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THE EFFECT OF ACTIVE LEARNING METHOD ON GRADE TEN STUDENTS IN THE ACHIEVEMENT OF CHEMISTRY: THE CASE OF ROMAN DEGA SECONDARY SCHOOL, KEDIDA GAMELA, KAMBATTA ZONE, CENTERAL ETHIOPIA REGION, ETHIOPIA

M.Sc. THESIS

BY

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WOLKITE , ETHIOPIA

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A thesis submitted to the Department of Chemistry, School of Graduate Studies, Wolkite University in partial fulfillment of the requirements for the Degree of Master of Science in Chemistry.

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DECLARATION

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

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We here by certify that we have read and evaluated this thesis, prepared by Mr Sewunet Samuel entitled, “The Effect of Active Learning Method on Grade Ten Students in the Achievement of Chemistry the case of Roman Dega Kedida Secondary School, Kedida Gamela ” prepared under our guidance by Mr Sewunet Samuel. We recommend that the thesis shall be submitted as fulfilling the requirements of Master’s of science degree in Chemistry.

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As members of the broad of reviewers of the thesis open defence by Sewunet Samuel have read evaluated the thesis entitled "The Effect of Active Learning Method on Grade Ten Students in the Achievement of Chemistry the case of Roman Dega Kedida Secondary School, Kedida Gamela". This is, therefore, to certify that the thesis is accepted as fulfilling the requirements for the degree of Master of science(M.Sc) in Chemistry.

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LIST OF ACRONYMS AND ABBREVIATIONS

AL	Active Learning
ASHE	Association for the Study of Higher Education
CAT	Chemistry Achievement Test
CG	Control Group
EG	Experimental group
H01	Null Hypothesis for Achievement Test between CG &EG
H02	Null Hypothesis for Perception of CG & EG towards Chemistry
KSA	Knowledge, Skills and Attitudes
MOE	Ministry of Education
SAS	Students Attitude Scale
SD	Standard Deviation
SPSS	Statistical Package for Social Science

TABLE OF CONTENTS

LIST OF TABLES

ABSTRACT

Active learning requires students to do meaningful learning activities and think about what they are learning. This study aimed to investigate the effect of an active learning method on Grade 10 students in the achievement of Chemistry. The research was conducted at Roman dega Secondary School, kedida Gamela, Central Ethiopia Region. For the study purpose, a quasi-experimental design was employed. By using simple random sampling technique, 72 students were selected as a sample size from a total population of 360. Also 7 chemistry teachers, 3 the school principals and 1 supervisor were included in the study .A stratified sampling technique was used to maintain the proportional allocation of students from each section. The sampled students were assigned to two groups: experimental (N (exp) = 36) and control (N(con) = 36). The experimental group received instruction with active learning methods such as group discussion, question and answer, problem solving, experimental and visual-based learning. In contrast to that, the control group was taught with the traditional lecture method from the same chapter of "Energy Change and Electrochemistry" by the same teacher. The application took seven weeks. At the beginning of the first week, a pretest was administered for both groups. A post test was given for both groups at the end of the seventh week. To ensure the validity of the tool, the test was presented to the study advisor and four experienced high school teachers. The data obtained was analyzed using SPSS version 20. A T-test was used to test the statistical significance of the hypothesis generated in the study. The significance level of the results was tested at alpha = 0.05 significance level. Results showed that there was a significant difference between the means of experimental group pretest and post test ($p \leq 0.05$) in the achievement of chemistry. But there was no significant difference between the means of the control group pretest and post test after intervention ($P > 0.05$). Questionnaires were also administered before and after the intervention. The findings of the study revealed that incorporating an active learning approach in chemistry enhanced the learning achievement of 10^{th} grade students. In light of the obtained results, the researcher recommended the utilization of an active learning method in teaching chemistry so as to enhance students' achievement in chemistry and positive perceptions towards chemistry.

Keywords: Effect of active learning, achievement, chemistry, grade 10 student

CHAPTER ONE

1.1 Background of the Study

The main purpose of science education is to improve students' understandings of concepts (Ball A.L 2007) and since chemistry is one of the branch of natural sciences that have importance in human life, educators have the responsibility to pay attention and search for the best ways to teach it in line with the needs of learners. In modern world, there is a shift from learning that capitalizes on memorization and rote learning to active learning. It is because, in the traditional approach of teaching, most of the class time is spent by teachers talking and students watching and listening, and active learning method appears to be discouraged (Baepler et al.,2014). Active learning is one of the educational and psychological trends that have a great positive impact on the educational process, as it transfers the teacher's role from a transmitter of knowledge and information to a facilitator and guides for the students' education (Acar and Tarhan,2008).

Effective use of learning methods can greatly improve learners' academic achievement. Poor performance has been blamed on poor teaching style. Learning styles has been considered as important factors in improving learners' academic achievement. It is well known that students, who have been trained according to teacher-centered traditional approach, were unable to integrate their knowledge, think critically and creatively, and this caused lower learning achievements and also misconceptions. For this reason, the traditional approach in where teacher is an information-giver to passive students appears outdated, and active learning methods requiring actively participated students have begun to take more interest to help students being meaningful learner (Baepler and Walker,2014).

Active learning is generally defined as any instructional method that engages students in the learning process. In short, active learning requires students to do meaningful learning activities and think about what they are learning,(Haman et al.,2012). Active learning methods such as: question and answer, group discussion, problem solving, experiments and visual based learning are categorized under student centered or inductive teaching methods to teach chemistry contents especially energy change and electrochemistry by increasing the engagement of secondary school students and enhance the achievement in chemistry

Active learning strategies through which students become active participants in the learning process is an important means for development of student skills. In the process of active learning, students move from being passive recipients of knowledge to being participants in activities that encompass analysis, synthesis and evaluation besides developing skills, values and attitudes. Active learning not only emphasizes the development of students' skills but also their exploration of their own attitudes and values (Cheung 2009).

The active learning consists of three factors, which are interrelated. These are basic elements, learning strategies, and teaching resources. The basic elements of active learning are speaking, listening, reading, writing and reflecting. These five elements involve cognitive activities that allow students to clarify the question, consolidate and appropriate the new knowledge. The second factor of active learning is the learning strategies that incorporate the above five elements. These are small groups, visual based, discussion, problem solving, question and answer and experiments. Third factor of active learning is teaching resources that the teacher uses to encourage students to interact and participate actively in the activities (Michael and Richarge ,2006).

As modern method of teaching, active learning approach has worldwide acceptance and are being exercised in all parts of the world. As indicated by an example of problem-based learning curricular or courses can now be found in almost all parts of the world. More emphasis was given to active learning method in the world because, learning is meaning full when it irrelevant to students` lives, needs and interests and when the students themselves are actively engaged in learning.

Thus, as a part of the world Ethiopia cannot remain an exceptional not to implement this method. Studies show that the best-designed active learning approach is more effective than traditional method of teacher centered approach of teaching. For instance, indicated that student from learner centered curricula are superior to their counter parts from traditional curricula with respect to their approach, perceptions of their education, long term retention of knowledge and motivation for learning in the Ethiopian context.

The new Educational Training Policy of Ethiopia emphasizes the development of problem solving capacity and culture in the context of education, curriculum structure and approach.

Generally, in line with the above discussion the government of Ethiopia is trying its best to establish systems and channel resources to promote active learning in order to produce citizens that are well equipped with the skill and knowledge to solve problems and bring about difference in their life and the country as well.(Michael and Model ,2003).

