mathematics was provided by the HOD and was compared with enrolment and performance in physics in that school.

3.6 Data collection procedure

The we visited the schools selected to participate in the study and arranged with the administration of the school on when it was most appropriate to collect data from the school. As for the questionnaire, the researcher took them personally to the respective schools .we sought assistance from the physics teachers to administer the questionnaires to the students to help reduce the Hawthorne effect. The teacher introduced the researcher to the student to reduce impressionistic factor. We explained to the students what was expected of them in filling the questionnaire. The questionnaire for the teachers was left to be collected on an agreed date or filled and collected on the spot. As for the interview schedule, the researcher arranged with the science HOD on the most appropriate date and time to conduct the interview. However, only five teachers were available for the interview and class observation was done only in four schools. In some schools teachers were not very enthusiastic on the observation and preferred to fill in the questionnaire only.

3.7 Data and data analysis

Most factors identified were tested using the SPSS technique to establish their level of significance. The

data was then presented in the form of tables, percentages and frequencies. The students were also categorized as male or female. The set research questions were also tested using crombach coefficient and the outcome for each test discussed. Tables, charts and graphs were used where possible and appropriate to make the results clearer**.**

3.8 Logical and ethical considerations

3.8.1 Logical considerations

The choice of Munesa district as the location of the study was necessitated by the researcher's proximity to the area. This reduced on travelling cost and saved on time that was required to collect the data. The researcher obtained a permit from Adama Science and Technology University to enable him legally collect data in Munesa schools. Advance prior arrangements were made to make the actual collection of data relatively easy.

3.8.2 Ethical considerations

The respondents were not required to fill in their names and the information given was treated with confidentiality and will not be used for any other purpose other than for the findings of this study. This was clearly shown on the research instruments that were distributed to the respondents. None of the respondents was forced or coerced to give information. Prior arrangements were done through the administration of the schools to be involved in the study in order not to adversely interfere with the school programs

Chapter Four

4. Research findings, presentation, analysis and in perpetration of data

This study was concerned with finding out the factors affecting interest and attitude in physics in Munesa District. This chapter examines and explains how certain factors such as interest, learner's attitude, experience, gender, and opinion of students in secondary and upper elementary schools toward physics subject. As was expected, the study found out that there was a high correlation between the identified factors with interest and attitude. The data collected using self-reported questionnaire were analyzed using descriptive statistics such as frequencies, i.e means, percentages, and standard deviations and variance. Concerning the observation, the data were analyzed quantitatively as mentioned (Dawit , 2002).

4.1 Research Finding

4.1.1 Background of the Respondents

Description of the background of the respondents' students taken in to consideration was school, grade levels, sex and age. For teachers and directors were Schools, sex, age, educational level (qualification),

service years, field of study regarded and all are taken as the important backgrounds for the study.

Table 4.1a Target School

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Kersa	40	20.0	20.0	20.0
	Ego	62	31.0	31.0	51.0
	G/Chike	53	26.5	26.5	77.5
	Markas	45	22.5	22.5	100.0
	Total	200	100.0	100.0	

Table4.1b Respondent Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	13-14	100	50.0	50.0	50.0
	15-21	100	50.0	50.0	100.0
	Total	200	100.0	100.0	

Table 4.1 c Respondent Sex

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	85	42.5	42.5	42.5
	Male	115	57.5	57.5	100.0
	Total	200	100.0	100.0	

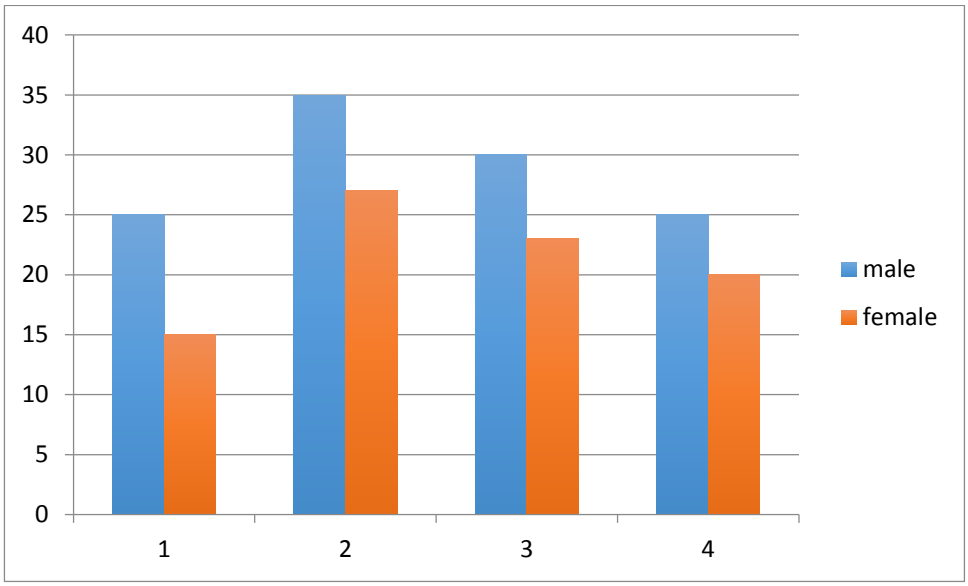


Figure 4.1Schematic graph of respondent school versus sex

Table 4.2 Teachers' and School Principals Backgrounds Respondents. (N = 6

№	Variable	№ of Respondent (n)	Percentage %
1	Sex		
	Male	6	100%
	Female	0	0%

2	Age		
	15-19	0	0%
	20-24	0	0%
	25-30	4	66,6%
3	Service year		
	1-5	1	16,7
	6-10	0	16.7
	11-15	1	0
4	Qualification		
	TTI	0	0
	Diploma	0	0
	Degree (B.Sc.)	6	100
	M.Sc.	0	0

