COMPARATIVE STUDY OF EFFECTIVENESS OF STUDENT-CENTERED VERSUS LECTURE BASED TEACHING METHOD ON STUDENTS PERFORMANCE LEARNING PHYSICS (THE CASE OF GRADE 11 MEKI PREPARATORY SCHOOL)

By

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Adama, Ethiopia

August, 2018

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Adviser

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August, 2018

Declaration

I hereby declare that this M.sc. thesis is my original work and has not been presented for a degree in any other Universities, and that all source of material used for the thesis have been properly acknowledge.

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APPROVAL SHEET

ADAMA SCIENCE AND TECHNOLOGY UNIVERSITY

SCHOOL OF APPLIED NATURAL SCIENCE

APPLIED PHYSICS PROGRAM

This is to certify that the thesis prepared by Tadele Tefera entitled " comparative study of effectiveness of student-centered versus lecture based teaching method on students performance learning physics (the case of grade 11 Meki Preparatory School)". Submitted in partial fulfillment of the requirement for the degree of Master of Science in physics complies with regulation of the University and meets the accepted standards with respect to originality.

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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 candidate department or School of graduate Committee (DGS or SGC).

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List of Acronyms

PBL	Problem – Based Learning
LBL	Lecture – Based Learning
AIP	American Institute of Physics
NSTA	National Science Teacher Association
FEC	Frontier in Education Conference
WRU	Western Reserve University
NSB	National Science Board
USA	United States of America
DUA	Danish University of America
AA	Asia America
NES	New England State
NRC	National Research Council
NSRC	National Science Research Center
EG	Experimental Group
CG	Comparison Group
SC	Student Centered

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Abstract

In the present study among two methods of teaching and learning strategy was done in Meki Preparatory School in Oromia, East Shewa Zone, Dugda Wereda. About 80 sampled students' were taken for the study by lottery draw method and by observing their 2010 E.C first semester physics examination result and taking two classes. The objective of the study was to know which method among student-centered and Lecture based learning if applied is more efficient and appropriate to improve students' performance, attitude and retention. The study was on the physics topics in which both groups were taught the same topic. The experimental group was taught the content through student-centered and the comparison group were taught the content through lecture method. To measure differences between the two groups before and after treatment, pre-test, post-test, and delayed retention-test items were prepared in the form of multiple choice, fill in the blanks space, and short answer questions. The test was aimed to ass's students' prior knowledge, performance, and attitude change and retention capacity in the subject. The data obtained from pre-test, post-test, delayed retention-test, students' attitude response and teachers focused group discussion responses were analyzed using t-test. No significant differences was observed between the two groups on pre-test and retention- test between experimental and comparison groups. From the study, the experimental group students who were taught the content through SC were found to benefit more than the comparison group who were taught the content through LBL. From the research findings, the mean gain of experimental group on post-test was 6.75 and on retention-test was -0.08, whereas the mean gain of control group in post-test was 2.93 and on retention-test was -1.90. The mean gains by the experimental group were statistically more significant as compared to comparison group on post-test and retention-test. The response given through student's attitude response and teacher's focus group discussion response strongly supported the above test result. In general, the researcher recommended that student-centered was more effective and had significant impact on students' performance, attitude and retention of subject matter than traditional lecture method.

Chapter 1 : Introduction

1.1. Background of the study

Physics is considered as the most problematic area within the realm of science, and it a traditionally attracts fewer pupils than chemistry and Biology. It is perceived as a difficult subject for students at all levels and also for adults in post graduate education. It is well known that both high school and college students find physics difficult, and as scientific discipline it is avoided because of the negative perception of the people towards the subject. While the world is developing rapidly through the application of science and technology, there is a problem of diminishing students' interest and attitude in physics at all level of education is a problem to be studied (Fischer and Horstendahal, 1997). The same problem witnessed in Meki preparatory school in Oromia East shoa Zone. Therefore, it is becoming a must that the instructional models of science in general, and physics in particular need to be reformed and improved in such a way that it can attract learners. Gloecker and Adamson (1996) emphasized the role of active teachers, explaining as "facilitators or teachers have the responsibility of updating, customizing, and modifying their curriculum to meet the individual needs of the class room." A legitimately well planed program would require the teachers to have an active role in context setup, inquiry guidance, reflection fostering, standard setting, and attention to individual student needs.

The goal of education is to produce an able, productive, problem solver, work creator, responsible citizen and show positive attitude towards the development. To this end, today in developing countries like Ethiopia, education is considered as a means of development and eradicating poverty. The needs of society are reflected based on the educational objectives of a particular country. In line with this, the Ethiopia education and training policy (1994)and (MOE,2007)formulated the following general objectives; to develop the physical and mental potential and the problem solving capacity of individuals by explaining education in particular and by providing basic education for all, to educate citizens who can take care of and utilize resources wisely, who are trained in various skills by raising the private and social benefits of education, to educate citizens who respect human rights,

stand for the well being of people, as well as for equality, justice and peace, to education citizens to differentiate harmful practices from useful ones; to seek and stand for truth, appreciate aesthetics and show positive attitudes towards the development and dissemination of science and technology, to develop potential of citizens by appropriately relating education to realization of the above listed educational objectives requires effective teaching and learning methodology, Which in turn necessitates the use of effective pedagogical and psychological approaches to meet the demands of the new generation. These helpful approaches should be used to stimulate the creative abilities of today's generation. The traditional approach.(The knowledge transmission approach) may not be suitable for the current generation who lives in a rapidly changing world. This is because the traditional teaching approach makes students passive receiver of facts provided by the teacher. To facilitate effective and useful learning, a methodology that concentrates on active learning, that gives opportunities for active involvement and participation of students as it enables them to develop critical thinking skills need to be implemented. Studies show that secondary school teachers must be able to design instructions and creative science experiences that incorporate students' needs, interest, abilities and result in positive student's Outcome (Athman & Monrocn 2003, Bartosh, 2003). Instruction in science and science education is a process through which teachers enhance learning by matching student characteristic to instruction and assessment. The education quality improvement packages develop by the ministry of education has also under listed the need of implementing these modern methods of class room instructions so as to achieve the intention of producing qualified graduates at all levels (MOE, 2007). It has been suggested that science specialists at the secondary and preparatory school levels may be employed to improve the quality of children's and adult's science learning experiences (Abell, 1990,Jones & Edmunds,2006,Rhoton,et al .,1992).

As can be observed from the result and findings of this study, student centered approach was more effective in generating student interest, sustaining motivation and had an effect on the process of learning as well as on learning outcomes. Different research findings reported that student centered approaches were more effective in promoting student interest, sustaining motivation, and preparing students for clinical interactions with

patients. Through the careful process of coaching and modeling, teachers empower students to become self- directed and independent learners, capable of approaching the kind of complex problems they will face as professionals. Moreover student-centered appears to improve critical thinking, Communication, mutual respect, teamwork, and interpersonal skills and increase student's interest in a course (Achillies and Hoover, 1996). Major and palmer (2001) conclude their review of student cantered literature by station that "students in student unfired instruction often report greater satisfaction with their learning outcome than those in traditional lecture. In an experimental study designed to investigate the effectiveness of students centered among the two groups, students in the student centered group obtained statistically significant higher score in the post –test & delayed rotation test than students in the comparison group.

1.2 Statement of the problem

Many science concepts require difficult thinking changes for students and special instructional techniques to assist and guide students in their learning (Anderson and Roth,1988 ;Carcy ,1985). Physics is one of the subjects that need deep mental work and therefore can be made to fully develop the student's potentials in the subject (Das, 1985). There are clear indications that students punishing interest to study basic sciences in general and physics in particular are a source of concern.

The teacher has long physics teaching experience in secondary and preparatory school. During all these years, the researcher observed that almost all physics teachers use lecture method. However, various research findings consistently have shown that, the traditional lecture method (which does not encourage students to actively participate in the teaching learning process), dominate in schools (Timberlake, 2009).

It can be observed from research result that teaching strategies that enhance student's performance and attitude towards physics such as student centered had not been implemented. Instead the predominant method of teaching in Meki preparatory school was found to be traditional class instructional method. Though, there may be several other external factors contributing to the law performance and lack of interest in learning among

the students, instructional methods might also be one of them. Thus, various teaching methods need to be investigated to study their effect in promoting students' attitude, performance and retention. In this regard therefore, this work was aimed at conducting comparative study to evaluate the effectiveness of student centered as compared to lecture method of instruction interns of promo icy student performance, attitude and retention.

In this regard the researcher initiated to investigate the effect of student centered learning on learner's attitude, performance and retention of physics concepts in general.To this end the researcher need to test the following null hypotheses at the end of the study.

Ho1; There is no significant different between student centered and lecture method in improving grade 11 students, performance and retention.

Ho2; The method of teaching and learning teachers use in Meki preparatory school is through student centered.

Ho3; both student centered and lecture methodologies have the same effect in improving grade 11 students' attitude towards physics.

1.3 .Objective of the study

The main objective of this research is to determine which instructional strategies (student centered and lecture instructional methods) are more effective and efficient to teach physics concepts in terms of improving grade 11 students' performance, attitude and retention.

The specific objectives of this study are;

1. To evaluate the effect of student centered and lecture based instructional strategies on grade 11 students' performance, attitudes and retention in physics concepts.
2. To determine the level of implementation and practice of student centered instructional method in the class in Meki preparatory school to teach physics.
3. To assess the effect of student centered and lecture based instructional methods on grade 11 students' attitudinal change towards physics positively.

1.4. Significance of the study

This study is expected to have the following theoretical & practical contributions for secondary and preparatory school physics teachers and students.

- It is hoped to generate information for physics teachers in Meki preparatory school and other similar secondary schools on how to teach physics using student centered approach.
- The overall body of this research will have an impact on the reader's attention and can benefit them to inherit methods of teaching physics.
- It may benefit and help other investigator to replicate and carry out similar studies.
- The study may help teachers to improve their methods of teaching.