Including Roman Dega kedida secondary school, Kedida Gamela education office selected active learning as a priority topic in continuous professional development plan for the last three successive years. However, many sciences, including chemistry teachers in the area where the researcher is working, still prefer the traditional teacher centered method of instructions and would like to stick to it. In addition to that there has been no research conducted in the town administration level concerning this. Therefore, this study is aimed to investigate the effect of active learning method as instructional methods on students' chemistry achievement and to explore students' perceptions towards chemistry due to active learning methods.

1.2. Statement of the Problem

Improving students' learning achievement in chemistry and other subjects was one of the main directions of Kedida Gamela Woreda education office for the year. Schools were given directions to apply active learning in all subjects, especially natural science, to enhance students' achievement. However, the researcher observed low achievement of students in chemistry from recorded documents in the school (2013-2015E.C). While working there, the researcher observed the trial of some teachers to apply Active Learning method in Chemistry but majority of chemistry teachers using traditional lecture method to teach chemistry in Roman Dega secondary school.

The students' low chemistry achievement in Zonal and school final examinations of the 2015E.C revealed that there was a problem to be researched on the effect of an active learning method on students' achievement in chemistry. Through certain years of teaching experience, the investigator considered the lack of interest of students towards the lecture method that teachers applied in chemistry classes.

As the investigator was a teacher at that school, in every monthly academic meeting the low students' achievement in chemistry and the lack of implementation of active learning methods were the main discussion agenda of the school. While the reporter was sharing experience with school chemistry teachers, some teachers were not aware of the effect of the active learning method on students' chemistry achievement. In addition to this, there

was no research conducted at the school on the effect of the active learning strategy on the achievement of chemistry and on the students' perceptions towards active learning in learning chemistry. That is why the researcher was motivated to conduct this study on the effects of active learning methods on grade 10 students chemistry achievement in Roman Dega , Kedida Gamela Woreda.

1.3. Objectives

1.3.1 General Objective

The general objective of the study was to investigate the Effect of Active Learning Method on Grade 10 students in the Achievement of Chemistry in Roman Dega,Kedida Gamela Woreda..

1.3.2 Specific Objectives

- To identify the students background about active learning method in chemistry teaching learning process
- To evaluate the effect of Active Learning method on students' achievement in learning chemistry.
- To examine the effect of active learning method on students' perception towards Chemistry.

1.4. Research Questions

To achieve the central aim of the study, the following research questions were entertained in this study:

- ✓ How does chemistry teachers implementation of active learning methods in the classroom carring out?
- ✓ To what extent is the effect of active learning strategy on students' academic achievement in learning chemistry?
- ✓ What is students' perception towards chemistry on the effect of active learning?

1.5. Research Hypotheses

To achieve the goals of the research, the study suggested the following hypotheses cases: H01:There should be difference in students' chemistry achievement between active learning and lecture-based learning classes.

H02:There should be difference in students' perceptions toward chemistry between active learning (EG) and lecture-based learning (CG) classes.

1. 6. Significance of the Study

The purpose of this study will be to examine student performance in a chemistry subject in high school by using active learning strategies in the classroom for its effectiveness on exam and subject scores. Active learning is an important technique in the modern classroom, especially with the various benefits and opportunities it brings. It was hoped that the finding of this study would be useful to a number of stakeholders in the education sector including chemistry teachers, chemistry students, and school administrators, curriculum developers and future researchers. It enables students to discover their own learning style. It helps them to shape their individual character. It encourages students to find ways to strengthen their resilience.

The benefit of this study is to motivate chemistry teachers to use active learning strategy in chemistry. It may motivate students to appreciate active learning strategies. Educational sectors, curriculum designers and policy makers also will be benefited from the study by getting clues for facilitating ground for active learning strategies in secondary schools. School administrators and teachers may use it as reference material in their schools to check whether the concerned bodies are applying active learning or not for increasing student's achievements in chemistry teaching. The finding of this research would help chemistry teachers on better way of organizing active learning methods for teaching chemistry to enhance students' achievement. The study may serve as a supporting document for other researchers in the future.

1.7. Delimitation of the Study

The scope of this study is delimited in Kedida Gamela Woreda governmental high schools from total of four high schools selected one high school in Roman Dega secondary school. To specify the study, the reporter delimited this study on grade 10 in the subject chemistry, especially " Energy changes and Electrochemistry" because chemistry is the area of specialization of the researcher.

1.8. Operational Definitions

Active learning: refers to the level of academic student engagement in and out of the classroom.

Active learning strategy: an elaborate and systematic plan of action on the students' performance.

Student achievement: the result in chemistry subject followed by implementation of active learning strategy through measurement and evaluation techniques.

Effect: the power to produce an outcome to achieve the result.

Cognitive development: intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from or generated by observation, experience, reflection reasoning, or communication as a guide to belief and action.

1.9. Conceptual Framework

In this study, the teaching approaches in chemistry are the independent variables

Independent Variables:

- Group discussion
- Problem solving
- Visual based learning
- Question and answer
- Experiments
- Gapped lecture

The students' achievements in chemistry were considered as the main dependent variable

Dependent Variables:

- Students' achievement in chemistry
- Perceptions of students towards chemistry through active learning

Interfering Variables:

- Resources

The student's achievements in chemistry were measured using this indicator; positive attitude towards chemistry, improved performance in examination. The independent variable however can be intervened by availability of resources; human, capital, material (Cheung 2009).

CHAPTER TWO

LITERATURE REVIEW

2.1 Teaching Methods

There are more than 120 teaching methods/ techniques which are exercising throughout the world's classroom. For the sake of simplicity, however, ethnologists categorize them in to two broad categories: Inductive and deductive teaching. Depending on their views, some educators labeled the category as direct versus indirect, conventional versus non-conventional, traditional versus modern, teacher centered versus student centered, and active versus passive (Harris and Hoffer, 2009).

2.1.1 Inductive Teaching

Inductive teaching and learning is an umbrella term that encompasses a range of instructional methods, including inquiry learning, problem-based learning, project-based learning, case-based teaching, discovery learning, and just-in-time teaching. These methods have many features in common, besides the fact that they all qualify as inductive. They are all *learner centered* meaning that they impose more responsibility on students for their own learning than the traditional lecture-based deductive approach does.

They are all supported by research findings that students learn by fitting new information into existing cognitive structures and are unlikely to learn if the information has few apparent connections to what they already know and believe. They can all be characterized as constructivist methods, building on the widely accepted principle that students construct their own versions of reality rather than simply absorbing versions presented by their teachers. The methods almost always involve students discussing questions and solving problems in class (*active learning*), with much of the work in and out of class being done by students working in groups (Michael and Rechared , 2006).

2.1.2 Deductive Teaching in Chemistry

Deductive Teaching is a teaching approach that starts from telling the key formulas, rules, theories, etc of the lesson at the beginning, then ask to solve problems or to treat concepts in line with the given keys in the lesson. It in other words is the movement from the general theory/formula/ to the specific facts/information. Traditional science instruction is deductive, beginning with theories and progressing to applications of those theories. The instructor, in deductive teaching, introduces a topic by lecturing on general

principles, then uses the principles to derive mathematical models, shows illustrative applications of the models, gives students practice in similar derivations and applications in homework, and finally tests their ability to do the same sorts of things on exams. Little or no attention is initially paid to the question of why any of that is being done what real world phenomena can the models explain, what practical problems can they be used to solve, and why the students should care about any of it. Deductive teaching is mainly associated to the behavioral learning theories that consider the learners a bit passive and an empty vessel in which the teacher is going to select and fill the important parts of the lesson (Harris and Hoffer, 2009).

2.1.3 Inductive Teaching versus Deductive Teaching

Of different methods that employ in chemistry teaching, lecture or dictation and demonstration methods from deductive category; Inquiry learning, problem-based learning, project-based learning, discovery learning and the experimental approach from inductive category of teaching (Michael and Richard, 2006).