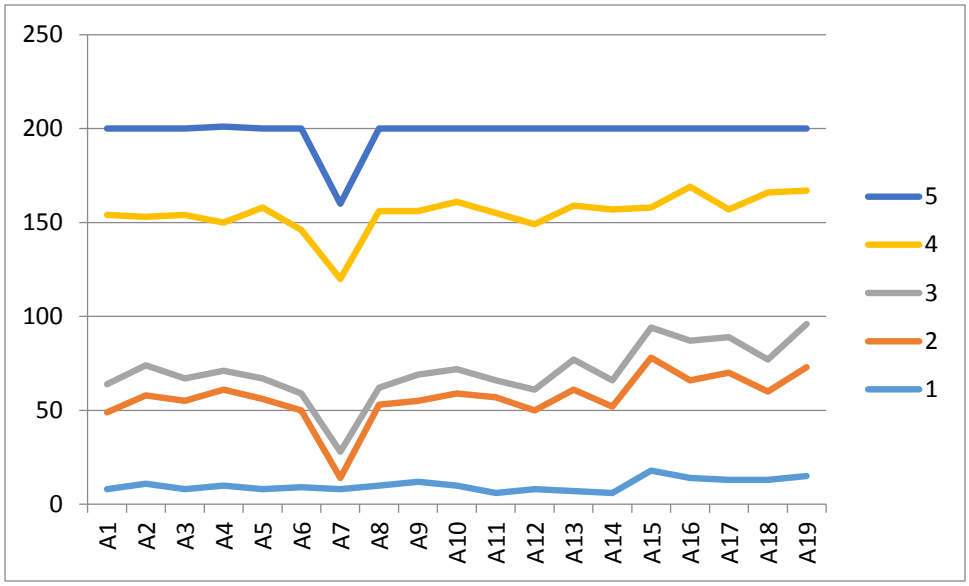
4.1.2 Results of student's respondent on opinion about physics class

Table 4.3 Students response on opinion about physics class

Items Code	1		2		3		4		5	
	F	%	F	%	f	%	f	%	f	%
A1	8	4.0	41	20.5	15	7.5	90	45.0	46	23.0
A2	11	5.5	47	23.5	16	8.0	79	39.5	47	23.5
A3	8	4	47	23.5	12	6.0	87	43.5	46	23
A4	10	5.0	51	25.5	10	5.0	78	39	51	25
A5	8	4.0	48	24.0	11	5.5	91	45.5	42	21.0
A6	9	4.5	41	20.5	9	4.5	87	43.5	54	27.0
A7	8	4.0	46	23.0	14	7.0	92	46.0	40	20.0
A8	10	5.0	43	21.5	9	4.5	94	47.0	44	22.0
A9	12	6.0	43	21.5	14	7.0	87	43.5	44	22.0
A10	10	5.0	49	24.5	13	6.5	89	44.5	39	19.5
A11	6	3.0	51	25.5	9	4.5	89	44.5	45	22.5
A12	8	4.0	42	21.0	11	5.5	88	44.05	51	25.5
A13	7	3.5	54	27.0	16	8.0	82	41.0	41	20.5
A14	6	3.0	46	23.0	14	7.0	91	45.5	43	21.5
A15	18	9.0	60	30.0	16	8.0	64	32.0	42	21.0
A16	14	7.0	52	26.0	21	10.5	82	41.0	31	16.5
A17	13	6.5	57	28.5	19	9.5	68	34.0	43	21.5
A18	13	6.5	47	23.5	17	8.5	89	44.5	32	16.0
A19	15	7.5	58	29	23	11.5	72	36.0	32	16.0

Table 4. 4 statistical analysis on students opinion

Item code	Valid	Mean	Std. Deviation	Range
A1	200	4.24440	0.91642	4.00
A2	200	3.5200	1.23581	4.00
A3	200	3.5800	1.19193	4.00
A4	200	3.5450	1.25533	4.00
A5	200	3.5550	1.18065	4.00
A6	200	3.6800	1.20201	4.00
A7	200	3.5500	1.16373	4.00
A8	200	3.5200	1.19083	4.00
A9	200	3.5800	1.21895	4.00
A10	200	3.5450	1.19878	4.00
A11	200	3.5550	1.17922	4.00
A12	200	3.6800	1.18381	4.00
A13	200	3.5500	1.19025	4.00
A14	200	3.5950	1.14785	4.00
A15	200	3.2600	1.32712	4.00
A16	200	3.3200	1.21449	4.00
A17	200	3.3658	1.27558	4.00
A18	200	3.3650	1.20451	4.00
A19	200	3.4200	1.24101	4.00



1. Very uninteresting
2. Uninteresting
3. Neutral
4. Interesting
5. Very interesting

Figure 4.2 the schematic graph of opinion about physics class

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		

(Constant)	1.664	.267		6.238	.000
Conservation of mechanical energy	.045	.035	.104	1.291	.198
Uses of simply machines	.008	.038	.019	.213	.832
Pascal's principle	.015	.034	.038	.451	.653
A different between mechanical and electromagnetic waves	.010	.033	.023	.294	.769
How can human eye see objects and colours	.013	.036	.031	.362	.717
Optical instruments and how they work (camera, Microscope etc....)	.051	.036	.120	1.420	.157
Electric city, how it is produced and used in the home	-.003	.032	-.006	-.084	.933
think every Body should learn science at school	-.016	.033	-.037	-.492	.623
School Science has shown me the importance of science for our way of living.	-.079	.030	-.210	-2.619	.010
School Science is interesting.	-.025	.032	-.060	-.769	.443
Transformer	-.021	.029	-.053	-.717	.475
Scales of temperature	-.033	.032	-.078	-1.017	.311
How can heat transfer from one body to another	-.023	.011	-.143	-2.011	.046

Table 4.5.Correlation Coefficients on opinion

a. Dependent Variable: Age

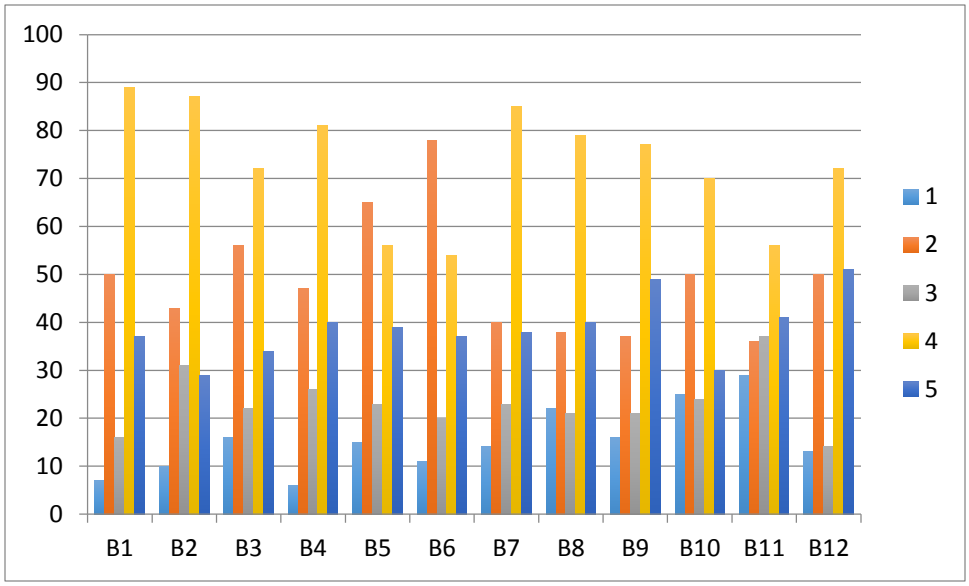
4.1.3 Results of student's respondent on interest about physics