1.5. Scope of the Study

The scope of this study was limited to one preparatory school of Oromia East Shewa Zone, Dugda Wereda. It focused on grade 11 Meki preparatory school students on the effect of student centered and lecture based learning method to comprehend physics.

This study mainly aimed to investigate if there is a certain attitude and performance change developed among students by applying student centered method. It was also aiming to investigate and compare the retention of the student's tough using the two instructional methods.

1.6. Limitation of the study

- Researcher's work load
- Experimental group student's previous experience and knowledge.
- Lack of awareness of teachers on student centered approach.

1.7. Delimitation of the study

1. Grade 11 physics

2. One governmental preparatory school which is found in oromia East shoa zone. From these preparatory schools two intact grades 11 classes for experimental and control group were selected.

1.8. Definition of terms

Student centered learning; - student centered courses focus on the learner rather than the teacher. Student centered teaching is based on the constructive model in which students construct rather than receive or assimilate knowledge. Student centered learning also refers to than knowledge is constructed by students and that the lecture is a facilitator of learning rather than a presenter of information. Rogers (1983) identified the important precondition for student centered learning as the need for,"… a leader or person who is perceived as an authority figure in the situation, is sufficiently secure with in herself (himself) and in her (his) relationship to others that she (he) exertions an essential trust in the capacity of others to think for themselves, to learn for themselves.

Problem –solving :- is a higher order thinking skill developing strategy that ultimately provides learners with the chance of examining and trying out that he/she knows, discover what his/her personal skill for achieving higher performance in group work.

Problem based learning; - problem based learning is the learning that takes place when a small group of students (usually 5-8) work together in a PBL tutorial on a red life ill structured problem. There is usually a student chair person, scribe and reader of the problem. The role of PBL tutor is not teach or give information but rather to facilitate students reasoning through the problem.

Comparison group; - A control is a group to compare to an experimental group in a test of a causal hypothesis. The control and experimental group must be identical in all relevant ways except for the introduction of a suspected causal agent in to the experimental group. The control group is a group that nothing happens too. A control group is the group used for comparison in an experiment. It has the exact some controlled environment, but does not receive this treatment.

The experimental group: - the experimental group is the group that you subject to the variable with which you are experimenting. At the end of the experiment, you test the differences between the comparison group, to whom nothing happened, and the experimental group, which received the variable. The deference (or similarities) between the two groups is how your results are measured. One group receives the treatment that is being tested by the experiment.

Lecture Based learning:-lecturing or large group teaching is one of the oldest forms of teaching; it is traditional face to face teaching process. The joint form of work of lectures and students in the classroom is a lecture, defined by tradition from the 15th century.

As a teaching method lecture is defined by vella(1992) to be a formal presentation of content by an educator (as a subject mother expert)for subsequent learning and recall during examination by student. Ruyle (1995) describe lecture simply as on oral presentation of instructional materials.

Individualistic learning: - This types of learning exists when the learning or achievements of the students is independent and separate from the achievement of the other student in the class (Johansson, 2001).

Whole group Discussion; - Whole group discussion is a modified form of class room lecture where the focus is shared between the instructor and the students for information transfer. Typically, an instructor will stand before a class and present information for the students to learn but the students will also participate by answering question and providing examples.

Chapter 2: Review of related literature

Researcher shows that science and mathematics teaching in the united state is toiling to produce future generations with strong analytic skills (martin, et al 1997, mullis, et al, et al, 1997, mullis, et al, 1998), indicating a need for stronger science teaching in the pre-college years beginning with the pre-kindergarten through sixth grade (NSRC.1997, NRC 2007).Standards for science highlights the necessity for science instruction grounded in children' s real world experience and aligned with community needs and interests, so science learning is consistent with the nature of science (NRC,1996,NRC, 2007) and addresses multicultural perspectives (Banks, 200;NRC 2007)and social justice issues (Barton, et al, 2003,NRC, 2007). Additionally, recent reports emphasize the need to create curricula that integrate creativity and analytical thinking of the United States is to remain competitive in the global economy (NRC, 2007).

Among students in the United States, interest in the study of physics appears to be the lowest of all the, available, introductory high school science courses. Surprisingly same school, do not even offer physical courses. Data collected by the national science Teacher Association the 1985- 1986 school years, (Aldridge, 1987). The total number of students enrolling in physics at this moment is declining from time to time. According to the American institute of physics (AIP) during the year 1986-87, 18% the high school in the united state rarely or never taught physics, (Newschots and covalt, 1988).

2.1. Teaching

2.1.1. Towards Discovery methods

Dewily (1938) and other educators had already emphasized the necessity of teaching science through problems that were relevant to students, using problem solving instructional strategies. Gagne (1965) also agreed that sciences concepts learned through problem solving or student centered were more meaningfully learned. Later report from Greero (1978) showed that when teaching emphasized a discovered oriented problem solving approach, students are likely to achieve greater problem solving skill.

However according to Marey, (2004) strategies like “active learning” developed out of the work of an earlier group of theorists those promoting discovery learning.

2.1.2. Student centered (problem solving) method in classroom.

Same research evidences have shown that explicit teaching of problem solving process is science class improved students problem solving skill, cognitive development and science achievement. Furthermore, cheekily (1997) asserted that the best way to learn science seems to be after learner opportunities to solve challenging problems.

2.2. Essence of learning physics

Physics is the study of matter and natural events based mostly an empirical observations and quantitative measurements. Many technical and basic tools and equipments surroundings us work according to the laws of physics. The result obtained from the scientific research have influenced the developments of other areas in science and these new development have been middy applied to the daily life. Scholars stated that, two important instructional methods (student centered and cooperative learning) to help students achieve a deep, conceptual understanding of the subject and to help them develop the power of problem solving capacity in and out of the class. However, learning the concept of physics may not be easy to comprehend. In most circumstances, students have considerable difficulty in understanding the concept of physics.

2.3. Traditional method of Teaching and learning physics in the classroom.

Teacher dominated class and lecture are same forms of traditional method. Traditional teaching is concerned with the teacher being the controller of the learning environment. Power and responsibilities are held by the teacher and they play the role of instructor (in the form of lectures) decision maker (in regard to curriculum content and specific out corns). Traditional teachers regard students as having “knowledge hole” that need to be filled with information. In short, the traditional teacher views that it is the teacher that

causes learning to occur (Novak, 1998). Learning is chiefly associated with in the class room and is often competitive.

The lesson contents and delivery are considered to be most important and students master knowledge through drill and practice (such as rate learning). Contents need not be learned in context. Few teachers have the line or to motivation to prepare all new materials for class. According to Vella (1992), same points of traditional instructional strategy i-e, lecture were put as follows ; To same scholars today the lecture method becomes the preferred teaching method used by about 87% of science professors. Indeed lecture is a comfortable format for many instructors it is law cost, easy to control, and an excellent method for organizing lesson content. However, every teacher knows that during lecture students are not actively engaged with the topic, they do not listen for very long time, and their retention of concepts is small.

2.4 .Features of problem based learning

Problem based learning by its nature is a student centered which refers to learning opportunities that are relevant to the students, the goals of which are at least partly determined by the students themselves. It serves to teach content by presenting the students with real world challenge similar to the one they must encounter. After a specific amount of content is presented students are tested on their understanding in a variety of ways. The nature of problems in PBL characterized with no right or wrong answer, rather there are a reasonable solutions based on application of knowledge and skill. Problem based learning begins with the assumption that, learning is active, integrated, and constructive process influenced by social and contextual factors (Barrows, 1996; Gijselaers, 1996).

Teachers hope to develop student's interest in the subject matter, emphasize learning as opposed to recall, promote group work, and help students become self directed learners. In this instructional approach learning is "student centered" because the students are given the freedom to study those topics that interest them the most and to determine how they want to study them. Students should identity their own work and their class mates work

(Gallagher and Reynolds, 1997). In addition to emphasizing learning by "doing" problem based learning requires students to be Meta cognitively a ware (Gijselaers, 1996) that is students must learn to be conscious of what information they already know about the problem, what information they need to know to solvate problem and strategies to use solve the problem. Gallagher and Reynolds (1997) also suggests that teachers "give voice to meta cognitive questions" and insert them in to the class room dialogue so that student learn to attend to them, appreciate their utility, and then adopt their use as they become increasingly independent and self directed.

2.5. Student centered learning process in physics class room.

Student centered learning is a learning strategy, and learning process is led by problem solving, arguing, rationalizing, reasoning etc. Student gains knowledge through solving problems given by facilitator.

The process of students centered learning in physics teaching

a. Giving a mini lecture and introducing the question and the problem in brief.
b. Dividing experimental students in to several groups in a class, ordering them discuss the question both in group and individually and suggest a method to solve problem.

2.5.1. Teacher's Role in student centered classroom

The role of teacher in student centered learning classroom is, giving learners more motivation and more feeling of accomplishment, setting the pattern for them to become successful lifelong learners. The faculty in turn produces resourceful, tutors, evaluators who are capable of guiding the students in their problem solving effect. Teachers assume the role of cognitive and Meta cognitive coach rather than knowledge holder. Teachers design an ill-structured problems based on desired curriculum outcomes, learner characteristics, and compelling, problematic situations, from the real world. Teacher's model and coach in supporting and making explicit students' learning processes (sage and Torp, 1997). The teacher is not passive during students learning but neither does he take

the traditional role. Teacher's role can be to model different kinds of problem solving strategies. Problem based learning programs may need facilitators, program designers and developers, and evaluation and measurement experts. Since the planning and application of student- centered learning may take extra time, teachers may have to spend more time on possible projects and working groups. Teachers may want to ensure that students understood the important points of the subject and most topics are touched up on. A part from scenarios, the most crucial element affecting the success of an active learning program is the facilitator's guiding skills, knowledge, and abilities (Jones, 2008).Facilitation is so significant in active learning that the teachers in active learning that the teachers in active learning is often referred to as a "facilitator". Facilitator skills include competences such as facilitation of small active learning group, an understanding of overall active learning process so that motivation students toward the objectives of the programs, establishing an effective communication with students, and creating a warm, open and safe atmosphere (Jone, 2008). The essential factor motivating student centered learning; i-e active learning approach is the opportunity to motivate students by allowing them to participate actively in the learning process. However, being a good facilitator of the program or designer is very different than wanting to be a facilitator of active learning. Planning, developing, and applying group work require teacher's dedication and require time.