In general sayings, chemistry contents may treat very well through different inductive teaching methodologies. Inductive teaching, the active involvement of learners to their learning, has introduced first by the natural science specialists when they treat the natural science disciplines. The reason behind is that natural science contents by their own very nature worries (demands strive) the learners' mind, i.e., the key of inductive teaching /active learning/. In short, even though traditional methods (e.g., lecture) are very important to tell basic facts, rules, principles etc, it is highly recommended to exercise inductive teaching in chemistry. The reason is that chemistry contents need active exploration and criticality from the learner because they need maximum precision and sensitivity (Michael .and Richarge , 2006).

2.2 Importance of Active Learning

Active participation strengthens learning regardless of environment active learning requires "intellectual effort, encouraging higher-order thinking (analysis, synthesis, evaluation)" and provides a means for the learner to assimilate, apply, and retain learning. It was further suggested that strategies promoting active learning are superior to passive learning in promoting the development of student's skills in thinking and writing. Active learning accommodates a variety of learning styles, promotes student achievement, enhances learner motivation, changes student attitudes, and basically, causes learners to learn more A preference perspective, students generally prefer

strategies promoting active learning to traditional lectures and other passive methodologies. Use of these techniques in the classroom is vital because of their powerful impact upon students' learning. Investigators evaluating students' achievement have demonstrated that many strategies promoting active learning are comparable to lectures in promoting the mastery of content but superior to lectures in promoting the development of students' skills in thinking and writing. Furthermore, some cognitive researches have shown that a significant number of individuals have learning styles best served by pedagogical techniques other than lecturing. Therefore, a thoughtful and scholarly approach to skillful teaching requires that the schools become knowledgeable about the many ways strategies promoting active learning have been successfully used across the disciplines. Further, each faculty member should engage in self-reflection, exploring his or her personal willingness to experiment with alternative approaches to instruction (Hermin and Toth ,2006).

2.3 Nature of Active Learning

Active learning is "a method of learning in which students are actively or experientially involved in the learning process and where there are different levels of active learning, depending on student involvement. States that "students participate in active learning when they are doing something besides passively listening." In a report from the Association for the Study of Higher Education (ASHE), authors discuss a variety of methodologies for promoting active learning. They cite literature that indicates students must do more than just listen in order to learn. They must read, write, discuss, and be engaged in solving problems. This taxonomy of learning behaviors can be thought of as "the goals of the learning process" In particular, students must engage in such higher-order thinking tasks as analysis, synthesis, and evaluation (Meyers and Jones, 2006).

There are a wide range of alternatives for the term active learning, such as: learning through play, technology-based learning, activity-based learning, group work, project method, etc. The common factors in these are some significant qualities and characteristics of active learning. Active learning is the opposite of passive learning; it is learner-centered, not teacher-centered, and requires more than just listening; the active participation of each and every student is a necessary aspect in active learning. Students must be doing things and simultaneously think about the work done and the purpose behind it so that they can enhance their higher order thinking capabilities. However,

some students as well as teachers find it difficult to adapt to the new learning technique (Murray and Mara , 2018).

There is intensive use of scientific and quantitative literacy across the curriculum, and technology-based learning is also in high demand in concern with active learning

Barnes suggested principles of active learning:

1. Purposeful: the relevance of the task to the students' concerns.
2. Reflective: students' reflection on the meaning of what is learned.
3. Negotiated: negotiation of goals and methods of learning between students and teachers.
4. Critical: students appreciate different ways and means of learning the content.
5. Complex: students compare learning tasks with complexities existing in real life and making reflective analysis.
6. Situation-driven: the need of the situation is considered in order to establish learning tasks.
7. Engaged: real life tasks are reflected in the activities conducted for learning.

Active learning requires appropriate learning environments through the implementation of correct strategy.

Characteristics of learning environment are:

1. Aligned with constructivist strategies and evolved from traditional philosophies.
2. Promoting research-based learning through investigation and contains authentic scholarly content.
3. Encouraging leadership skills of the students through self-development activities.
4. Creating atmosphere suitable for collaborative learning for building knowledgeable learning communities.
5. Cultivating a dynamic environment through interdisciplinary learning and generating high-profile activities for a better learning experience.
6. Integration of prior with new knowledge to incur a rich structure of knowledge among the students.
7. Task-based performance enhancement by giving the students a realistic practical sense of the subject matter learns in the classroom.

2.4 Constructivist Framework

Active learning coordinates with the principles of constructivism which are, cognitive, meta-cognitive, evolving and affective in nature Studies have shown that immediate results in construction of knowledge is not possible through active learning, the child goes through process of knowledge construction, knowledge recording and knowledge absorption. This process of knowledge construction is dependent on previous knowledge of the learner where the learners are self-aware of the process of cognition and can control and regulate it by themselves (Toomey, B., & Ecker, B. 2007).

2.5. Science of Active Learning

Active learning has been shown to be superior to teachings in promoting both comprehension and memory the reason it is so effective is that it draws on underlying characteristics of how the brain operates during learning. These characteristics have been documented by thousands of empirical studies and have been organized into a set of principles. Each of these principles can be drawn on by various active learning exercises (Stephen and Kosslyn , 2017).

2.6. The Principles of Learning

One way to organize the empirical literature on learning and memory specifies about 11 distinct principles, which fall under two umbrella "maxims". The first maxim, "Think it through", includes principles related to paying close attention and thinking deeply about new information. The second, "Make and Use Associations", focuses on techniques for organizing, storing, and retrieving information. The principles can be summarized as follows (Anderson et al., 2007).

2.6.1 Basic Principles of Active Learning

- Every One Can Learn – Humans learn throughout their lives.
- Learning Facts and Learning to Do something are two different processes
- Active Learning is ‘Hands On’ – You learn by doing and applying new ideas and materials.
- Learning Involves Practice – What you do, you learn. What you do repeatedly builds mastery.
- You are likely to learn more when you learn with others than when you learn alone.
- Meaningful learning is facilitated by articulating explanations to yourself (written or verbal), and to others (peers or teachers).

- Use all Your Senses in Learning – Visual, auditory, and kinesthetic aspects support learning. Information is complex and exists in contexts that include all of these aspects.
- Learning Includes Failure – Failure leads to success as new methods are tried and mastered.

  Reflection Solidifies Learning – How do you want to react next time?

2.7. Active Learning Exercises

suggested learners work collaboratively, discuss materials while role-playing, debate, engage in case study, take part in cooperative learning, or produce short written exercises, etc. The argument is "when should active learning exercises be used during instruction?". Numerous studies have shown that introducing active learning activities (such as simulations, games, contrasting cases, labs.) before, rather than after lectures or readings, results in deeper learning, understanding, and transfer the degree of instructor guidance students need while being "active" may vary according to the task and its place in a teaching unit. In an active learning environment, learners are immersed in experiences within which they engage in meaning-making inquiry, action, imagination, invention, interaction, hypothesizing and personal reflection (Michael and Richarge , 2006).

Active learning activities include: A class discussion may be held in person or in an online environment. Discussions can be conducted with any class size, although it is typically more effective in smaller group settings. This environment allows for instructor guidance of the learning experience. Discussion requires the learners to think critically on the subject matter and use logic to evaluate their and others' positions. As learners are expected to discuss material constructively and intelligently, a discussion is a good follow-up activity given the unit has been sufficiently covered already Some of the benefits of using discussion as a method of learning are that it helps students explore a diversity of perspectives, it increases intellectual agility, it shows respect for students' voices and experiences, it develops habits of collaborative learning, it helps students develop skills of synthesis and integration . In addition, by having the teacher actively engage with the students, it allows them to come to class better prepared and aware of what is taking place in the classroom (Feden and Vogel, 2003).