Table 4.6 Students response on interest about physics

Items Code	1		2		3		4		5	
	F	%	F	%	f	%	f	%	f	%
B1	7	3.5	50	25	16	8	89	44.5	37	18.5
B2	10	5	43	21.5	31	15.5	87	43.5	29	14.5
B3	16	8	56	28	22	11	72	36	34	17
B4	6	3	47	23.5	26	13	81	40.5	40	20
B5	15	7.5	65	32.5	23	11.5	56	28	39	19.5
B6	11	5.5	78	39	20	10	54	27	37	18.5
B7	14	7	40	20	23	11.5	85	42.5	38	19
B8	22	11	38	19	21	10.5	79	79.5	40	20
B9	16	8	37	18.5	21	10.5	77	38.5	49	24.5
B10	25	12.5	50	25	24	12	70	35	30	15
B11	29	14.5	36	18	37	18.5	56	28	41	20.5
B12	13	6.5	50	25	14	7	72	36	51	25.5

Table 4.7statistical analysis on students interest

Item code	Valid	Mean	Std. Deviation	Range
B1	200	3.5100	1.1617	4.00
B2	200	3.2900	1.2664	4.00
B3	200	3.4150	1.1310	4.00
B4	200	3.2650	1.2670	4.00
B5	200	3.5101	1.1476	4.00
B6	200	3.7070	1.3611	4.00
B7	200	3.1515	1.12694	4.00
B8	200	3.4650	1.2066	4.00
B9	200	3.3850	1.2981	4.00
B10	200	3.3700	1.3006	4.00
B11	200	3.4250	1.1752	4.00
B12	200	3.5300	1.2637	4.00
B13	200	3.2400	1.8107	4.00
B14	200	3.3100	1.8441	4.00



1. Strongly disagreed
2. Disagreed
3. Neutral
4. Agreed
5. Strongly agreed

Figure 4.3 the schematic graph of interest in physics

Table 4.8 Correlation Coefficients on interest toward physics

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
	(Constant)	1.895	.378		5.020	.000
	Physics is interesting subject	-.062	.031	-.142	-1.988	.048
	I Like physics better than most other subjects	-.024	.029	-.061	-.827	.409
	I think you should learn most other subjects	-.008	.031	-.019	-.268	.789
	The things that I learn in physics at school will be helpful in my everyday life.	-.082	.028	-.205	-2.936	.004
	Physics is an important for society.	.090	.031	.207	2.955	.004
	Stars, plants and universe	-.012	.007	-.131	-1.881	.062
	Atoms and Molecules	-.019	.028	-.048	-.670	.504
	Light around us that we can’t see (infrared uitrarl violet	-.007	.030	-.016	-.226	.822
	How different musical instruments produce different sound	-.010	.028	-.026	-.358	.721
	Rockets, Satellites and space travel	.021	.028	.056	.765	.445
	The use of satellites for communication and other purposes.	-.062	.031	-.144	-1.989	.048
	How x-ray, ultra sound, Radio therapy , etc. Are used in medicine.	.003	.028	.007	.100	.921

Why we can see rain bow	.040	.019	.145	2.090	.038
New sources of energy from the sun, wind, tides, walls, etc.	.013	.019	.047	.662	.509

a. Dependent Variable: Age

4.1.4 Results of student's respondent on experience in and out of school about

Physics

Table 4.9 Students response on experience in and out of school about physics

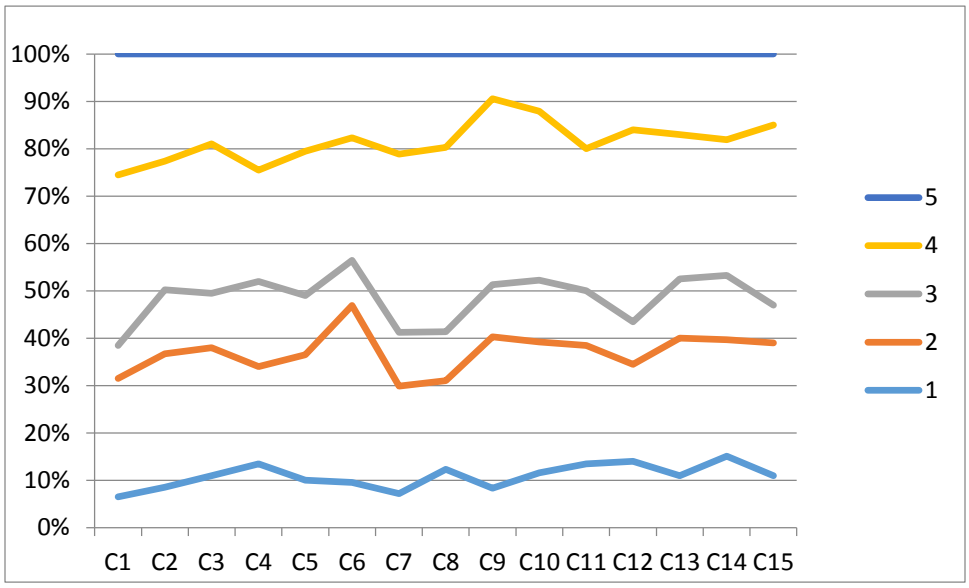
Items Code	1		2		3		4		5	
	F	%	F	%	F	%	f	%	f	%
C1	13	6.5	50	25	14	7	72	36	51	25.5
C2	17	8.5	56	28	27	13.5	54	27	45	22.5
C3	22	11	54	27	23	13.5	63	31.5	38	19
C4	27	13.5	41	20.5	36	18	47	23.5	49	24.5
C5	20	10	53	26.5	25	12.5	61	30.5	41	20.5
C6	20	5.5	78	39	20	10	54	27	37	18.5
C7	14	10	44	22	22	11	73	36.5	41	20.5
C8	25	11	38	19	21	10.5	79	79.5	40	20
C9	16	12.5	61	30.5	21	10.5	75	37.5	18	9
C10	23	11.5	55	27.5	26	13	71	35.5	24	12
C11	27	13.5	50	25	23	11.5	60	30	40	20
C12	28	14	41	20.5	18	9	81	40.5	32	16
C13	22	11	58	29	25	12.5	61	30.5	34	17
C14	30	15	49	24.5	27	13.5	57	28.5	36	18