2.5.2. Learner Role in Student Centered Classroom.

In student centered learning classroom, students role changes from passive knowledge receivers to active learners' and teachers' role changes from knowledge transmitter to facilitators in the learning process and assumes increasing responsibility for their learning. Students assume the role of the active problem solvers, discussion makers, and meaning makers rather than passive listeners. Students construct their own understanding and knowledge of the world, through experiencing things and reflecting on role experiences. They will be asked to develop and write out the problem statement in their own words and list down the possible solutions in a group or individually. In this method, learners are actively involved in their learning. Therefore, they are not considered as "blank slate". It is

rather be leaved that they are responsible and can play active role in their own learning. Temechegn (2002) has also remarked that learner centered method capitalized on individual difference. It recognized the different learning styles of students, which also demands the implementation of various active learning strategies.

According to Bon well and Eison (2003), students must do more than just listen. They must read, write discuss or be engaged in solving problem. Most important, to be actively involved students must engage in such higher order thinking tasks as analysis, synthesis and evaluation. In this method, therefore learning by doing is emphasized which leads to student learning. This may show that students learning depend on what they do. In general most learning is not the result of interaction. It is rather the result unhampered participation in a meaning full setting. Generally in order to make teaching learning process active and passive solving character, Students can use it, connect it to their day –to-day life, or actively participate in it. In this regard, learning facts alone is not enough to prepare students to understand and participate in complex world. The methodology of teaching and learning must design in that way, as to prepare students to solve problems and to use information from their environment and other sources to make a better life for themselves, their families and their communities. In any case, they are active creators of their own knowledge. To do this, they must ask question, explore, and asses what they know. They are responsible for all of their learning (Good nough and Cahsion, 2003).

2.6. Research Findings on student centered Active learning.

Johnson and Johnson (1989) have found that student centered (active learning) instructions seem to motivate students to form closer relationship with one another in working together. Each student centered group not only scored high marks academically, but they also gained same social skills through cooperative work on the other hand, students in the teacher centered classroom did not spend as much time working cooperatively and thus hood less of working relationship with one another. Schmidt (1993) conducted research found that the facilitators' process facilitation skills also affected student achievement in a significant way, there by leading to conclusion that subject matter

expertise and facilitation skills are both necessary conditions for effectiveness of problem based learning environments. Thus, after decades of research on teaching and learning strategy, the effectiveness of student centered learning has been clearly documented. However, in the institution of higher learning there have been challenges to incorporate the new model of active learning in to their classrooms. Thus, same have embraced this approach to instruction with enthusiasm whole others seem more cautious in moving towards adoption. In either case, active learning occurs in on environment where the student is at the centered and the instruction is student centered. On the other hand passive learning occurs in setting where the teacher is the focus, described as teacher centered instruction. In the teacher centered (passive learning) approach the teacher becomes the manager of the classroom with learning process heavily development up on the pronouncement and enforcement of rules. But practically, most cognitive psychologists and educators agree that instruction is effective when students are encouraged to become actively involved in their own learning. Besides, an allowance of time must be made for. Meaningful open interaction between students and teacher and group of students that nurture the student's natural curiosity. Finally through some have unitized the effectiveness of problem solving method, more studies show the true effectiveness of problem based learning on academic achievement and classroom participation.

2.7. Cooperative learning

Cooperative learning is one of the most remarkable and fir tile area of theory, research, and practice in education. Cooperative learning occurs when students work collaboratively together towards a common goal to accomplish a shared learning goal (Jonson, and Jonson, 1990). Achievements are positively correlated with the other cooperative students. Students work to gather in small classes or groups. Groups may reflect and discuss how well they function as a unit and how effective their working relationships are. Each student can then achieve his or her learning goal. During the past few years, researchers who have observed that students achievement in science are less than desired, have began to focus on the factors that affect students understanding and learning of scientific conceptions. Bodner (1986) indicated that the most important factor that affect learning in the students'

exiting conceptions. He stated also that learning is a cognitive process and occurs by construction of knowledge in the mind of the learner. Students can develop scientifically in correct conceptions during this process and these conceptions co diversity influence subsequent learning (Garnett et al -- ,1995 Jonassen 1991, Resnick, 1983)Is a small group of learners working together as teams to solve a problem complete a task or accomplished a common goal (Artz and Newman, 1990)? On the other hand class organizations. Such as cooperation learning for increasing students active involvement in learning activities and having students take more responsibility for managing their own instruction, thus allowing the teacher more opportunities to have academic interactions' with individuals and small groups.

2.8. Cognitive and Behavioral Readiness of learners for active learning Environment in the classroom.

According to Mayer (2004) strategies like "active learning'' developed out of the work of earlier group theorists those promoting discovered learning. While there is no question that learners should be engaged during learning and cognitively active, several researchers have noted that being behaviorally active during initial learning can be deter mental to knowledge acquisition (Mayer,2004, kirschner,et-,2006). He also suggested that, learners should be behaviorally and cognitively active during learning.

2.9. Learner's Attitude and academic performance.

Attitude can be acquired through learning and can be changed through pervasion using variety of techniques. Although attitude changes gradually, learners constantly form new attitudes and modify old ones when they are exposed to new information and new experiences (Adesina and Akinbobola, 2005). Gagna (1979) defines attitudes as an internal state that influences the personal actions of an individual. He recognized attitude as a major factor that affects learner's academic achievement. Alas (1990) showed that there is positive correlation between attitude and performance in the science subjects. Moreover, in order to bring a positive attitude towards the subject, using the appropriate teaching strategy is one of the most important issues.

2.10. Lecture method

Lecture methods is one of the oldest forms of teaching, it is traditional face to face teaching process. As teaching method lecture is defined by vella (1992) to be a formal presentation of content by an educator (as a subject matter exert) for subsequent learning and recall during examinations by students. Ruyle (1995) describes lecture simply as an oral presentation of instructional material. Although same educators consider the lecture method outdated and ineffective, it offers several advantages and reasons for its continued use. According to Adist (2002), same points of traditional lecture method were discussed as follows ,today the lecture system is the preferred teaching styles using by 80% of science professors (Time berlake, 2009).Indeed, lecture is a comfortable format for many instructors and a non- treating one for students. It is a law cost, easy to control, and an excellent method for organizing course content. However, every teacher knows that during lecture students are not actively engaged with the topic, they don't listen for very long time, and their retention of concepts is minimal.

The lecture is placed at the centered of instruction and is thought to hold most of the knowledge necessary for students to be successful. This implicit that the lecture assumes responsibility for students learning. The lecture centered approaches use sequenced and structured materials. It refers to teaching activities where goals are clear to students, time allocated for instruction is sufficient and continuous, coverage of content is extensive, and the performance of students monitored and feed back to students is immediate. The lecture method usually is one way communication and allows for little or none audience participation. The result is audience misunderstanding, loss of information and poor retention. Some presenters prefer one-way communication methods, such as lecturing, become they can transmit large amount of information to audience in a short period of time. Presenters find lecture efficient because the flow of information can be directed and controlled with great or precision. Listeners find it difficult to figure out where the speaker is going and to focus at tension unless they are provided a road map for lecture. The audience has little or no opportunity to get involved or provided feedback on the messages being communicated.

2.11. Advantage of the lecture method

1. The teacher controls the topic, aims, content, organization, sequence, and rate.
2. The lecture can be used to motivate and increase interest, to clarify and explain, to expand and bring in information not available to the students, and to review.
3. Other media and demonstrations can be easily combined with the lecture
4. The lecture can be easily revised and updated.
5. The lecture can serve as a model in showing how to deal with the issue and problems.

2.12. Disadvantage of the lecture method

1. It is difficult to maintain student interest and attentions for a full hour of lecture.
2. The communication is mostly one-way communication from the teacher to the students.
3. Most students have not, learned to take good notes.
4. Same of students may already know the content of the lecture while same may not be ready for the lecture.
5. Lecture information is forgotten quickly, during and after the lecture.
6. There is no immediate and direct check and feed back of whether learning has taken place.
7. The lecture method encourages student depends on the teacher.

2.13. Comparison of student centered learning and lecture based learning

Evidence show that student centered learning is more effective than conventional approaches in developing greater student motivation, breadth of interest, learning satisfaction, confidence with clinical functional, knowledge acquisition, use of variety of learning resources and self directed work (Ramp, 1999), student centered learning has variety of ways in which it can be implemented. The traditional lecture based method is intrinsically not conductive to learning unless augmented by activities which involve students directly, and which give them opportunity to a quire the necessary knowledge by after means besides passive listening. This active learning is, to a large extent, what student

do in a problem, based learning environment. Farther more, the summative assessment method used in the lecture based approach of teaching encouraged subject learning due to the significant importance given to student's performance in the final examination. In this environment, most students tend to waste their time during the semester and cram the material of the entire syllabus in to a single night's study just before the final examination. Obviously, this study style does not allow for any fruitful thinking.

2.14. What characterized problem based learning?

To Duch (1996) the following are characteristics of problem based learning.

- ✓ The problem is an ill- structured one
- ✓ Performance assessment completes the problem for instance, assessment can be thought
- ✓ keeping of journal throughout the project.
- ✓ The formulation of problems must come from key curricular issues.
- ✓ Teacher becomes facilitators letting the students make their own decision
- ✓ Students are not told how to solve the problem; they are only give guidelines for approaching the problems and must search for needed information. The requirement for problem based learning is, however enormous but realizable. Here training of teachers is central to the development of this approach (Barrows, 1996). There must be consultants or resource faculty. Problem simulation is also a key curricular requirement. Learning resources should be available to students. There must also be flexible time to be scheduling. Barrows (1996) even suggests that there should be no curricular schedules except for initial orientation, weekly meetings, and examinations, what even the involvement, the justification for such according to science education, is that of meaningfulness and a work while endeavor.