A think-pair-share activity is when learners take a minute to ponder the previous lesson, later to discuss it with one or more of their peers, finally to share it with the class as part

of a formal discussion. It is during this formal discussion that the instructor should clarify misconceptions. However, students need a background in the subject matter to converse in a meaningful way. Therefore, a "think-pair-share" exercise is useful in situations where learners can identify and relate what they already know to others. It can also help teachers or instructors to observe students and see if they understand the material being discussed This is not a good strategy to use in large classes because of time and logistical constraints Think-pair-share is helpful for the instructor as it enables organizing content and tracking students on where they are relative to the topic being discussed in class, saves time so that he/she can move to other topics, helps to make the class more interactive, provides opportunities for students to interact with each other .A learning cell is an effective way for a pair of students to study and learn together. The learning cell was developed by Marcel Goldschmid of the Swiss Federal Institute of Technology in Lausanne .A learning cell is a process of learning where two students alternate asking and answering questions on commonly read materials.

To prepare for the assignment, the students read the assignment and write down questions that they have about the reading. At the next class meeting, the teacher randomly puts students in pairs. The process begins by designating one student from each group to begin by asking one of their questions to the other. Once the two students discuss the question, the other student asks a question and they alternate accordingly. During this time, the teacher goes from group to group giving feedback and answering questions. This system is also called a student dyad. A short-written exercise that is often used is the "one-minute paper". This is a good way to review materials and provide feedback. A collaborative learning group is a successful way to learn different material for different classes. It is where you assign students in groups of 3-6 people and they are given an assignment or task to work on together to create participation and draw on the wisdoms of all the learners the classroom arrangement needs to be flexible seating to allow for the creation of small group (Cheung 2009).

A student debate is an active way for students to learn because they allow students the chance to take a position and gather information to support their view and explain it to others. A reaction to a video is also an example of active learning. A small group discussion is also an example of active learning because it allows students to express themselves in the classroom. It is more likely for students to participate in small group discussions than in a normal classroom lecture because they are in a more comfortable setting amongst their peers, and from a sheer number’s perspective, by dividing the

students up more students get opportunities to speak out. There are so many different ways a teacher can implement small group discussion in to the class, such as making a game out of it, a competition, or an assignment. Statistics show that small group discussions are more beneficial to students than large group discussions when it comes to participation, expressing thoughts, understanding issues, applying issues, and overall status of knowledge (Hamann 2012).

Just-in-time teaching promotes active learning by using pre-class questions to create common ground among students and teachers before the class period begins. These warmup exercises are generally open-ended questions designed to encourage students to prepare for class and to elicit student's thoughts on learning goals. A class game is also considered an energetic way to learn because it not only helps the students to review the course material before a big exam but it helps them to enjoy learning about a topic (McKinney 2010).

Learning by teaching is also an example of active learning because students actively research a topic and prepare the information so that they can teach it to the class. This helps students learn their own topic even better and sometimes students learn and communicate better with their peers than their teachers. Gallery walk is where students in groups move around the classroom or workshop actively engaging in discussions and contributing to other groups and finally constructing knowledge on a topic and sharing it. In a learning factory production-related subjects can learn interactively in a realistic learning environment (Wilson 2012).

2.8 Technology Enhanced Active Learning

The use of multimedia and technology tools helps enhance the atmosphere of the classroom, thus enhancing the active learning experience. In this way, each student actively engages in the learning process. Teachers can use movies, videos, games, and other fun activities to enhance the effectiveness of the active learning process. The theoretical foundations of this learning process are:

1. **Flow:** Flow is a concept to enhance the focus level of the student as each and every individual becomes aware and completely involved in the learning atmosphere. In accordance with one's own capability and potential, through self-awareness, students perform the task at hand. The first methodology to measure flow was Csikszentmihalyi's Experience Sampling (ESM).(Bens,I.2005).

2. **Learning styles:** Acquiring knowledge through one's own technique is called learning style. Learning occurs in accordance with potential as every child is different and has particular potential in various areas. It caters to all kinds of learners: visual, kin-aesthetic, cognitive and affective. [dubious – discuss].
3. **Locus of control:** Ones with high internal locus of control believe that every situation or event is attributable to their resources and behavior.
4. Ones with high external locus of control believe that nothing is under their control.
5. **Intrinsic motivation:** Intrinsic motivation is a factor that deals with self-perception concerning the task at hand. Interest, attitude, and results depend on the self-perception of the given activity.

2.9 Active Learning Methods and Student Learning Outcomes

Described active learning strategies as those that involve "students in doing things and (have the students) think about the things they are doing" In an effective learning environment that incorporates active learning strategies, "greater emphasis is placed on students' exploration of their own meaning, attitudes, and values. Active learning refers to the level of academic student engagement in and out of the classroom. These teaching techniques are intended to make the students active (rather than passive) participants in learning. Active, hands-on teaching strategies and learning activities are designed to take students out of their books, sometimes out of their seats, sometimes out of the classroom, sometimes out of their school, and sometimes out of their familiar ways of thinking. Active, hands-on teaching strategies and learning activities are intended to make students active participants in their own learning Teaching strategies refer to the structure, system, methods, techniques, procedures, and processes that a teacher uses during instruction. es refer to the teacher-guided instructional tasks or assignments for students (Mckeache 2006).

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Description of the Study Area

Roman Dega kedida secondary school is found in Central Ethiopia region , particularly found in kambata Zone, kadida gamela woreda which is located approximately 280 km south of Addis Ababa, 120km west of Hawassa and 6km north of durame and the study area is geographically embedded between the Halaba east, Hadia north, Wolaita south and Dawuro in west.

The study mainly focuses on one of Kedida Gamela administration governmental high schools called Roman Dega kedida secondary school on the effect of active learning strategy on the learning achievements of 10^{th} grade students in learning chemistry.

3.2 Research Design

For this study purpose quasi. Experimental design was employed. Quasi. experimental design is efficient to evaluate and determine the effectiveness of teaching method using two groups, one experimental and the other control group (Gay 2003).In both groups a pre-test and a post- test were used to determine the achievement of the groups before and after intervention. In order to compare experimental group students' chemistry achievement who received instruction through active learning method (experimental group) with that of control group that was taught through traditional lecture method, the quasi-experimental design was suitable. In order to take problems related to the effects of active learning method on students learning achievement and perception towards chemistry, the researcher used mixed approach. A static group comparison design was also applied for questionnaires in which post-treatment scores are compared between a control group and an experimental group (Singleton and Straits, 2005).

Table 3.1: Frame Work of Research Design

Population	Sample	Groups		Tools	treatment	Lesson topic	Application	Out put
N=360 Roman Dega secondary school	n=72	N(ex) =36 Experimntal	N(c)=36 control	SAT Questionnaire	AL LBL	Electro chemistry of grade 10	AL for EG LBL for CG	-Result & discussion Recommendations

3.3 Target Population (Participants)

The target population of the study was grade 10 students of Roman Dega secondary school in Kedida Gamela Woreda. In 2016 E.c The total number of grade 10 students enrolled in Roman Dega secondary school was 360 from which 164 were males and 196 were females. To gather sufficient and relevant data for the study the target population of the study includes all 360 of grade 10(A-F) students. In table (2) below the total population of grade 10 students enrolled in Roman Dega secondary school was shown.

Table 3.2: Distribution of students with respect to sex and classes.