C15	22	11	56	28	16	8	76	38	30	15

Table 4.10 statistical analysis on student's experience

Item code	Valid	Mean	Std. Deviation	Range
C1	200	3.8850	4.7797	4.00
C 2	200	3.4900	1.2977	4.00
C 3	200	3.2500	1.3809	4.00
C 4	200	3.4150	1.4191	4.00
C 5	200	3.2050	1.3236	4.00
C 6	200	3.2500	1.3076	4.00
C 7	200	3.3650	1.2990	4.00
C 8	200	3.0000	1.2440	4.00
C 9	200	3.1850	1.6529	4.00
C 10	200	3.1800	1.3663	4.00
C 11	200	3.2400	1.13271	4.00
C 12	200	3.1350	1.3058	4.00
C 13	200	3.2450	1.4354	4.00

C14	200	3.1800	1.2946	4.00
C 15	200	3.9300	1.2461	4.00



1. Never 2. Seldom 3. Occasionally 4. Sometimes 5. Always

Figure 4.4 the schematic graph of students experience in and out of school

Table 4.11Statistical analysis of variance on opinion of students toward physics

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	9.710	15	.647	2.956	.000[b]
	Residual	40.290	184	.219		
	Total	50.000	199			

a. Dependent Variable: Age

df(degree of freedom),F (frequency),sig(significance of hypothesis)

b.Predictors: (Constant), I used a science kit (like for chemistry optics or

4.1.5 Results of student's respondent on attitude toward physics

electricity, I used microscope and camera, Connecting electric switch, I used a meter stick in measuring length, Making different model of devices like car, plane and extra, I used different simple machines to heavy object , I used a water

pump or siphon, I used different devices to measure kinematics quantity (like stopping watch, meter tick etc....) , I used hydraulic press to lift heavy objects, I used to charged a car battery, I used different reference physics books , I used a stop watch, Measuring your body temperature using thermometer, Changing or fixing electric bulbs or fuse, I used measured the temperature with a thermo meter

Table 4.12 Correlation Coefficients on interest toward physics Coefficient

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.428	.294		8.269	.000
	I used a meter stick in measuring length	-.005	.007	-.047	-.673	.502
	I used different devices to measure kinematics quantity (like stopping watch, meter tick etc....)	-.081	.027	-.208	-2.943	.004
	I used different simple machines to heavy object	-.069	.027	-.191	-2.524	.012
	I used hydraulic press to lift heavy objects	-.003	.015	-.016	-.212	.833
	I used microscope and camera	-.052	.031	-.138	-1.694	.092
	Connecting electric switch	-.022	.027	-.057	-.792	.429
	Changing or fixing electric bulbs or fuse	-.092	.032	-.239	-2.859	.005
	Measuring your body temperature using thermometer	.139	.033	.346	4.166	.000

Making different model of devices like car, plane and extra	-.002	.002	-.062	-.912	.363
I used different reference physics books	-.040	.032	-.108	-1.253	.212
I used a water pump or siphon	.036	.035	.094	1.028	.305
I used a stop watch	-.072	.031	-.186	-2.335	.021
I used to charged a car battery	.027	.015	.131	1.782	.076
I used measured the temperature with a thermo meter	-.053	.034	-.136	-1.541	.125
I used a science kit (like for chemistry optics or electricity	.022	.032	.054	.682	.496

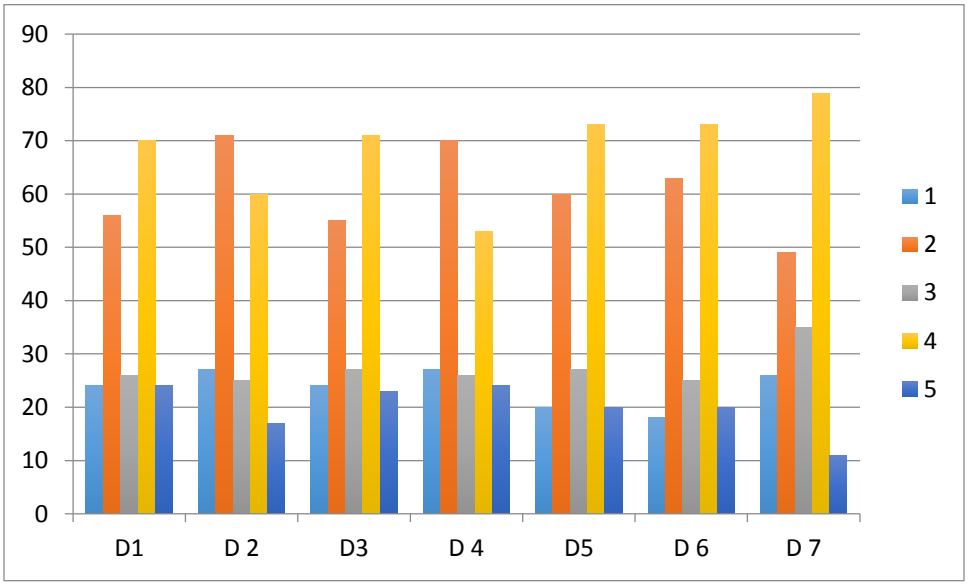
a. Dependent Variable: Age

Table 4.13 Students response on attitude toward physics

Items Code	1		2		3		4		5	
	F	%	F	%	f	%	f	%	f	%
D1	24	12	56	28	26	13	70	35	24	12
D 2	27	13.5	71	35.5	25	12.5	60	30	17	8.5
D3	24	12	55	27.5	27	13.5	71	35.5	23	11.5
D 4	27	13.5	70	35	26	13	53	26.5	24	12
D5	20	10	60	30	27	13.5	73	36.5	20	10
D 6	18	9	63	31.5	25	12.5	73	36.5	20	10
D 7	26	13	49	24.5	35	17.5	79	39.5	11	5.5