2.15. Advantage of student centered learning

- ✓ This model enables students to see events multidimensional and with a deeper perspective.
- ✓ It develops student's problem solving skills.

- ✓ This learning model develops self- control in students. It teachers making plans prospectively, facing realities and expressing emotions.
- ✓ It encourages students to learn new material and concepts when solving problem.
- ✓ It develops sociability levels and communication skills of students by enabling them to study and work in a team.
- ✓ It develops student's high level of thinking and scientific thinking skills.
- ✓ It unites theory and practice. It allows student both to merge their old knowledge and to develop their judging skills in a specific discipline environment.
- ✓ Students acquire the skills of time management, focusing on clue points, data collection and report preparation.
- ✓ It motivates learning for both teachers and students.

2.16. Barriers to student centered learning.

To effectively implement student centered learning, teachers must adopt new roles that are frequently different from those of their past. In lecture based learning, the teacher is in control of and is the "export" dispensing knowledge. In student centered learning, the teacher select the problem, presents it to the students and then provides direction for student's inquiry.

Another factor inhibiting change was noted by Albion and Gibson (2000) in teacher education programs.

Another barriers to student centered learning is the lack of prepared materials for classroom instruction. Few training materials are available. Present curriculum guides and text books do not contain the variety of sample problems or assessment tools needed to support this methodology broad scale.

Chapter 3: Research methodology

This chapter presents description of the study area, research design population of the study, source of data, sampling technique, procedure of data collection, instruments for data collection and methods of data analysis.

3.1. Description of the study area

The study was conducted of Meki preparatory school found in Oromia, East Shewa zone (Meki), which is located about 131km from Addis Ababa.

3.2. Research Design

Bless and Higson smith (1995) reported that research design is the specification of the most adequate operations to be performed in order to answer the research questions under a given condition. The design of the research was experimental research involving two equivalent groups. Experimental and comparison group were used to conduct the research. In this proposed experimental research the experimental group was treated with a student-centered learning, which sought to stimulate the students to examine the content those topics by themselves with the researcher acting as a guide and facilitator. The comparison group reserved the lecture method. To investigate effectiveness of student-centered learning in terms of performance, attitude, and retention, a comparative study was carried out using physics contents. To reduce the effect of other uncontrollable variables, both groups were thought by a researcher only. Finally, immediately after content teaching time completed, a post- test was given to both groups. And about one month later a delayed relation test was administered to examine rotation of ideas.

3.3. Population of the study

There were four grade 11 sections in the school whose total capacity of the students in each class was ranging from 40-45. Population of the study the four grades 11 sections students and physics teachers in Meki preparatory school. Research sample were taken

from the four grade 11 sections. The intended study was carried out on grade 11 students Meki preparatory school in Oromia East shoa Zone.

3.4. Source of Data

In order to gather relevant information a reliable and primary data source were used. The main Source of data were two selected grade 11 class students, three physics teachers, pre-test, past-test, retention –test, students attitude response and teachers focus group discussion response respectively.

3.5. Sampling Technique and sample size

According to the statement of Bless and Hison smith (1995), sampling is a technical device to rationalize the collection of information, to choose an appropriate way of the restricted variables of things person and events. Thus, the present study was conducted on Meki preparatory school. From the four grades 11 classes two classes were randomly taken by using lottery draw method and by observing 2018 first semester physics examination result. From independent samples t-test data analysis of the four class's first semester physics final examination the mean 50.35, 50.10, 50.07 and 51.40 were observed by independent sample t-test data analysis respectively (table 1). As can be seen from an independent sample t-test data analysis there is no significant different at (α=0.05) level of confidence and p >0.05 between the four classes first semester physics examination mean result. In case since their mean results were almost similar the researcher taken two intact classes each of capacity of 40 comparison and 40 experimental group students.

Table 1: Two tailed independent samples t-test of four class student' first semester physics final examination result

Class	N	Mean	S D	MD	t-value	p-value	df
11A	40	50.35	9.588	0.250	0.120	0.906	78
11B	40	50.10	9.106	0.250			
11C	40	50.07	6.743	1.327	0.926	0.357	78
11D	40	51.40	6.134	1.327			

N=total No of students, SD =standard deviation, MD =mean difference t= test, p=probability, df = Degree of freedom

3.6. Procedure and Instrument of data collection

3.6.1. Procedure of data collection

The researcher strived to get the relevant and reliable data. The content was taught by the researcher himself. To teach the content in physics the researcher used two month (8weeks) about 32 periods. As mentioned before, there were two groups, comparison and experimental groups for the experimental group, contents were delivered through students centered learning method. In the case of comparison group, the researcher employed the program through traditional lecture method. Both groups were treated in different classes until research data collecting time was completed.

The experimental Group

Before starting teaching the contents, the researcher divided the hand the researcher give a mini lecture and brain storming concerning how to learn the designed contents and then introduced the questions, term and problem selected from students text book and other reference books on physics and the theory needed to resolve the problem in brief. Experimental group students were grouped in to 9 each were containing 4-5 members. The group members remained the same until research data collecting time was completed. Before Students in their respective group discussed on the given questions and problems, they asked each other the meaning and how they could solve the given problems. Experimental group students learn concepts in each activity when they practiced the problems and questions as asserted by chekley (1997) that the best way to learn and teach science is to after learner's opportunities to solve challenging problems.

The researcher was facilitated learning, organized the learning contents for each period rather than being source of solution in the program and encouraged experimental group students towards things and reasoning through the given activities and problem.

Students were organized in groups of nine to carry out initial analysis of the problem, with guidance in process but with no content knowledge instruction from the researcher these

were instructed to ask each other how they got the answer to the given problems and activities. Finally, the group showed and reported their findings and solutions, communicated information as required by the problem with conclusion to the researcher.

The comparison group

The comparison group was taught the same content with traditional lecture method by the researcher only. In this case the researcher prepared notes and definitions' of same physics forms and come to the class and explained, discussed, derived different formula and finally this group was given summery note. Students followed, listened, wrote the note and they asked what was not clear to them. Immediately after the teaching and research data collecting time of both groups were completed, a post-test was given, and after a delay of one month, a delayed retention-test was administered to both groups to examine and measure their retention capacity in the physics content.

3.6.2. Instruments for Data collection

Both qualitative and quantitative primary data were collected. As mentioned above on the allotted periods, the study was conducted for about eight weeks. In order to collect the required data for this study five types of data collecting tools namely pre-test; post-test, delayed retention test students' response and teacher focus group discussion were used.

In this regard the researcher employed the following tools to collect reliable data.

Post –test administration:-The question items were constructed by the researcher and the physics department of Adma Science and Technology University by considering a review of related literature for content validity. The test was 10 multiple choice items, 5 fill in the black space items & 5 short answer structures. The researcher corrected the test papers of both experimental and comparison groups and recorded the result in prepared mark list of each individual sampled student of both groups.

Delayed retention test;- It is research instrument which is administered two or more weeks after instruction and initial testing to measure retained knowledge. For retention test also10 multiple choice, 5 fill in the blank space items and 5 short answer structures

were prepared by the researcher together with physics teachers. The delayed retention test results were the only data analyzed in the experimental portion of this investigation.

Student's response: - this is aimed to explore student's opinion and the perception they have on physics teaching and learning methodology, performance and attitude towards physics.

Teachers focus group discussion: - the focus group discussion was conducted with teachers often treatment. The focus group discussion was conducted among two teachers. There were seven semi- structured questions designed for focus group discussion concerning methodologies of teaching physics in the class room in relation to physics education.

3.7. Method of Data Analysis

The goal of data analysis was to summarize, describe and extract the required result or information as accurately as possible. The collected data were analyzed, described and interpreted by subjecting to both descriptive and inferential statistics.

The mean gains of achievement scores which were treated under the comparison and experimental groups were compared. The significance of the mean and difference b/n the two groups was checked by using **spss 15** for window evaluation version.

Comparison analysis was also employed taking the learning gains, using students centered and lecture based. Learning method of the current student scores. The data from students' response, pre-test, post-test and delayed retention –test of both groups were organized and interpreted using statistical package for social science, spss for window evaluation version statistical package. Finally, the result of the interpretation was discussed, summarized and concluded to give recommendations.

3.8. Ethical considerations

Researcher ethics refers to be type's agreements that the researcher enters in to with his or her research participants. More even he or she has to reach an agreement with them on the objective and purpose of collected data, and how its analysis will be reported and disseminated. To bell (2004), the conditions for ethical research in practice are that all participants are offered for opportunity to remain anonymous; all other information is treated with strict confidentiality. For this study, ethical codes in terms of data collection data analysis and diffusion of findings are conformed. In this regard, the researcher contacted the school principal personally in order to seek prior permission, to administer the five research data collecting instruments. Adequate information all the aims of the research, the procedure to be followed and the use of the result were given to each participant. The participants were given full assurance that the findings of the study would be used strictly for academic purposes.

Chapter 4: Results and discussion

In this section the result of the three tests and the responses obtained from sample students and teachers from the subject of this study based on the research hypothesis and objectives were analyzed and interpreted.

4.1. Background information of respondents

Participants of this study were two grade 11 class students and teachers.

Table 2: Background information of students

No	Age	Experiment group			Comparison group		
		M	F	T	M	F	T
1	15-22	22	18	40	21	19	40

M=Male, F=female, T= total

Table 1 describes the total number of experimental and composition group's students. It is also includes the gender distribution & age range.

Table 3: Background information of teachers

Teachers	Gender	Age	Qualification	Service year
1	M	40	Degree	18
2	M	27	Degree	6
3	M	33	Degree	12

Table 3 above describes the number, age, sex question and service year of teachers.