No	**Region**	**Town**	**School**	**Ownership**	**Enrolled students**		
	CE	Odorich	Roman Dega	Government	M	F	T
1			10A		27	31	58
2			10B		28	32	60
3			10C		28	33	61
4			10D		24	35	59
5			10E		29	31	60
6			10F		28	34	62
Total					164	196	360

3.4 Sample Size and Sampling Technique

From the total of four governmental high schools in Kedida Gamela Woreda, Roman Dega secondary school was purposively selected by researcher for this study. Target population of the study was grade 10 students. According to (Gay 2003) one rule of thumb for determining an adequate sample size for descriptive research is that it should consists of 10%-20 % of the population under study. Of these, the researcher intended to take 20% of the population as sample size for this study. By using random sampling technique 20% (72) of 360 students were selected. The reason why students were selected randomly from each section was to give them equal chance to be selected.

The sample students were age of (16-17 years) of grade 10. Stratified random sampling is a sampling technique that involves the identification of important sub groups in a particular population. To identify sub groups from the total population stratified random sampling technique was used. To determine the number of students included in the study, the sub groups were allocated from the six sections and the sample size required was 72, so n=72, the total population was 360, so N=360 .Then after for this comparative study, the researcher classified the sample students in to two groups with mixed ability and gender and then purposively assigned to the experimental (N(ex)=36) and control groups (N(c)=36).

Table 3.3: Proportionality allocation to obtain sample students of grade 10A-F

No	**Section**	**Students**	**Sample size**	**Experimental group**	**Control group**
1	10A	60	12	6	6
2	10B	60	12	6	6
3	10C	61	12	6	6
4	10D	58	12	6	6
5	10E	61	12	6	6
6	10F	60	12	6	6
Total	6	360	72	36	36

3.5 Data Collection Sources

A set of primary and secondary data related to the subject of the study would be collected from two sources. The data was collected from primary sources by both qualitative and quantitative (mixed) approach. Hence, in this study, qualitative approach was used to collect data through interview and open-ended questionnaire and quantitative approach was used to collect data from closed ended questioner and achievement test results.

- **Primary sources**: 72 students of grade10 in Roman Dega secondary school ,7 chemistry teachers,3 principals and 1 super visor.
- **Secondary sources:** It was represented by references from books, articles, seminars, master's thesis, additional documents and rosters that dealt with related topics. This enabled accessing the data necessary to clarify the effect of using the active learning method in teaching chemistry on the level of academic achievement of secondary school students. And then appropriate statistical tests like Independent T-test and Paired samples T-test and descriptive statistics frequency of SPSS were used in order to reach valuable indications that support the subject of the study.

3.6 Instrument of Data Collection

Tools or methods that the researcher used in conducting this research were basically: chemistry achievement tests(pre-test and post-test) ,questionnaires , interviews and observation. The validity, reliability and item difficulty of the achievement tests and questionnaire were tested by experienced subject teachers.

3.6.1 The Chemistry Achievement Tests

The pretest with twenty multiple-choice items was delivered to both control and experimental groups to identify students' prior knowledge before intervention. the test was marked and recorded. Chemistry achievement test (post- test) was given for both control and experimental groups after intervention. This test was also marked and recorded.

3.6.2. Piloting Test

Validity and reliability of the research instrument (achievement tests) were piloted accordingly. Geriba secondary school was chosen for the piloting purposes.

3.6.3 Validity of the Tool

Validity is the extent to which an instrument measures what it is supposed to measure .The validity of the tools (the achievement tests and questionnaires) were verified by presenting it to the study advisor and four experienced high school chemistry teachers. The appropriateness of objective, language, content items were seen. Based on their suggestion, corrections were made. Some vague items were removed and the tools rearranged and came to final form.

3.6.4 Reliability of the Tool

The reliability of achievement test was piloted by administering twenty multiple-choice questions on 30 students of grade 10 in Gariba secondary school who were not part of the study sample.. The reliability coefficient is a measure of the error associated to the students‘ scores. Its values can range from 0 to 1. A reliability coefficient of zero would indicate the instrument does not consistently measure anything while coefficient of 1 would indicate the instrument has no measurement error .The Cronbach’s Alpha correlations, if it was 0.7 and above then the test was considered reliable. The instrument reliability coefficient gotten through the use of Cronbach’s Alpha were 0.77 and 0.79 for the Pre-test and post-test tests respectively. The Students Perception Scale was a reliability coefficient of 0.75. It ensured the internal consistency of the instrument used. Therefore, in all cases the instruments had good value to meet the purpose of the present study.

3.6.5 Item Difficulty Index Vs Pilot Test

Pilot test was also conducted in order to calculate item difficulty index and discrimination index . This is a measure of the difficulty of a particular question. The difficulty factor was calculated for each of the test items, using the following equation:

$P(D)_{value}$ =number of people responding correctly/number of people taking the test

It is the ratio of the number of students, who answered the question correctly to the total number of students taking the test. A difficulty index value in the range of 0.2-0.8 is

conventionally considered adequate (Kubiszyn and Borich 2003). A value less than 0.2 indicate that, the questions are too difficult for discriminating and a value more than 0.8 indicates that the question is too easy. Considering difficulty index, the tools were used for data generation**.**

3.6.6 Questionnaire

Questionnaire was one of the data collection tools or methods that the researcher would use. Both close ended and open ended questions was prepared and distributed for the target teachers and students. The researcher used this method because it was the simplest and the familiar way of collecting data and enables to gather data from a large number of people in a short time. To determine student attitudes toward the chemistry lesson before and after the instruction, questionnaires with 12 statements were developed. This was administered at the beginning of the study and at the end of the study (Appendix III).

3.7 Data Collection Procedure

The researcher wrote application for permission to Kedida Gamela Woreda

educational office to conduct the research entitled “the effect of active learning strategy on grade 10 in the achievement of chemistry in Roman Dega secondary school” and got permission. By receiving the letter, the school principal permitted the researcher to conduct the research in the school and facilitated the class rooms for the study. Then after the researcher prepared the action plan to conduct the study on the sample students of target school.(APPENDIX I).

At the beginning, 20 questions of multiple choice item chemistry achievement pretests from electrochemistry was administered for both control and experimental groups in order to collect data about students prior knowledge. The test result was marked and recorded. After pre- test according to the plan the teaching action took place for seven weeks. The time given for teaching each group was 2 hour per week. Total 14 hours were used for each group. The control group was taught in traditional lecture method. Experimental group was taught by active learning strategies for seven weeks total (14) hours 2 hours per a week using group discussion, problem solving, visual-based learning and question and answer methods.

The instructions were accomplished in seven weeks period including two class times per week for each group(control and experimental) by the same teacher After the treatment for experimental group or at the end of seventh week 20 scrambled questions of multiple choice item post -test for both group was administered. The achievement scores of both groups were marked and recorded. The tests score for both tests was out of 20.The two groups were given a student attitude scales, the scale was based on a five point Likert type attitude towards chemistry though learning. An interview questions were also included after post -test in order-gather farther information. Observation was done in classes. From the school recorded class grade 10 students' successive results of chemistry were observed and data was collected.

3. 8 Action Plan & Implementation

3.8.1 Action plan for Experimental group

For this study purpose it was the seven weeks treatment plan for experimental group. The following table show action plan for delivering energy changed and electrochemistry through AL strategies for EG group was selected for this purpose**.**

Table 3.4: Action plan strategies for Experimental group

Week	Topics Electrochemistry	Duration of time	Treatment	
			Teaching methods	Teaching Aids
1	Introduction, Exothermic and endothermic chemical reactiom	2'	Group discussion Gapped Lecture Visual-based	Diagram,wood,fire stove, chalk Black board, duster
2	Electrical Conductivity	2'	Visual based Active Learning Strategy and Experiments	-Wire ,Bulb, chalk Electrodes -Switch
3	-Electrolysis	2'	Question and Answer, Visual based	Diagram, , Wood, Stone, Sulfur
4	Galvanic (Voltaic) Cell	2'	Visual-based, Group discussion ,Experiment	Old car battery, Leclanche cell
5	Electrolysis of molten or fused cell	2'	Visual based, Problem solving	Diagrams showing…
6	*Unit Summary*	2'	Group discussion,	Chalk, duster, black board
7	*(posttest)*	2'	Suggested Methods	Diagrams and Charts

3.8.1.1. Experimental Group

This was the group in which active learning method such as visual -based learning, group discussion, problem solving, experiment and question and answer methods were implemented. The class was divided into 6 sub-groups with six members per sub-group total 36 students. The active learning methods were chosen to teach an Electrochemistry chapter of grade 10 chemistry student text book.