Table 4.14 Statistical analysis on attitude of the students on physics

Item code	Valid	Mean	Std. Deviation	Range
D1	200	3.0700	1.2621	4.00
D 2	200	3.8450	1.2323	4.00
D 3	200	3.0700	1.2541	4.00
D 4	200	3.0850	1.2116	4.00
D5	200	3.8850	1.2766	4.00
D 6	200	3.0800	1.2774	4.00
D 7	200	3.2250	1.4851	4.00
D 8	200	3.1960	1.0701	4.00



1. Strongly disagreed
2. Disagreed
3. Less agreed
4. Agreed
5. Strongly agreed

Figure 4.5 the schematic graph of students' attitudes toward science and technology at the selected school

Table 4.15 Statistical analysis of variance

Model	Sum of Squares	df	Mean Square	F	Sig.

	Regression	12.509	8	1.564	8.210	.000b
1	Residual	36.185	190	.190		
	Total	48.693	198			

a. Dependent Variable: Sex

Table 4.16 correlation Coefficients on experience in and out of school

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	1.778	.203		8.743	.000
Science and Techno logy are important for society	.145	.026	.368	5.624	.000
Science and Technology will find wren to diseases such as HIV) AIDS , centered etc.	-.034	.028	-.086	-1.222	.223
Thanks to science and Technology, there will be greater appropriates for feature generation.	-.157	.033	-.397	-4.824	.000
Science and Technology make our locals healthier, easier and more comfortable	-.022	.032	-.053	-.671	.503
technologies will make the word more in tresting.	.061	.030	.156	2.051	.042

Science and Technology will help to eradicate poverty and Famine in the world	.006	.024	.015	.233	.816
A country needs science and Technology to be developed	-.067	.029	-.162	-2.272	.024
Scientific theories develop and change all the time	.003	.011	.019	.276	.783

a. Dependent Variable: Sex

Table 4.17 Statistical analysis of variance on attitude of students on physics

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	38.450	8	4.806	5.039	.000[b]
Residual	181.239	190	.954		
Total	219.688	198			

a. Dependent Variable: school

b. Predictors: (Constant), Scientific theories develop and change all the time, Science and Techno logy are important for society, Science and Technology will help to eradicate poverty and Famine in the world, Science and Technology will find wren to diseases such as HIV) AIDS , centered etc. , A country needs science and Technology to be developed , Science and Technology make our locals healthier, easier and more comfortable , technologies will make the word more interesting., Thanks to science and Technology, there will be greater appropriates for feature generation.

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
	(Constant)	2.056	.455		4.517	.000
	Science and Techno logy are important for society	-.077	.058	-.092	-1.339	.182
	Science and Technology will find wren to diseases such as HIV) AIDS , centered etc.	.040	.063	.047	.633	.528
	Thanks to science and Technology, there will be greater appropriates for feature generation.	.172	.073	.205	2.369	.019

Science and Technology make our locals healthier, easier and more comfortable	-.005	.072	-.005	-.063	.950
technologies will make the word more in tresting.	.035	.066	.042	.524	.601
Science and Technology will help to eradicate poverty and Famine in the world	.101	.055	.122	1.842	.067
A country needs science and Technology to be developed	-.173	.066	-.198	-2.646	.009
Scientific theories develop and change all the time	.060	.024	.174	2.451	.015

Table 4.18 correlation Coefficients on attitude versus school

a. Dependent Variable: school

4.2 Discussions

From table 4.1a.A total of 85 (42.5%) Female were involved in the study out of which 200 (10%) were sampled from four schools and 115 (10%) came from four mixed schools. A total of 115 boys participated in the study out of which 57.5 % were from four were sampled from four mixed schools. As observed from the findings of this study that majority of students who interested for physics in four in mixed schools were boys. Asked why they did not intend to enroll in physics, one student said that "I like physics better than other subjects" Only 29 (14.5%) of these students believed that physics subject is better than others subject for boys but 86(43%) didn't agree while 12 (19.35%) neither agreed nor disagreed and 4(6.45%) remained non committal. Most boys (58.5%) believed that boys perform better in physics than girls. Concerning the

interest of of the the students shows in table 4.4 shows that 55%- 90% selected agree. The achievement test, the mean score of all the females from the sampled schools was relatively lower at 22.41 compared to that of boys at 23.54 as indicated in fig 4. This difference has been attributed to socialization Theory (Generserth, 1987). On average men perform better than women in college and high school physics. Studies of elementary and secondary education suggest that these disparities originate when students are in junior high school (Mazur, 2006). Some studies have shown that women perform better in science classes that are taught cooperatively rather than cooperatively and benefit from classes that challenge every student to think about and respond to questions asked during class (Tobias *et a*l, 1999, Osborne et al 2003 and Mazur et al 2006). The findings of this study are in agreement with (Orodho ,1996) that in deed there is sex difference in science achievement and particularly in physics at secondary school level in Munesa district.

How interested are students in learning about physics topics? One index in the questionnaire is an inventory of possible topics to learn about. Students were requested to select the appropriate category for how interested they are in learning about the topic. The "Students' interest in physics" variable is a sub- index of a more comprehensive one: "What I want to learn about," comprising14 items with Cronbach's α coefficient of 0.88. The "Students' opinions about their science classes" variable is also a sub-index of a more comprehensive one, "My science classes," comprising 19 items with Cronbach's α coefficient of 0.89. The students' attitudes toward science and technology variable was defined a priori by the questionnaire developers and comprised8 items with Cronbach's α coefficient of 0.79. The "Students' out-of-school experience in physics" variable is a sub-index of a more comprehensive one, "My out-of-school experiences," comprising15 items with Cronbach's α coefficient of 0.84 (see Appendix to characterize the different variables used in this study).