4.2. The pre-test, post test and delayed rotation test results of students.

4.2.1. The pre- test results

The pre-test result of grade 11 sample students were analyzed and interpreted as shown below. The statistical different between the experimental and comparison group student are shown Table 4

Table 4: Two tailed independent samples t-test on pre –test results of EG & CG students

Group	N	Means	SD	MD	t-value	p-value	Df
EG	40	7.18	2.11	0.125	0.240	0.811	78
CG	40	7.05	2.52				

EG=Experimental group, CG=Comparison group, N=total number of students,

SD=Standard deviation, MD=Mean difference, t=test, p=probability df =degree of freedom.

One can see clearly from Table 4 the mean score results and an independent samples t-test at (α =0.05 level of confidence) confirm that there is no significant difference observed between experimental and comparison group students. Therefore, from this it is possible to conclude that the groups used in the study exhibited comparable characteristics. The groups were therefore suitable for the study when comparing the effects of teaching through problem based and lecture method on performance and attitude change in physics. Independent sample t-test result analysis showed that the mean result on the pre test was interpreted as follows. The mean result for the experimental group was found to be 7.18, standard division 2.11 and that of comparison group was found to be 7.05, standard division 2.52 at t-value of 0.240. This show that student had no prior knowledge differences on physics therefore, from these results it is possible to conclude that the groups used in the study exhibited similar background knowledge on physics.

4.2.2 The post –test results

Differences in performance between experimental group students who completed learning contents in physics through student- centered & comparison group students who

completed learning the contents through traditional lecture method were analyzed and interpreted by using a t-test. The t-test statistical analysis (α=0.05 level of confidence) states that there is highly significant different observed between experimental group students and comparison group students on the post test results.

Table 5: Two tailed independent sample t-test result on post -test of EG & CG students.

Group	N	Mean	SD	MD	t-value	p-value	Df
EG	40	13.93	2.44	3.95	5.848	0.000	78
CG	40	9.98	3.50				

EG=experimental group, CG= Comparison group, N= total number of students,
SD=Standard division, MD= mean difference, t=test, p= probability, df= degree of freedom.

One can see clearly from table 5 that the experimental group students scored better results in post –test more than the compassion group students. This result revealed that teaching through student centered is more effective for enhancing student's performance & retention of subject matter than traditional lecture method.

4.2.3. Delayed retention test results

The t-test statistical analysis confirm that, there is also significant difference observed between experimental group and comparison group students can the delayed retention test results. Besides, the mean results of the two groups exhibited there is a significant difference observed between two group students on delayed retention test examination score.

Table 6: Two tailed independent sample to t-test retention test results.

Group	N	Mean	SD	MD	t-value	p-value	Df
EG	40	13.85	2.52	5.77	4.69	0.001	78
CG	40	8.08	3.32				

EG=experimental group, CG, Comparison group, N= total number of students, SD=Standard division, MD mean difference, t-test, p= probability, df= degree of freedom.

One can see clearly from table 6 that the experimental group student's score better result, in delayed retention test than control group students. This result revealed that teaching by student centered is more effective for enhancing student's performance and attitude than traditional lecture method. The standard deviation of scores of experimental group students depicts that the gap between each score is small where as in the case of comparison group the interval between each score is for a part.

4.2.4. The mean gain between pre-test and post- test of experimental group and comparison group students.

A comparison analysis was also made by taking the learning gains obtained using student centered and traditional lecture method. The mean gain in this case is the difference between post –test result and pre-test results of students. Table 7 depicted that the mean achievement score of experimental group in the pre-test is 7.18, while it is 13.93 in post test providing a mean gain score of 6.75 on the other hand, the mean achievement results of comparison group are 7.05 on the pre-test and it is 9.98 on the post –test providing a mean gain result of 2.93. The difference in mean gain results of the students describes that the experimental group students have actually gained better result than those in comparison group. This result signifies that student centered is more effective in teaching – learning physics than traditional lecture method.

Table 7: the mean gain between pr-test and post test results

Mean			
Group	Pre –test	Post –test	The mean gain
EG	7.18	13.93	6.75
CG	7.05	9.98	2.93

EG=Experimental group CG=Comparison group

4.2.5. The mean gain between post –test and retention- test of experimental group and comparison group students.

A comparison analysis was made by taking the learning gains obtained using student-centered and traditional lecture method .In this case the mean gain is the difference b/n delayed retention test result and post –test result of students. Table 8 below shows that the mean achievement score of experimental group on the post test is 13.93 while it is 13.85 in retention test providing a mean gain result of -0.08. On the other hand, the mean achievement score of the comparison group is 9.98 on the post test and it is 8.08 on the delayed retention test providing a mean gain score of -1.90. The difference in mean gain score describe that the experimental group students a gain have actually gained better score than those in comparison group. This significant result indicates that student-centered based learning is more effective in teaching learning than traditional lecture method.

Table 8: the mean gain between post test and retention test results.

Mean			
Group	Post –test	Retention –test	The mean gain
EG	13.93	13.85	-0.08
CG	9.98	8.08	-1.90

EG=Experimental group CG=Comparison group

4.3. Students response

4.3.1. Percentage distribution of experimental and comparison groups

To investigate students opinion and perception on the methodology of teaching and learning in physics at Meki preparatory school, response question with 7 items were administered with a five liker scales, 5=always, 4= frequently, 3=sometimes, 2=rarely & 1=not at all, for both groups, percentage distribution analysis were performed to compare learner's perception and opinion by applying concepts in physics and its significance

difference was tested using an independent samples t-test. The responses of the two groups are given in Table 9

Table 9: percentage distributions of responses of students regarding to response question items

	Number of respondents showing the alternatives					
No	Group	5	4	3	2	1
		%	%	%	%	%
1	CG	15	17.5	12.5	32.5	22.5
	EG	12.5	30	35	12.5	10
2	CG	15	15	17.5	27.5	25
	EG	12.5	20	20	30	17.5
3	CG	22.5	20	25	17.5	15
	EG	40	22.5	17.5	12.5	7.5
4	CG	5	20	22.5	20	32.5
	EG	10	7.5	17.5	10	55
5	CG	20	32.5	22.5	10	15
	EG	22.5	22.5	20	20	15
6	CG	12.5	15	17.5	25	30
	EG	25	25	25	12.5	12.5
7	CG	30	15	27.5	15	12.5
	EG	35	22.5	30	7.5	5

5=Always, 4= frequently, 3=sometimes, 2= rarely, 1=not at all

4.3.2. Interpretation of table 9 regarding to comparison and experimental group student's response question items.

From the above Table 9 concerning response of item No 1 one can see that, majority of comparison group students about 55% "do not participate in physics class discussion," where as majority of experimental group students about 42.5% "participate in physics class discussion,"

Concerning item No 2 Table 9 that majority of both groups that is about 52.5% of comparison group and about 47.5% of experimental group "do not study physics".

Table 9 on item No 3 shows that, majority of comparison group students about 42.5% and majority of experimental group students about 62.5% "have a good feeling and attitude towards physics."

In Table 9 above concerning item No 4 one can generalize that majority of comparison group students about 52.5% and majority of experimental group students about 65% "do not score a good result in physics."

The above table 9 on item No 5 depicts that, majority of comparison group students about 52.5% and majority of experimental group students about 45% both agreed on a common idea that "physics is always a difficult subject"

From Table 9 concerning item No 6 one can see that, majority of comparison group students about 55% "don't motivated at all by the method of teaching and learning physics in the class but majority of experimental group students about 50% always motivated by the method of teaching and learning physics in the class."

One can observe in Table 9 above on item No.7 majority of comparison group students about 45% and majority of experimental group students about 57.5% "always approach physics with hesitation"

4.4. Teachers Focus group Discussion

It is argued that the focus group discussion approach produces a wealth of detailed information allowing the researcher to gain insight about thought of individuals (Patton, 1990). Similarly, this is to mean that it is technique provides a means for in depth study without the categorization constraints of quantities survey. The focus group discussion would be conducted among three physics teachers, T_1,T_2 & T_3 respectively.

There are about 5 question prepared for the teachers to explore their opinion and perceptions concerning which method of teaching and learning of physics teachers use is more effective and efficient to improve students' performance, interest and retention of the lesson and what possible factors are affecting and learning physics. For the 5 question, the three teachers were asked and discussed together with the researcher on issues and give their qualitative responses by writing their perception and opinion on the prepared blank spaces, Below are the 5 focus group discursion question items and the teacher's qualitative responses.

1. Which method of teaching and learning among student-centered and lecture do you suggest is better to teach physics in the class?

For the discussion question No 1 the three teachers' give their opinion as follows to teach physics in the class student centered is better and effective. Because, it encourages learners towards active participation in learning, it helps students towards acquire knowledge of problem solving ability, it leads student towards creative mind and practical work.

But in lecture method, students are failing to grasp the concepts of the lesson, they become passive fewer participants and their performance is less and they become passive rather than sharing their ideas .Therefore, all three teachers' agreed on student centered method of teaching and learning than lecture method.

2. What mechanism do you use to actively participate your students when you teach physics in the class and how do you improve your students performance?

For the discussion question item No 2 the three teacher's give their response as follows To actively participate students and improve their performance, it is better to teach students through problem solving, activity, using student centered method, ordering students to do problems on the board, organizing students in group and giving different exercise and activity in their group, using continuous assessment, developing sense/culture/of competition among the groups, allowing students to explain their ideas freely in their group and do the given problem on the board.

3. In what way if students learn physics that their attitude and interest in physics change?

For the discussion question item No 3 the three teachers give their perception as follows. To teach physics and change (or bring) students interest towards physics is by using student centered and active learning approach, using activity based and practice based teaching and learning, giving chance for the students to share their ideas among their group members, creating a competitive environment among the groups.

4. What is the predominant method of teaching and learning in Meki preparatory School?

For this discussion question item No 4 the three teachers give their opinion follows. The predominant of teaching and learning all teachers use in meki preparatory school is traditional teachers dominated class method of teaching and learning, same times both lecture and student centered method but mostly it is the lecture method used by most teachers.