3.8.2 .Action plan for Control group (CG)

For this study purpose it was the seven weeks treatment plan for control group..The following table show action plan for delivering electrochemistry through Traditional lecture method for control group was selected for this purpose.

Table 3.5: Action plan for Control group (CG)

Week	Topics in Electrochemistry	Duration of time	Treatment	
			Teaching methods	Teaching Aids
1	Introduction, Exothermic and endothermic chemical reaction	2'	Lecture	Chart,Duster,Black board
2	Electrical Conductivity	2'	Lecture	,Chalk,Duster,,wire, bulb,board
3	-Electrolysis	2'	Lecture, Demonestration	Chalk,duster,
4	Galvanic (Voltaic) Cell	2'	lecture	Chalk, Duster, old car battery
5	Electrolysis of molten or fused cell	2'	Lecture	Chalk,board
6	Unit Summary – Review Exercise	2'	lecture	Chaik,black board
7	Review questions and posttest	2'	Lecture, Explanation	Chalk,board

3. 8.3Treatment for the Groups

In Roman Dega secondary school, where the research conducted, grade 10 students were the study groups. The researcher was a chemistry teacher of the school. To evaluate the effect of active learning strategy, the researcher selected the chapter Electrochemistry from grade 10 chemistry student text book,. The sample groups CG and EG already took the chemistry achievement pre-test.

3.8.3.1. Active Learning Methods Used in the Study

- ✓ Visual-based learning: the method carried out by usingvisual matters
- ✓ Problem solving: has to do with problems need the solution
- ✓ Group discussion: peer teaching method
- ✓ Activity /Experimental: learning by direct involvement of the students
- ✓ Question and answering: learning by active competition of Question and answering methode

These were some of the methods (AL) for treatment of experimental group on chapter electrochemistry. Different active learning methods were applied which would play a significant role on students' achievement in chemistry. The same teacher taught both groups throughout the study in order to eliminate variations that may have arisen due to instrumentation. In order to see the effect of AL on students chemistry achievement, all possible cares were taken during the study The experimental and control group subjects were given equal time of treatment and observations. To prevent the students from being familiar with the questions of the pre-test and post-test, the test items in the pre-test were scrambled in the post test.

3.8.3.2 Control Group

This group was exposed to the traditional lecture-based instructional method. This method was teacher-centered. The electrochemistry concepts were delivered by explanation, writing key points on the board for the learners while the students listened. It also involved sometimes question and answer sessions .with demonstration by the teacher.

3.8.4 Action Interpretation

The traditional lecture method was used to treat the group. Talk and chalk was the dominant. Even though, the group was treated in ordinary lecture method, the researcher did what expected from oneself to make clear the concepts of electrochemistry in the study. The instruction delivered by the same set of teacher throughout the study. Attendance of the students was taken by the teachers throughout the teaching sessions. The experimental and control group subjects were given equal time of treatment and observation. To prevent the students from being familiar with the questions of the

pre-test and post-test, the test items in the pre-test were scrambled in the post-test. Data obtained in respect of hypotheses and 2 were analyzed using-test in SPSS .at $P \leq 0.05$ significant level.

3.9 Method of Data Analysis

In this study, the researcher collected both quantitative and qualitative data. The gathered data from student achievement tests (pretest and post- test) and questionnaires was systematically arranged. To analyze the data, The Statistical Package for the Social Sciences (SPSS) version 20 computer software was used. The quantitative data obtained from the chemistry achievement test was analyzed by comparative statistical analysis using one sample t-test, mean and standard deviation at 0.05 statistical confidence level. The questionnaire data was also analyzed by simple descriptive statistics like mean, standard deviation and significance value $P \leq 0.05$. Finally statistical significance of the results was evaluated at alpha = 0.05 statistical confidence level based on the objectives and research hypothesis.

3.10 Ethical consideration

Ethics are part and package of the paradigm position held by the researcher while conducting a research. The basic ethical consideration in conducting a research is informed consent. Permission was given for the researcher from Kedida Gamela administration education office, school principals and chemistry teachers for the study. Thus, while conducting close-ended questionnaires, the researcher was request the oral consent of the participants by clearly explaining the objective and significance of the study. The participation of each participant was also base on their willingness (voluntarily). They were pre informed that, they could quit their participation if they felt discomfort without looking permission from the investigator.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter deals with analysis, interpretation and discussion of the research findings. The discussion particularly explains the effect of active learning methods on grade 10 students in the achievement chemistry in Roman Dega secondary school, Kedida Gamela administration. The chapter also presents of chemistry and the students perceptions towards active learning strategy in learning how chemistry achievement test results (pre-test and post-test) and questionnaires were analyzed to compare achievement and perceptions of control and experimental groups so as to accept or reject the research hypothesis based on statistically Significant at $p \leq 0.05$

4.2. Demographic Variables of the Respondents

The number of sample students involved in the study and their gender were explained in . Table 4.1: Number of respondents level of significance.

Respondents	Gender					
	Male	%	female	%	total	%
Students	34	47.2	38	52.8	72	100

From the table above, 52.8% were females and 47.2% were males.

Before talking about the results of the research questions, here given the distribution of respondent groups.

Table 4.2: Distribution of respondents' group type

Respondent Group Type	Frequency	Percent
Control	36	50
Experimental	36	50
Total	72	100

The data presented in table 4.2 show that 50%of the respondents formed the experimental group while 50% the control group

4.3 Analysis of Test Score

In this section that the mean for pre-test, the standard deviation, the mean for post-test and the standard deviation, and the significance value alpha 0.05 could be analyzed. Which is lower than 0.05.The comparison of means of control group (CG) and experimental group (EG) in pre-test and post-test would be discussed.

4.4 The Effect of Active Learning method on Students Achievement in Chemistry

Before giving any treatment, both control and experimental groups were exposed to Chemistry achievement pre-test. So as to determine, the respondents' prior knowledge and academic achievement pretest was administered . For this purpose 20 questions of multiple choice type were used (Appendix I).

4.4.1 Students Chemistry Achievement Pre-test

Both control and experimental groups were exposed to achievement pre-test before treatment. The researcher was interested in pre- test so as to took remedial action if the wide differences would see between the groups.

4.4.2 Comparison of Mean Scores of CG and EG in Pre Test

Comparing the means was used in order to determine the groups prior achievement back ground, both CG and EG were exposed to CAT pretest.

Table 4.3 Comparison of mean scores of the CG and the EG Pre-tests

Group	Paired Samples				
	Group	Mean	N	Std.dev	Std. Error
Pre-test	Control	7.36	36	2.72	0.45
	Experiment	8.03	36	1.65	0 .27

The table (4.3) above Shown the means of both control and experimental groups in pre-test. The means were almost equivalent one another. This confirmed that before any treatment, both groups were on the same chemistry achievement level. The groups of the study clearly indicated that both had equivalent prior achievement in chemistry.