We see that all the differences are statistically significant. Boys showed a higher interest in physics and had more out-of-school experience in physics than girls, with a large effect size (Cohen, 1988). Boys also held more positive attitudes toward science and technology and better opinions about science classes than girls, but with a smaller effect size. Sjoberg*et al.* (2004), in their first review of the international data, found that: Some challenges in S&T education seem to be common for most countries. Other challenges seem to be more pronounced in certain countries than other. For instance, the lack of interest in S&T studies, and the possible hostility or disenchantment with S&T seem to be more pronounced in many highly developed countries than other parts of the world.

Students' opinions of their science classes, their out-of school experiences in physics, their attitudes toward science and technology, and their gender proved to be significant factors explaining about 37% of students' "neutral" interest in physics. (Students' opinions of their science classes contributed 27%, their out-of-

school experiences in physics 6%, their attitudes to science and technology only 2.5%, and their gender less than 1 %.) We looked further and found only 133 students (21% of the sample) who were interested in physics, i.e., they marked on the average, that they were "interested" or "very interested" in the different physics topics presented to them in the questionnaire. The gender distribution among them was 89 boys (67%) and 44 girls (33%), with no statistically significant difference in their interest in physics. The strongest correlation to this variable was "limited out-of-school experience in physics" with a Pearson coefficient of 0.424 (p-value <0.01) and with a significant contribution of 18% to the explanation of their interest in physics in a multiple regression model. This was also the only variable, which showed a statistically significant difference between boys and girls in this group (t = 2.79, p-value = 0.005), with boys having more out-of-school experiences (mean = 2.50, SD = 0.48) than girls (mean = 2.26, SD = 0.43).

These findings raise serious questions about the implementation of the changes made in the Israeli science curriculum in primary and junior high school, if indeed the goal is to prepare the new generation for life in a scientific-technological era, as stated by the Tomorrow 98 Report (1992).

So, what is the reason why students' interest in physics at the end of junior high school is so low? What can be done to increase the number of students, especially girls, choosing physics as their major field of study in secondary school? As we have found in our study, the most influential factor on students' interest in physics is their poor opinions about science classes in junior high school. In most countries, the evidence would indicate that children enter junior high school with a highly favorable attitude toward science and interest in science, both of which are eroded by their experience of school science, partic- ularly for girls (Kahle and Lakes, 1983). Various researchers (Hendley*et al.*, 1995; Sundberg*et al.*, 1994; Woolnough, 1994a) concluded that it is the quality of teaching of school science that is a significant determinant of attitude towards school science. Osborne and Collins (2000) claim that, for many, contemporary curricula put too much emphasis on undemanding activities such as recall, copying and a lack of intellectual challeng

Chapter Five

5. Summary, Conclusions and Recommendations

In this chapter, the conclusion and recommendations of the study findings will be made. The fundamental purpose of educational research is to develop new knowledge about educational phenomena and develop our confidence regarding particular knowledge while confirming whether it is true or false. The purpose of this study was to identify and examine the identified factors affecting interest and attitude in physics among secondary and junior upper school students. Having collected and analyzed data, a summary of findings, conclusion and recommendations are outlined in this chapter.

5.1Summary of the main findings

The study was anchored on four factors that include; interest, attitude, opinions, experience, mathematical/spatial ability and gender differences. These factors were assumed to affect enrolment and performance in physics among secondary school students in Munesa District. Five research questions guided the study and they form the following outline in the summary. Schools were found to have no several teaching and learning resources. The teachers made use of several of them. It was however noted that these resources were mostly used during class experiments in the laboratory. There was no notable use of charts, overhead projectors or even power point presentations. In most cases, the textbooks were used during the lesson to discuss diagrams and flow charts. Wall charts, which would have been very convenient, were rarely used. The study found out that the textbooks were over used in spite of the fact that the teacher's guide had suggestions on the various resources that the teacher could employ in teaching particular topics. There was no evidence of the use of class projects in the process of teaching. This was restricted to presentations made during annual congress on science and technology by the few students who attend. It is worth noting that projects play a vital role in the students' understanding of physics concepts. Teachers are therefore advised to incorporate projects in the process of teaching. Generally, the use of resources in the classroom elicits a marked show of interest in the topics of discussion.

Spatial visualization ability is the ability of a learner to cognitively "see" operations in space. This ability is closely associated with mathematical ability. Physics and mathematics at secondary level are requirements for all students intending to pursue Science and Technology related courses. This is because the said professions require high precision and spatial visualization ability. Though this research did not exhaustively study spatial visualization ability due to its complexity, it found out that students who

performed well in mathematics were likely to enroll and perform well in physics. Boys performed better and this is likely to give them an advantage over the girls. The attitude of student towards a particular science subject was found to significantly affect the choice of subject in Form Three. All the students who had enrolled in physics had positive attitude towards the subject. The attitude was even higher among the students who performed well. Student attitude determines the amount of time and effort dedicated to the subject and this ultimately improves enrolment and performance in the subject. Acquisition of proficiency in a subject may lead to a positive attitude in the subject.

5.2. Conclusion

To a certain extent, the identified factors were found to affect enrolment and performance. However, contrary to what was indicated in the concept model, enrolment did not affect performance neither did performance affect enrolment. The school environment played a major role in improving students attitude towards learning which leads to improved performance and higher enrolment. Provincial schools had a higher enrolment than District schools yet the former had a better performance. As was found out in the study, an attempt has been made in the recent past to try and synchronize primary science and high school science to try and bridge the gap between the two levels both in content and instructional methods. However, primary science teachers have not adopted a practical/inquiry instructional strategy leading to confusion after transition to high school.. Girls were found to perform lower than boys in areas that required spatial and mathematical ability. This poor performance was partly due to the fact that in mixed schools, boys denied the girls an opportunity to handle apparatus, which contributed to their poor manipulative skills. Teachers in these schools should therefore adopt more cooperative than competitive methods in the process of instructions. Single gender schools performed better than mixed schools. They had however higher entry behavior and this study could therefore not establish the relationship between performance and the school's gender composition. Contrary to what was indicated in the concept model, enrolment did not have a significant effect on performance but schools with better performance in the previous years had a higher enrolment in physics. This was the case in provincial schools where there was a greater percentage physics enrolment and better performance in the previous years.