5. Which of the following methods do you use most and frequently in the class to teach your students? For this all three teachers give their following responses.

A/ Lecture B/ demonstration C/ Student centered D/ explanation with note giving
T_1 Answer A, T_2 Answer D, T_3 Answer A
From items 5 teachers' response, one can see that most of physics teacher's at Meki Preparatory School use traditional lecture method of teaching and learning in the class.

In general with teacher's focus group discussion responses of the above 5 question item. Majority of the teacher's agreed on the student centered method of teaching and using active learning approach is more effective and efficient method to teach physics.

4.5. The research question to be tested by a null hypothesis concerning student-centered and lecture methodologies on teaching experimental and comparison group students.

1. The first null hypotheses were “there is no significant difference between student-centered and lecture in improving grade 11 students performance and retention.” For these null hypotheses, strong significance difference between experimental and comparison groups was observed. The experimental group students who thought, student-centered were observed to exhibit high performance and retention of the contents than the comparison group students who thought the content through lecture.
2. The second null hypotheses was ”the method of teaching and learning teachers use in Meki preparatory School is through student centered.” For these null hypotheses the method of teaching physics teachers in Meki preparatory School was teacher – dominated class method.
3. The third null hypotheses was “both student centered and lecture methodologies have the same effect in improving grade 11 students attitude towards physics”

For the third null hypotheses a significance difference between the experimental and comparison group’s students was observed on their attitude towards physics.

The experimental group students were showed significant attitudinal charge towards physics.

Chapter 5: Summary, conclusion and recommendations.

5.1. Summary

This thesis research is organized in to (5) five chapters chapter 1 focuses mainly on starting a brief background of the study concerning the topic. It states and introduces the problem, research hypothesis, objectives, significance and scope of the study. Chapter 2 includes an internationally published review of related literatures, which are used to support the development of the research body and to address what often scholars have written about the effect of problem based on lecture based on learners' attitude, performance and retention. The research design, study area, population of the study, source of data, sampling techniques, instrument for data collection and method of data analysis all discussed under chapter 3.The most important research instruments used in the research study were; a pre-test, post test, delayed retention –test, students question response and teachers, focus group discussion.

Reduced interest and poor performance of learners towards physics in all levels is becoming a timely burning issue in the teaching and learning process. An efficient and enjoyable instruction in physics concepts calls for a modified delivery approach and is a determinant factor for learner's attitude and performance change. This can be done either by modifying the existing learning strategies or by applying new strategies. In this study lecture method was compared with student centered learning method to investigate which of the two methods of teaching and learning methods improved performances of students and helped them to develop positive attitudes in contents in physics. For conducting the research, two classes, of capacity of 40 students each were selected based on lottery drawn method and 2018 their first semester physics examination results.

Two methods of instructions (SC & LBL) were tested in this study. Comparison between the two groups was made using post and retention test, student's attitudes and teacher focus group discussion responses were also investigated. Data analysis using an independent

sample t- test at (α=0.05) level revealed that student-centered instructional method was found to be more effective and efficient in improving grade 11 students' physics performance and retention than traditional lecture method. Therefore student –centered method found to be the most suitable method at secondary and preparatory levels for teaching physics.

To evaluate student's interest in assisting and participating learner's activity, attitude question item were employed to the students as instrument of data gathering. Students attitude were tested through null hypothesis. In addition, the qualitative information of teachers' focus group question items responses explored.

5.2. Conclusions

Report on the outcomes of the analysis the study was presented under chapter 4. The analyzed post-test and delayed retention test result in chapter 4 Table 5 Through Table 8 shows that there was significant mean differences between experimental group who learn the content through student-centered learning and comparison group who learn the content through lecture based learning method. The mean gain for experimental group were 6.75 and 0.08 while the mean gains for control group were 2.93 and -1.90, and it is significant at $p<0.05$. The results found from the data collected through post –test and delayed retention –tests are the major indicators of the significance difference between student- centered and lecture teaching and learning.

This result observed from post –test and retention test indicated in Table 5 and Table 6 revealed that teaching though student-centered is more effective and efficient for enhancing students' performance and retention of subject matter than traditional lecture method. The difference in mean gain results of the students indicated in Table 7 & Table 8 describe that the experimental group students have actually gained better result than those in comparison group. This result signifies that student-centered is more effective and interesting in teaching-learning physics than traditional lecture method.

5.3. Recommendations

Based on the research findings, the researcher recommends the following points for the concerned bodies.

1. It is better for physics teachers to select and use a suitable teaching method like student-centered, project based learning, problem solving strategies, to high light the main points, to make obstruct and complex concepts visible, and to help students stabilize the lesson by peer or group discussion and student independent work.
2. While designing the practical course, prior consideration should be made to facilitate practical experiences and modern practical teaching method.
3. Teacher's on the job should update themselves with innovative techniques or method of teaching like student-centered learning on how to popularize in the school.
4. Physics content should be designed in line with competency based, student-centered and active –learning teaching and learning approach.
5. The students should develop a positive attitude and high interactive involvement in group discussion, cooperative learning and problem solving activities.
6. Teachers shall have ability of preparing a competency based teaching and learning method and a skill of coordination and facilitating the classroom.
7. Text books need to be rewritten in such a way that they help or guide the teachers in their facilitation of competence based teaching and learning and student centered teaching and learning approach.
8. Physics teachers shall be always ready to cheek their delivery approach from time to time and search the existing problem and find solution and use the better one in sense of active learning strategy.
9. The students should develop a habit of group work.
10. It is hoped that, this study will benefits Meki preparatory school and other secondary, primary school teachers, primary, secondary & preparatory school departments head, school principals and woreda education offices.

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Appendices

Appendix I

Pre – test exam. For both experimental and comparison research groups of grade 11 Meki preparatory school to measure conceptual understanding (2010EC.). Time allowed is: 40min

This test consists of three types: a/ multiple choice items b/ Fill in the blank space items and c/ give short answer items

PART: I. Multiple Choice Items.

Read the following multiple choice questions carefully and write the letter of the correct Answer" on the space provided.

1/ If $\vec{A}$ = 6î-8ĵ units $\vec{B}$ = -8î-3ĵ units, and $\vec{C}$=26î+19ĵ units determine a and b such that a$\vec{A}$+b$\vec{B}$ + $\vec{C}$ = 0 A/ a=1 and b= 0.5 B/ 0.2 and b= 0.3 C/ a=2 and b= 0.1 D/ a=0.9 and b= 3.9

2/ If $\vec{A} - \vec{B}$ =2$\vec{C}$, $\vec{A} + \vec{B}$ =4$\vec{C}$ and $\vec{C}$ = 3î+4ĵ, then what are vector $\vec{A}$ and vector $\vec{B}$ respectively.

A/ 9î+12ĵ and 3î+4ĵ B/ 6î-5ĵ-k & 4î-3k̂ C/ -2î+4ĵ+k & 8î-5ĵ+2k̂ D/ none of the above.

3/ Consider a Lady Hockey player standing on her skater on a fro Zen pond She starts from rest, at position x= 5m at t= 0, to move with a constant acceleration a. What is her acceleration if her position at t= 1sec is x= 8m? A/ 4m/s^2 B/ 6m/s^2 C/ 2m/s^2 D/ 5m/s^2

4/ An object starts moving from rest with a constant acceleration of 1.6m/s^2. If the displacement of the object in the time interval b/n t_1= t and t_2= t+1 is 2m find t.

A/ 0.5sec B/ 2sec C/ 0.75sec D/ 0.42 sec

5/ An automobile moves according to x(t)= 10 +20t-1.5t^2, where x is in meter and t is in seconds .what is the average velocity of the automobile in time interval b/n t=0 and t= 2sec.

A/ 15m/s B/ 10m/s C/ 12m/s D/ 17m/s

6/ from question no 18 the instantaneous velocity of the automobile at t=5sec is

A/ 5m/s B/ 4m/s C/ 10m/s D/ 6m/s

7/ what is the acceleration of the automobile on question number 5?

A/ $-2m/s^2$ B/ $-3m/s^2$ C/ $2m/s^2$ D/ $3m/s^2$

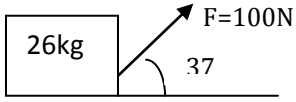
8/ A particle turns through 2880 rev in 2min. Find the magnitude of its average angular velocity in rad/s

A/ 34πrad/s B/ 26πrad/s C/ 48πrad/s D/ 40πrad/s

9/ Car A is moving with a speed of 40km/hr to the positive x-direction with respect to the ground. Another car B moving to the same direction with a speed of 20km/her relative to the ground then what is the velocity of car A with respect to car B?

A/ 60km/hr B/ 50km/her C/ 10km/hr D/ 20km/her

10/ A 100N force is exerted on a 26kg block, placed on a horizontal level surface in a direction indicated in fig of the black move horizontally with a constant acceleration of magnitude $2m/s^2$, find the coefficient of kinetic friction (cose 37= 0.8, sin37=0.6)



A/ 0.14 B/ 0.5 C/ 0.21 D. 0.4

II Fill in the blank spaces

11/ the area under a curve in an acceleration versus time graph gives _____

12/ _____ is a velocity of an object at point.

13/ _____ is a vector with a length of one unit.

14/ _____ a collision between two particles where kinetic energy is constant.

15/ the frictional force between two objects sliding over each other is called_____.

III Give a short answer

16/ If the position versus time graph of an object is a horizontal, what can you say about the motion of an object?

17/ the slope of a velocity versus time graph tell you;

18/ If an object has a negative velocity, that means it is;

19/ what is the main difference between elastic and Inelastic collision?

20/ a rubber ball is dropped on to the floor. What force causes the ball to bounce?

Appendix II

Post – test exam. for both experimental and comparison research groups of grade 11 Meki preparatory school to measure conceptual understanding (2010 E.C.). **Time allowed is: 45min.**

This test consists of three types: a/ multiple choice items b/ Fill in the blank space items and c/ give short answer items

PART: I. Multiple Choice items.