Table 4.4: The paired samples t test for control and experimental groups pretest

Group	Pretest	Paired Differ each conclusion.ences						T	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lowe	Upper			
CG & EG	Pre-con Pre-exp	-.66	2.60	.43	-1.54	.22	-1.53	35 .	0.13

Table (4.4) Confirmed that from paired samples statistics, the academic achievement of CG and EG was not significant. CG and EG had equal achievement.. P > 0.05. or 0.134>0.05.

4.4.3 Students Achievement Post-test

In order to evaluate the effect of active learning method on grade 10 in the achievement of chemistry, both group were exposed to CAT. This was done after intervention at the end of seventh week in Roman Dega secondary Kedida Gamela .

To what extent is the effect of active learning on students' achievement in chemistry? The research question 1 could be answered based on the following research hypothesis :H01: There should be difference in chemistry achievement in AL and lecture based learning class? To know the difference, the researcher used the statistically significant p ≤ 0.05 confidence interval alpha parameter.

4. 4 .4 Comparison of means of pre-test and post- test of control group

Control group, where traditional lecture method was exposed to post -test . This was done at the end of seventh week.

Table 4.5 Mean Scores of CG in Pretest Post test

Group	Pre-Post tests	Mean	N	Std. Deviation	Std.Error Mean
CG	post control	8.36	36	2.39	0.39
CG	pre control	7.36	36	2.71	0.45

Table (4.5) represents Paired samples statistics mean, SD and std. error mean of control group pre test and post test. Of course there was increasing change on the mean score in post test , however, the number was not significant.

In order to assure the change in academic achievement of the control group paired samples test was applied.

The table below shows the t-value df and sig(2-taild) of CG pretest post test.

Table 4.6: Significance of CG pretest and post test in achievement test

Groups	Paired Differences					T	Df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Postcon_pre control	1.00	3.52	0.58	-.19	2.19	1.7	35	0.097

On grade 10 students in Roman Dega secondary school in ,Kedida Gamela Administration. the findings from table (4. 6) (CG) on which traditional lecture applied was scored low grade on post- test .p>0.05 which was not significant. or 0.097 > 0.05 no significant.

The paired sample statistics t-test analyzed the CG pre -test post test scores and p=0.097. .Since p = .097 was greater than alpha (0.05).p > 0.05.In short, the paired-test result p = 0.097. sig(2-taild) = .097 is not significant at 0.05 level of significance. From the researcher point of view based on the result, traditional lecture method which was one of the independent variable of the study which resulted in poor achievement in chemistry

4.5 The achievement post test result of EG

After the treatment EG took 20 questions of multiple choice items from energy change and electrochemistry on grade 10 chemistry text book. The test score of each student was analyzed in SPSS software. From SPSS the parameter .like mean was analyzed using paired samples t-test in 95% confidence interval.

Table 4.7 Mean Scores of EG Pretest & Post -test.

Groups	Pre-Post tests	Mean	N	Std. Deviation	Std. Error Mean
EG	post experimental	17.22	36	2.66	0.44
	Pre experimental	8.03	36	1.65	0.27

From the above table (4.7) one can see a great change in mean score in post –test after the intervention. The experimental group mean scores in pre- test and post- test were 8.03 and 17.22 respectively.

4.5.1 Checking Experimental Group Pre Test Post Test Significance

In order to check the significance of experimental group score ,Paired Samples Test was applied.

Table 4.8 Significance of EG Pretest & post test(CAT)

Group	Tests	Paired Differences					T	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std Error M	95% Confidence Interval of the Difference				
					Lower	Upper			
EG	postexp -preexp	9.19	2.97	0.49	8.18	10.20	18.54	35	.00

.From paired sample statistics t-test, the experimental group pre- test post- test was p=0.00 sig(2-taild) or $p \leq 0.05$ which is significant. Here AL methods applied were effective

4.7 The effect of active learning method on students' perceptions toward chemistry

4.7.1 Questionnaires

To examine the students' attitude towards chemistry based on active learning approach, a set of questionnaire was framed by using five-point Likert scale. The questionnaire consisted of 12 statements pertaining to the students' attitude towards chemistry based on active learning approach in teaching and learning chemistry. It was conducted to the sample groups before and after intervention. The target population was Roman Dega secondary school students control (CG) and experimental groups EG). The instrument used in this study was questionnaire (Appendix III). Respondents were 72 students. Total 72 questionnaires were distributed. (72) Questionnaires on students perception towards chemistry based teaching strategies especially active learning and lecture based learning were filled by students of the two group and called students' perception towards chemistry (Pretest). After collecting the filled questionnaires, all papers counted and none of questionnaire was invalid by the respondent because all of them were the study group. The questionnaire was developed based on the relation, active learning and Perception/ attitude issues and arguments raised in previous literature about the topic. The questionnaire was structured into four parts with close-ended questions..

1. Chemistry and teaching methods
2) students interest towards chemistry
3). Importance of chemistry in life
4). Subject contents difficulty

At the end of intervention, the same questionnaire was distributed as (Post- test).Using the rating scale the respondent answered like strongly agree (SA = 5), Agree (A =4),undecided (U =3), disagree (D =2), and strongly disagree (SD =1) respectively . In order to determine the effect of active learning strategy on students attitude/perception towards chemistry student's T test was done, P value was calculated and the comparison of attitudes/perception towards chemistry was computed. Paired samples test gave the value of significance at $p \leq 0.05$ level of significance. To determine whether students' perception was positive or negative towards chemistry the data were analyzed using frequency and percentage. Statistical Package for Social Science (SPSS) was used to analyze the data,

4.8 Students' perception towards chemistry based on active learning

.The following table presents twelve attitudinal questionnaires of CG and EG towards chemistry. These questionnaires were administered twice (pre & post) for the whole sample groups and their means were analyzed.

Hypothesis H02: There should be difference in students' perceptions toward chemistry between active learning (EG) and passive learning (CG) classes.

To determine whether to accept or reject the hypotheses, this study employed a static group comparison design (Singleton and Straits, 2005), in which post-treatment scores are compared between a control group (CG) and an experimental group (EG). To control for internal validity (Singleton & Straits, 2005), the same teacher taught both CG &EG.

Table 4.9 (CG) & (EG). students' Perception Towards Chemistry Pretest and Post test

Table 4.9 (CG) & (EG). students' Perception Towards Chemistry Pretest and Post test

№	Students view(perception) towards chemistry through Active Learning strategies	Mean scores in pre- test & post test			
		Control (CG)		Experimental (EG)	
		Pretest	Post test	Pretest	Post test
1	I feel happy when I learn Chemistry	4.25	4.25	4.26	4.61
2	Students understand chemistry better through Active Learning strategies	4.22	4.23	4.21	4.90
3	Experiment method makes students active learners than traditional lecture method does in chemistry.	4.19	4.30	4.00	4.58
4	I positively perceive chemistry while I learn it in active learning approach than lecture based method	4.22	4.23	4.21	4.90
5	When teachers use group discussion method students engagement is high in Chemistry classes	4.19	4.30	4.00	4.58
6	Visual based learning process make students alert and active in chemistry classes.	4.22	4.28	4.25	4.76
7	I like chemistry subject when teacher facilitate learning process	3.86	4.00	3.84	4.24
8	Active learning is time killing process in chemistry	4.25	4.30	4.20	4.70
9	Chemistry becomes my first choice because of its importance in life	4.17	4.17	4.20	4.60
10	All chemistry contents are difficult	1.67	1.67	2.10	3.70
11	**I** enjoy chemistry because of its importance	3.89	3.82	4.00	4.80
12	I don't feel comfort while I learn Chemistry	4.11	4.20	4.20	4.60

4.8. 1 Summary on comparison of EG and CG Pre- test and post -test mean scores on students perception towards chemistry scale

4.8.1.1. Comparison Between Means of EG and CG Perception in Pre-Test

Table 4.10: Comparison between means of EG and CG in pre-test(Students' perception)

Test	Groups	Mean	N	Std. Deviation	Std. Error Mean
Pretest	Control	3.79	12	0.82	0.23
	Experimental	3.83	12	0.72	0.20

Table 4.10 presents the means of EG and CG in pre- test students' perception towards chemistry. The means were equivalent. In other words both had similar attitude towards chemistry before intervention. This shows that experimental and control groups are found in similar level of performance in chemistry before interventions were done. The equivalence of two groups was confirmed by using Paired Samples test by using their means. The difference of their means was not significant.