This thesis was intended to find out and analyze the factors affecting interest and attitude in physics. It was the intention of the researcher that the findings of this study will go a long way in improving interest and attitude in physics at secondary and upper juniorschool level. Teachers will also tap from the findings of this study on the modern and effective methods of teaching physics. Spatial visualization ability is key to the study of science and engineering courses. This study therefore intends to have the teachers encourage the students with high spatial visualization ability to pursue science and engineering courses and use

instructional methods that encourage the use of spatial ability among the learners. Proper utilization of teaching/learning resources plays a pivotal role in the process of instruction. It is therefore the intention of this study to encourage the teachers to adequately prepare learning materials prior instructional period to effectively utilize them.

5.3 Recommendations

5.3.1 Recommendations for action

The following recommendations for action were made based on the findings of this study. Teachers should therefore work towards improving students' achievement in the subject in order to inculcate positive attitude to the learners.

The study found a great disparity in enrollment across the gender. In all the mixed schools sampled, there were more boys than girls enrolling in physics. Performance was also better among boys in mixed school than their female counterparts. However, girls in provincial schools performed better than the boys. The girls in the provincial school had however a higher entry behavior than the boys in the same category. Teachers should therefore make a deliberate effort encourage the girls in mixed schools and employ teaching methods that are girl friendly. Inclusion of guidance counseling during selection of subjects at Form Two is highly recommended. This will go a long way in helping the students choose subjects that will assist them in their future career**.**

Teachers at primary school should therefore be encouraged to use appropriate methods of instructions to develop in learners an exploratory, investigative and intuitive mind at an early age in educational ladder

- ✓ Teachers are advised to use effective modern teaching methods to improve absorption and retention of learnt materials by the learner. The use of field trips and laboratory work in particular should be encouraged to give the students direct experience with their surrounding and appreciate the importance of physics to the environment.

- ✓ Resources assist in visualization and conceptualization of concepts more so in physics. The school administration should therefore prioritize provision of physics laboratory equipment to improve the quality of class experiments. Teachers should also make use of locally available materials so that learners can associate the subject with the surrounding environment and compliment on convectional resources.
- ✓ The study found out that girls learning physics without the boys were more confidant and

consequently performed better than their counterparts in mixed schools. There is need therefore for the government to minimize the number of mixed schools and increase the number of boys' only and girls' only schools. Teachers teaching the girls are also encouraged to use more practical approach to improve their masterly of concept and cater for their low spatial ability.

- ✓ Positive attitude of students towards physics was found to greatly improve performance. It is therefore the responsibility of the physics teachers to make the subject more appealing to the learners since this will consequently lead to a more positive attitude towards the subject. As has been stated earlier, students' feelings are very important and have strong effect upon the amount of work and the effort put towards learning. It is the teachers' responsibility to foster students' positive attitude towards a subject. Teachers' and parents attitudes affect the way a student views a subject, they should therefore themselves cultivate a positive attitude on order to foster the same to the learners.

5.3.2 Recommendation for further research

I. This study was set up in location where people have similar culture and economic background. It is therefore recommended that a similar study should be carried out in other districts in the country to investigate whether or not the findings of this study apply to other areas of different cultural and economic backgrounds

II. There are other factors, which affect interest, attitude in physics but were not considered. The factors that were not considered in this study include class size, students' literacy level, subject's difficulty index, students' cultural back ground and type of curriculum offered; further research should therefore be carried out to look into the extent to which these factors affect enrolment and performance.

III. The study focused on physics at secondary school level. Another study should also be considered in other science subject areas to establish the extent to which these factors affect enrolment and performance in those subjects

IV. Since the cost of implementation was not carried out in this study, a survey should be conducted to investigate the cost of implementation of physics curriculum at secondary school level and its effect on enrolment performance.

V. That there is a gender difference in physics achievement and enrolment is not in dispute, a further research should therefore be carried out to find out the major causes of the disparity and recommend action to bridge the gap. Such a study should identify social, cultural, ecological, economic, physiological and political factors that tend to influence gender differences in physics achievement.

References

A.A.P.T. (1999). *Physics education journal* 26, no. 4.

Abell, S. K. (1990)."A case for the elementary school science specialist." *School Science and Mathematics* 90, no. 4: 291-301.

"American Association for the Advancement of Science (1990)." *Science for all Americans*,(Oxford University Press).

Angell, C., Guttersrud, O., Henriksen, E., & Isnes, A. (2004)."Physics: Frightful, but fun. Pupils' and teachers' views of physics and physics teaching." *Science Education.*88, no. 5: 683-706.

Athman, J., & Monroe, M. C. (2003)."The effects on student' critical thinking and achievement motivation."*Environment-based education in Florida high schools* (Gainesville, FL: University of Florida),.

Baker, M., and Doran, "From an awareness of scientific data to concerns of mankind: Strategies for affective instruc- tion in science. ." *Science Education* 59 (1975): 539–558 pp.

Dawit, et.al.(2009) *introduction to applied educational research data collection analysis, interpretation and report writing in educational research.* Addis Ababa: ministry of education,

Francis, L., and Greer, J. (1999)."Measuring attitudes towards science among secondary school students ." *The affective do- main. J.Res.Scie Tea.*35: 877– 896pp.

Generserth, S.& Nilsson, T.L.(1987). "Qualitative Research in education Ibadan ." (alleim and Beicon Press.)

Graber, W. "Pupils' interest in chemistry and chemistry lessons. ." *In Proceedings of the International Conference Sci- ence Education in Developing Countries: From Theory to Practice* 201.

Iraki, N.W.(1994). "Students and teachers' expectations of practical work in physics." *A study of Laikipia and Nyandarua Districts of Kenya Unpublished Med Thesis*,

Keith, M. (1996)"Introduction to high school physics." Oxford University Press,.

Kersa Woreda Education office (2016). *Analysis Students' mark.* Annual report, Kersa Woreda.

Lyons, T. (2005)."The puzzle of falling enrolment in physics and chemistry courses; putting some pieces together ." *National Centre of Science, ICT, and Mathematics Education for Rural and Regional Australian University* ,

Mazur, E. & Lorenzo. M. (2006).*Reducing the Gender Gap in physics classroom.* department of applied sciences , Havard university , Oxford street Cambridge.

Ministry of Education [MoE] (2003). "Education quality improvement package ."

Nathan, S. And Brian, L.(1995)."Physics laboratory Manual: A students' physics practical guide." *European journal of science education* 5: 203-215pp.