Read the following multiple choices questions carefully and write the letter of the correct

Answer on the space provided. Please do not write the number for your answer on the space provided.

1. A wheel initially rotating at 2 rad/sec accelerates at 3.5 rad/sec^2 for 2 sec. Through what angle does the wheel rotate during 2 sec?

A.11 rad B. 8 rad C. 5 rad D. 3 rad

2. Which one of the following statement is not correct about a particle that is in equilibrium?

A. It can have a velocity different from zero.

B. Its velocity can be equal to zero.

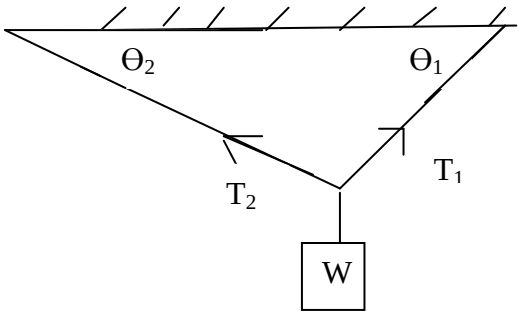
C. It can be under the action of more than one force.

D. It can have acceleration different from zero.

3. A 5kg cart is moving horizontally at 6 m/s. In order to change its speed to 10 m/s, the net work done on the cart must be?

A. 160J B. 40J C. 90J D. 400J

4. An object of mass 5kg hangs from three lights in extensible strings as shown in fig. Two of the string makes an angle of $\Theta_2=37^0$ and $\Theta_1=53^0$ with the horizontal. If the system is in equilibrium what will be the tension T_1 and T_2 in the fig.(use $g=10m/s^2$, $\sin53^0=\cos 37^0=0.8$ & $\sin37^0=\cos53^0=0.6$)



A. $T_1 = 40N$ & $T_2 = 30N$

B. $T_1 = T_2 = 30N$

C. $T_1 = 30N$ & $T_2 = 40N$

D. $T_1 = T_2 = 40N$

5. Which one of the following laws best describes the behavior of elastic materials?

A. Gay-Lussac's law B. Hook's law

C. Newton's second law D. Newton's law of gravitation

6.A uniform solid sphere of radius 0.5m and mass 15kg turns counterclockwise about a vertical axis through its center. Find its vector angular momentum when its angular speed is 3 rad/sec.

($I_{sph} = 2/5mr^2$) A. 1.5 N.m.s B. 2.7 N.m.s C. 4.5 N.m.s D.11.25 N.m.s

7. Two particles of equal mass moving with the same speed in opposite directions collide each other and stick together. What is the speed of the composition mass?

A. 1m/s B. 2.5m/s C. Zero D. 0.5m/s

8. When a force acts on an object producing a stress on the object, the resulting strain is the;

A. relative change in its dimension B. The applied force per unit area.

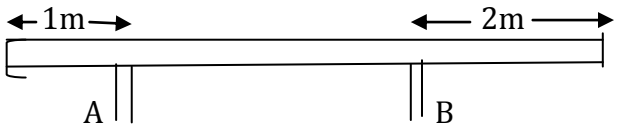
C. the bulk modulus D. the ultimate strength of the material.

9. A 4m long steel beam supports a load of 6×10^4 N. If its cross- sectional area is 8×10^{-3} m^2, what is its elongation? ($Y_{steel} = 2 \times 10^{11}$ pa)

A. 4.5×10^{-4}m B. 3.5×10^{-4} m C. 2.5×10^{-4} m D. 1.5×10^{-4}m

10. A uniform, 6m long and 600N beam, rests on two supports as shown in fig. The force exerted on the beam by the right supports B is closest to;

A. 240N B. 75N C. 400N D. 320N



II Fill in the blank space

11. Angular impulse is equal to the _____ multiplied by the change in angular velocity.

12. In _____, The sum of all the external torques acting on the body must be zero.

13. A _____ is set of forces with the resultant moment, but no net force.

14. _____, is the ratio of tensile stress to tensile strain over the range for which Hook's law applies.

15. _____, is the force applied perpendicular to a particular area.

III Give a short answer

16. What are the conditions for there to be no rotation of a body?

17. What are the difference b/n concurrent & coplanar forces?

18. What are the difference b/n static & dynamic equilibrium?

19. Give the unit for heat, heat capacity, specific heat capacity and latent heat.

20. Explain the factors that determine the rate of heat flow through a material.

Appendix III

Delayed retention post–test exam for both experimental and comparison research groups of grade 11 Meki Preparatory School to measure conceptual understanding. (2010 E.C).
Time Allowed is: 50 min.

This test consists of three types: a/ multiple choice items b/ Fill in the blank space items and c/ give short answer items

PART: I. Multiple Choice items.

Read the following multiple choices questions carefully and write the letter of the correct

Answer on the space provided. Please do not write the number for your answer on the space Provided.

1. A turbine is rotating at 600 rev/min. What is the angular velocity of the turbine in rad/sec?

A/ 20π rad/sec B/ 10π dad/sec C/ 100π rad/sec D/ 50π rad/sec

2. A flywheel is rotating with an angular velocity of 2.6 rad/sec. a force accelerates it uniformly to an angular velocity of 10.6 rad/sec over 4sec. What is an angular acceleration of the wheel?

A/ 1.6 rad/sec^2 B/ 2 rad/sec^2 C/ 3 rad/sec^2 D/2.5 rad/sec^2

3. A tap in a hospital has a rod attached to the top of it which is 0.25m long. The rod is perpendicular to the axis of rotation of the tap. It takes a force of 25N quarter of a turn to turn to the tap in. What is the torque exerted on the tap?

A/ 8.9 Nm B/ 6.25 Nm C/ 5.26 Nm D/ 3.45 Nm

4. On question number 3, How much work is done in turning on the tap?

A/ 6.74π J B/ 2.14π J C/ 3.125π J D/ 5.14π J

5. A mechanic applies a torque of 100 Nm over a half turn and takes 2 sec. What is the power?

A/ 20π W B/ 30π W C/ 40π W D/ 50π W

6. A flywheel of mass 3kg consists of a flat uniform disc of radius 0.4m. If pivots about a central axis perpendicular to its plane. What is the moment of inertia? ($I_{disc} = 1/2\ mr^2$)

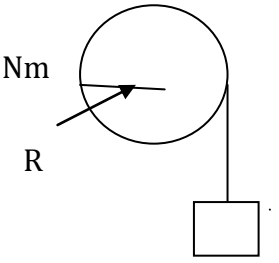
A/ 0.18 kgm^2 B/ 1.16 kgm^2 C/ 0.6 kgm^2 D/ 0.24 kgm^2

7. on question number 6, If a torque of 6.8Nm acts on it. What is the angular acceleration?

A/ 28.3 rad/sec^2 B/ 21.7 rad/sec^2 C/ 19.6 rad/sec^2 D/ 8.6 rad/sec^2

8. A flywheel of mass 12kg and radius 50cm with a rope wrapped around it. On the end of the rope is a 2kg load. Initially it is at rest. What is the torque on the flywheel? ($g= 9.8m/s^2$)

A/ 19.8 Nm B/ 9.8 Nm C/ 11.4 Nm D/ 6.47 Nm



9. On question number 8, what is angular momentum will be after 2.5 sec?

A/ 11.6 kgm^2/sec B/ 17.2 kgm^2/sec C/ 24.5 kgm^2/sec D/ 21.7 kgm^2/sec

10. A 10kg bowling ball with radius 9cm rolls without slipping down a lone at 5 m/s. What is the kinetic energy? ($I_{ball}= 2/5\ mr^2$)

A/ 105.5 J B/ 76.4 J C/ 115 J D/ 175 J

II Fill in the blank space

11. _____is a collision in two dimensions.

12. _____ is a set of forces that act in the same plane.

13. A change in angular momentum of rotating body caused by torque acting over a certain time is called _____.

14. A measure of an objects resistance to changes in its speed of rotation over a certain time is known as_____.

15. Springs and gravity are an example of _____ forces.

III Give a short answer

16. How can you find the center of mass of a rigid body?

17. What is parallel axis theorem?

18. What is the law of conservation of angular momentum?

19. How can you use the right hand rule to work aut the direction of angular momentum?

20. What are rotational laws of motion?

Appendix Table 1: The Pre – test result on the physics content, Experimental and Comparison group Students.

Experimental Group				*Comparison Group*			
No	*Out of 20*	*No*	*Out of 20*	*No*	*Out of 20*	*No*	*Out of 20*
1	*12*	*21*	*8*	*1*	*7*	*21*	*8*
2	*8*	*22*	*7*	*2*	*7*	*22*	*8*
3	*7*	*23*	*8*	*3*	*3*	*23*	*3*
4	*7*	*24*	*3*	*4*	*12*	*24*	*8*
5	*7*	*25*	*8*	*5*	*8*	*25*	*8*
6	*5*	*26*	*7*	*6*	*7*	*26*	*13*
7	*8*	*27*	*7*	*7*	*3*	*27*	*7*
8	*3*	*28*	*7*	*8*	*7*	*28*	*7*
9	*3*	*29*	*8*	*9*	*3*	*29*	*8*
10	*7*	*30*	*8*	*10*	*7*	*30*	*8*
11	*8*	*31*	*3*	*11*	*8*	*31*	*10*
12	*7*	*32*	*7*	*12*	*8*	*32*	*8*
13	*7*	*33*	*7*	*13*	*3*	*33*	*7*
14	*8*	*34*	*7*	*14*	*8*	*34*	*3*
15	*13*	*35*	*7*	*15*	*7*	*35*	*7*
16	*3*	*36*	*8*	*16*	*3*	*36*	*8*
17	*10*	*37*	*7*	*17*	*7*	*37*	*7*
18	*3*	*38*	*8*	*18*	*8*	*38*	*3*
19	*7*	*39*	*10*	*19*	*7*	*39*	*7*
20	*7*	*40*	*8*	*20*	*8*	*40*	*13*
Sum			*283*	*Sum*			*284*
Average			*7.075*	*Average*			*7.1*

Appendix Table 2: The post – test result on the physics content, Experimental and Comparison group Students.

Experimental Group				*Comparison Group*			
No	*Out of 20*	*No*	*Out of 20*	*No*	*Out of 20*	*No*	*Out of 20*
1	*11*	*21*	*12*	*1*	*7*	*21*	*9*
2	*14*	*22*	*16*	*2*	*7*	*22*	*8*
3	*16*	*23*	*14*	*3*	*12*	*23*	*14*
4	*18*	*24*	*11*	*4*	*7*	*24*	*6*
5	*16*	*25*	*14*	*5*	*6*	*25*	*9*
6	*17*	*26*	*12*	*6*	*10*	*26*	*18*
7	*13*	*27*	*14*	*7*	*4*	*27*	*8*
8	*18*	*28*	*16*	*8*	*8*	*28*	*8*
9	*13*	*29*	*10*	*9*	*14*	*29*	*12*
10	*10*	*30*	*12*	*10*	*10*	*30*	*14*
11	*12*	*31*	*17*	*11*	*11*	*31*	*13*
12	*14*	*32*	*12*	*12*	*8*	*32*	*11*
13	*15*	*33*	*15*	*13*	*6*	*33*	*12*
14	*13*	*34*	*14*	*14*	*11*	*34*	*8*
15	*14*	*35*	*11*	*15*	*4*	*35*	*9*
16	*14*	*36*	*17*	*16*	*10*	*36*	*15*
17	*10*	*37*	*12*	*17*	*7*	*37*	*19*
18	*17*	*38*	*17*	*18*	*14*	*38*	*12*
19	*14*	*39*	*13*	*19*	*14*	*39*	*9*
20	*13*	*40*	*11*	*20*	*9*	*40*	*6*
Sum			*557*	*Sum*			*399*
Average			*13.93*	*Average*			*9.98*

Appendix Table 3 The Delayed retention – test result on the physics content, Experimental and Comparison group Students.

Experimental Group				*Comparison Group*			
No	*Out of 20*	*No*	*Out of 20*	*No*	*Out of 20*	*No*	*Out of 20*
1	*16*	*21*	*9*	*1*	*7*	*21*	*8*
2	*17*	*22*	*11*	*2*	*8*	*22*	*6*
3	*12*	*23*	*12*	*3*	*6*	*23*	*10*
4	*13*	*24*	*16*	*4*	*13*	*24*	*5*
5	*16*	*25*	*12*	*5*	*12*	*25*	*8*
6	*17*	*26*	*13*	*6*	*7*	*26*	*7*
7	*12*	*27*	*15*	*7*	*8*	*27*	*8*
8	*17*	*28*	*16*	*8*	*8*	*28*	*7*
9	*12*	*29*	*11*	*9*	*7*	*29*	*11*
10	*13*	*30*	*17*	*10*	*12*	*30*	*7*
11	*17*	*31*	*13*	*11*	*12*	*31*	*8*
12	*9*	*32*	*12*	*12*	*8*	*32*	*12*
13	*11*	*33*	*15*	*13*	*7*	*33*	*8*
14	*13*	*34*	*13*	*14*	*6*	*34*	*7*
15	*19*	*35*	*16*	*15*	*14*	*35*	*5*
16	*13*	*36*	*13*	*16*	*7*	*36*	*7*
17	*12*	*37*	*12*	*17*	*8*	*37*	*6*
18	*17*	*38*	*16*	*18*	*7*	*38*	*8*
19	*16*	*39*	*11*	*19*	*3*	*39*	*11*
20	*12*	*40*	*17*	*20*	*5*	*40*	*9*
Sum			*554*	*Sum*			*323*
Average			*13.85*	*Average*			*8.08*

Appendix Table 4: Students Attitude response: Experimental group

(Total number of Experimental group students: 40)

No	Items for response	5	4	3	2	1
1.	Item 1	5	12	14	5	4
2.	Item 2	5	8	8	12	7
3.	Item 3	16	9	7	5	3
4.	Item 4	4	3	7	4	22
5.	Item 5	9	9	8	8	6
6.	Item 6	10	10	10	5	5
7.	Item 7	14	9	12	3	2

5= Always, 4= frequently, 3= sometimes, 2= rarely, 1= Not at all

Appendix Table 5: Students Attitude response: Comparison group

(Total number of Experimental group students: 40)

No	Items for response	5	4	3	2	1
1.	Item 1	6	7	5	13	9
2.	Item 2	6	6	7	11	10
3.	Item 3	9	9	10	7	6
4	Item 4	2	8	9	8	13
5.	Item 5	8	13	9	4	6
6.	Item 6	5	6	7	10	12
7.	Item 7	12	6	11	6	5

5= Always, 4= frequently, 3= sometimes, 2= rarely, 1= Not at

Appendix IV.

Adama science and Technology University

Department of Applied Physics

School of Applied Natural science

Attitude questions items to be filled by experimental and comparison group students.

Instruction: The purpose of this attitude question items is to gather information on the title≪ Comparative study of effectiveness of student-centered versus Lecture based of teaching method on students performance learning physics (In the case of Grade 11 Meki priparatory school ≫ ,In Ormia East shewa zone Dugda wereda.

Dear respondents since the reliability of this survey depend on the objectivity of your response. You are kindly requested to offer your response based on factual and genuine information.

Thank you for your cooperation!!

Direction: 1. Don't write your name

2 .put a tick mark ≪ √≫ on the space provided

3. Respond all questions precisely and genuinely

General information

Name of the school _____

Sex : male ☐ Female ☐

Age: A, 17-21 ☐ B, 22-26 ☐ C, 27-30 ☐ D, 31-and above ☐

Based on the likert writing scale (always, Frequently, Sometimes, Rarely and Not at all) put a tick ≪ √≫ on one of the 5 alternatives for question 1-7 on the space provided.

No	Item for response	Responses				
		5	4	3	2	1
1	Do you have chance to Participate in physics class discussion?					
2	Do you study physics regularly?					
3	You have a good feeling & attitude towards physics					
4	Would you often score very good result in physics?					
5	Do you think that Physics is difficult subject?					
6	The method of teaching and learning physics in the class motivates you?					
7	You are approaching physics with hesitation					

5= Always 4= Frequently 3= Sometimes 2= Rarely 1= Not at all

Appendix V

Adama science and Technology University

Department of Applied Physics

School of Applied Natural science

Teachers focus group discussion

Instruction : These questions are designed to collect information that helps to conduct a study that is entitled ≪ Comparative study of effectiveness of student-centered versus Lecture based of teaching method on students performance learning physics (In the case of Grade 11 Meki preparatory school ≫ ,In Ormia East shewa zone Dugda wereda

There are five questions prepared to explore teacher's opinion and perception concerning which method of teaching and learning if physics teachers use is more effective and efficient to improve students' performance, attitude and rotation. For 5 questions, the three teachers were asked and discussed with researcher and give their response by writing their perception and opinion on the prepared blank spaces.

Thank you for your cooperation!!

General Information

Fill the following information with an appropriate answer

Name of the school_____

Sex male ☐ Female ☐

Age 25-30 ☐ 31-35 ☐ 36 and above ☐

Qualification

A. College diploma ☐ **B.** Degree ☐

C. Masters Degree ☐ **D.** Any Other ☐

Service year in teaching

A. 1-10 ☐ **B.** 11-20 ☐ **C.** Above 20 ☐

Answer the following question

1. Which method of teaching and learning among Student centered & Lecture do you suggest is better to teach physics in the class?

2. What mechanism do you use to actively participate your students when you teach physics in the class and haw do you improve your student's performance?

3. In what way if students learn physics that their attitude and interest in physics change?

4. What is the predominant method of teaching and learning in Oda bokota preparatory school?

Justify your opinion.

5. Which of the following methods do you use most and frequently in the class to teach your students?

A. Lecture

B .Demonstration

C. Student-centered

D. Explanation with note giving

Appendix-VI

Answer to a pre-test examination

I Multiple choice

1/ D

2/ A

3/ B

4/ C

5/ D

6/ A

7/ B

8/ C

9/ D

10/ A

II Fill in the blank space

11/ Velocity

12/ Instantaneous velocity

13/ Unit vector

14/ Elastic collision

15/ Kinetic friction

III Short Answer

16/ at rest/ moving in constant velocity

17/ acceleration

18/ going back towards

19/ Kinetic energy is conserved and kinetic energy is not conserved

20/ Normal force from the floor = Weight of the ball

Appendix-VII

Answer to a post-test examination

Multiple Choices

1. A
2. D
3. A
4. A
5. B
6. C
7. C
8. B
9. D
10. B

Fill in the blank space

11. Moment of inertia
12. Rotational Equilibrium
13. Couple
14. Young's modulus
15. Absolute pressure

Short answer

16. The sum of all external torques on the body must be zero.
17. Concurrent forces ; all passes through the same point & Coplanar forces act in the same plane.
18. Static equilibrium; If a body is not moving & there are no net force or torque on a body.

Dynamic equilibrium; If a body is moving & there are no net force or torque acting on a body & no net acceleration, the body to move at the same velocity.

19. J, J/k, J/kgk,, J/kg
20. The material itself, The area of cross-section, Temperature gradient across the material.

Appendix-VIII

Answer to a retention-test examination

I Multiple Choices

1. A
2. B
3. B
4. C
5. D
6. D
7. A
8. B
9. C
10. D

II Fill in the blank space

11. Glancing collision
12. Coplanar force
13. Angular Impulse
14. Rotational Inertia
15. Conservative

Give a short answer

16. Finding the geometric center of the shape.

17. $I_p = I_{cm} + Md^2$

18. Angular momentum does not change unless the system is acted on by a resultant torque.

19. Since angular momentum is a vector products, the right hand rule can be used to find the direction of the resultant vector.

20. The rotational laws of motion are the same as linear law of motion except that linear quantities are replaced by rotational quantities