Nderitu, M.K. (2007)."Determinants of enrolment and performance in physics in selected secondary schools in Murang'a District ." Med Thesis .

Ormerod, M., and Duckworth, D. (1975)."Pupils' Attitudes to Sci- ence, Slough, National Foundation for Educational Research."

Orodho, J.A. (1996)."Factors determining achievement in science subject at secondary school level in Kenya ."

P.K., Torongey. (1986)."A survey of problems experienced by girls in learning physics at O' level and their implications on girl's interest in the subject in Kericho district. Kenya ." *Unpublished Med Thesis* (Kenyatta University).

Schibeci, R., & Lee, L. (2003)."Portrayals of science and scientists, and science for citizenship. Research in Science & Technological Education, ." 21, no. 2: 177-192 pp.

Selim, M., and Shrigley, R.(1983). "The group-dynamics approach: A socio-psychological approach for testing the effect of dis- covery and expository teaching on the science achievement and attitude of young Egyptian students." *Journal of Research in Science Teaching* 20: 213–224 pp.

Tamir, P. "Gender differences in high school science in Israel ." *British Educational Research Journal* 14 (1988): 127–140 .

UNESCO. (1973)."UNESCO source book for teaching.".

Ward, L. (2003)."Understanding the role of entertainment media in the sexual socialization of American youth ." *A review of empirical research. Developmental Review* (doi:10.1016/S0273-2297(03)00013-3) 23, no. 3: 347-388 pp.

Appendix A. Students' questionnaire

Adama science and Technology University

Dear Students :

The purpose of this Questionnaire is '**To identify comparative analysis of factor affecting secondary and upper elementary student's interest towards physics'**atMunessaWoredato give appropriate solutions to overcome the problem. Hence your genuine response has a great value for outcome of study, do you are kindly requested to provide response honestly.

Instructions

- ✓ Do not write your name on this paper
- ✓ Please answer all the questions
- ✓ Do not spend so much time on one question, write N/A if the question does not concern you
- ✓ Where choices are provided, choose the most appropriate in your view by ticking (√) in the corresponding box*General*

  *Information*School.....**……**Class...

  .....

Key Words.

5- Very interesting

4- interesting

3- neutral

2- Uninteresting

1- very uninteresting

R.No	Item	5	4	3	2	1	Remark
1	Distinguish vector and scalar quantity						
2	Kinematic s						
3	Solving acceleration and distance from velocity-time graph						
4	I would like to be scientist						

5	Acceleration under resultant force						
6	Relation between energy and work						
7	Conservation of mechanical energy						
8	Uses of simply machines						
9	Pascal's principle						
10	A different between mechanical and electromagnetic waves						
11	How can human eye see objects and colours						
12	Optical instruments and how they work (camera, Microscope etc....)						
13	Electric city, how it is produced and used in the home						
14	I think every Body should learn science at school						
15	School Science has shown me the importance of science for our way of living.						
16	School Science is interesting.						
17	Transformer						
18	Scales of temperature						
19	How can heat transfer from one body to another						

II. Key Word

5- Strongly agreed 3- Neutral

4- Agreed 2- Disagreed 1- Strongly disagreed

R.No	Item	5	4	3	2	1	Remark
1	Physics is interesting subject						
2	I Like physics better than most other subjects						
3	I think you should learn most other subjects						
4	The things that I learn in physics at school will be helpful in my everyday life.						
5	Physics is an important for society.						
6	Stars, plants and universe.						

7	Atoms and Molecules						
8	Light around us that we can't see (infrared uitrarl violet)						
9	How different musical instruments produce different sound						
10	Rockets, Satellites and space travel						
11	The use of satellites for communication and other purposes.						
12	How x-ray, ultra sound, Radio the rapy , etc. Are used in medicine.						
13	Why we can see rain bow						
14	New sources of energy from the sun, wind, tides, walls, etc.						

III. Key Words

5- Always 3- occasionally

4- Sometimes 2- Seldom 1- never

R.No	Item	5	4	3	2	1	Remark
1	I used a meter stick in measuring length						
2	I used different devices to measure kinematics quantity (like stopping watch, meter tick etc....)						
3	I used different simple machines to heavy object (inclined plane pulley, lever etc.....)						
4	I used hydraulic press to lift heavy objects						
5	I used microscope and camera						
6	Connecting electric switch						
7	Changing or fixing electric bulbs or fuse						
8	Measuring your body temperature using thermometer						
9	Making different model of devices like car, plane and extra						
10	I used different reference physics books						
11	I used a water pump or siphon						
12	I used a stop watch						

13	I used to charged a car battery						
14	I used measured the temperature with a thermo meter						
15	I used a science kit (like for chemistry optics or electricity						

IV. Key Words

5- Strongly agreed

4- agreed

3- Less agreed

2- disagreed

1- Strongly disagreed

R.No	Item	5	4	3	2	1	Remark
1	Science and Techno logy are important for society						
2	Science and Technology will find wren to diseases such as HIV) AIDS , centred etc.						
3	Thanks to science and Technology, there will be greater appropriates for feature generation.						
4	Science and Technology make our locals healthier, easier and more comfortable						
5	Now technologies will make the word more in tresting.						
6	Science and Technology will help to eradicate poverty and Famine in the world						
7	A country needs science and Technology to be developed						
8	Scientific theories develop and change all the time.						

APPROVAL SHEET

ADAMA SCIENCE AND TECHNOLOGY UNIVERSITY

SCHOOL OF APPLIED NATURAL SCIENCE

APPLIED PHYSICS PROGRAM

This is to certify that the thesis prepared by Ayano Koji entitled: "**Comparative analysis of factors affecting secondary and upper elementary school students interest in physics at munesa district, Arsi Zone Oromia Region** "submitted in partial fulfillment of the requirement for the Master of degree of science in physics complies with regulation of the university and meets the accepted standards with respect to originality.

Signed by the examination committee

Dr. Aiemu Kebede	_____	_____
Advisor	Signature	Date
_____	_____	_____
Chairperson	Signature	Date
_____	_____	_____
External examiner	Signature	Date
_____	_____	_____
Internal examiner	Signature	Date

Final approval and acceptance of the research is contingent up on the submission of its final copy to the final of graduate studies (CGS) through the candidates department or school of graduate committee (DGS or SGC).