Table4.11 Paired Samples Statistics for pre control-pre experimental

Group	Pretest	Paired Differences					T	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
CG & EG	precon – preexp	-0.03	0.14	0.04	-0.13	.05	-0.94	11	.36

From the table (4.11) at P≤ 0.05 significant level, CG &EG perception towards chemistry was not significant 0.36 > 0.05. paired samplet test of experimental and control groups pre-test P=0.36 that is greater than 0.05. There is no significant difference between the mean performance score of the experimental and control group on pre-test. This was indicating that the two groups of students were equivalent performance in chemistry achievement before the treatment was given.

4.8.1.2 **Comparison Between Means in Pre-Test and Post- Test of CG Perception**

Table 4.12: Comparison between means in pre-test and post- test of CG perception

CG post-Pretest	Mean	N	Std. Deviation	Std. Error Mean
Post test	3.82	12	0.83	0.24
Pretest	3.79	12	0.82	0.23

Table4.12. tells us comparable means of CG in pretest &post test. After the treatment there was no significant perception difference within the group. shows that the mean score of control group before the action and after learning chemistry lesson by pure lecture methods. As shown in the above table, the control group students' result of pretest mean score was 3.79 then after seven weeks period of learning through convectional lecture method their mean score became 3.82. This shows that the mean

score of post-test control group result was little improve from the pretest mean score result.

Table 4.13:Paired Samples Test for (CG) pretest post test perception

Group	Pretest Posttest	Paired Differences					T	df	Sig. (2-tail)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Control(CG)	Post test – pre test	.037	.057	.016	.0008	.074	2.2	11	.076

The findings in table 4.13.reveals that there was no significant change in CG pretest post -test after intervention. In other words in CG where traditional lecture method was exercised there was no attitudinal change towards chemistry throughout the study .076 > 0.05 is not significant at $p \leq 0.05$ significance level.

4.8.13 Comparison Between Mean Scores in Pre-Test and Post Test of EG Perception

In order to check students achievement change of means were compared.

Table 4.14 Comparison between means of EG pretest-post -test perception

Group	Tests	Mean	N	Std. Deviation	Std. Error Mean
Experimental(EG)	Post test	4.41	12	0.51	0.15 .
	Pre test	3.83	12	0.72	0.20

Table 4.14: shows that there was change in mean scores which describes AL strategy used bring positive perception change.

Table 4.15: Paired Samples Test for EG pretest-post- test perception

Group	Pretest post test	Paired Differences					T	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Experimental	Post-test – pretest	0.58	0.36	0.10	0.35	0.81	5.59	11	.00

Table 4.15: Clearly shows the mean scores of EG increased.AL strategy used was effective.

The change was significant at $p \leq 0.05$ significance level. To determine whether to accept or reject the hypotheses, this study employed a static group comparison design (Singleton & Straits, 2005), in which post-treatment scores are compared between a control group and an experimental group..

Table4.16: Mean Scores of CG and EG Perception Post- test.

Groups	Tests	Mean	N	Std. Deviation	Std. Error Mean
CG&EG	Post- test(EG)	4.41	12	0.52	0.15
	Post -test(CG)	3.82	12	0.83	0.24

The table 4.16 shows means of post- tests of CG and EG. This reported that after treatment the perception of students' towards chemistry was positively changed. The response of each student CG and EG for perception towards chemistry post- test was analyzed based on the average score in SPSS and revealed that AL used was effective

Table 4.17 paired sample statistics for post- tests CG and EG(perception)

Groups	Post test	Paired Differences					T	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
CG& EG	Post-test(EG) – post -test(CG)	0.58	0.50	0.14	0.26	0.90	4.02	11	.002

Table 4.17: Paired Sample Statistics for post -tests CG and EG 0.02 which was lower than 0.05.P < 0.05 was significant .There was clear difference between CG and EG students' perception towards chemistry. The change would be the effect of active learning in EG.

4.9 What is the Students' Background about Active learning method?

To identify the students background about active learning method in teaching learning process ,the researcher made interview with 7 chemistry teachers,3 the school principals and one cluster supervisor. Interview with students were not done because of students variation. To get the reliable response ,the researcher intentionally included supervisor and the school principals. The designed interview questions were(Appendix IV).

4.9.1 Interview

From a long time teaching experiences in Roman Dega high school., the researcher identified the problem to be researched like current title on the school. In order to get others view on the implementation of active learning method and to conduct this study the researcher used open-ended item interview. Structured interview was also used.. However, he would not have interview with students due to time and other related challenges.

Researcher: Is your school implementing Active Learning method on the moment in chemistry ? If so, how do you evaluate?

Teacher 1: Yes, I attempted to do all my best so far. This in turn, helps some students able to improve their problem solving skill.

Teacher 2: In my opinion teachers in my school are not implementing this learning so far.

Teacher 3: No, the principals are striving to implement the government's policy. They believe and want to believe what the authorities said is true. However, I am exerting my own effort.

Teacher 4:No, almost all the teachers in my school are not implementing active learning techniques because they think it is time wasting. They usually use the traditional approach.

Teacher 5: No, I do not think so.

Teacher 6.:No,for the sake of meeting agenda. No implements the method truly

.Teacher 7. No , so many hindering factors factors are there.

Main principal: It is difficult to say yes. It is not only teachers' but also we are no ready.

Academic vice director:. No. from teachers lesson students do not learn with AL method.

Second vice director : No: even merging classes are problems. Once upon started but nowadays no more implementation.

Supervisor: No, .teachers raise many hindering factors like class size facilities ,subject load and students lack of interest.

.Almost 90% of the teachers responded that there was no implementation of active learning techniques in their school, 10% of them responded that there was the trial of implementation in their classes only this means they had a doubt on their school towards the practice of active learning method.100%principals confirmed that as there was no effective implementation of active learning method in the school. Cluster supervisor also assured that there was no continues implementation of active learning method. Therefore, standing from this information the researcher believed that most of the school chemistry teachers were highly immersed to use the traditional teaching method. Including this (EG) and (CG) groups, the students background in the school was identified in practice of teacher centered method in which students were considered as an

empty barrel expected to be filled by the teacher's knowledge and little experience of active learning method. From this the back ground of students of the school revealed that they were influenced in the lack of implementation of active learning method.

4.9.2 Presentation and analysis of data obtained through observation

As I understood from (Appendix III) all(6) of the chemistry classes I had observed only 15% had enough sitting space for all students, but in most (85%) of the classrooms there was no enough sitting space for all of the students. This data proved that the classroom condition and the sitting arrangement were not convenient to implement active learning .All(100%) of the desks were arranged in straight order. Such kind of arrangement is only important for the traditional lecture method. This was another outlook for me to consider that active learning method implementation very less. All(100%) of the class size was not appropriate for the implementation of active learning method there was an average of 59 students in one classroom. There was little or 25% space for movement between desks, but in most cases 75% of the classes there was no enough space for movement between desks. Thus, all data showed that the physical environment of the classrooms does not reflect the required conditions for the practice of active learning method.

4.10 Discussion

The major finding of the study was that the use of active learning method on grade 10 students enhanced the academic achievement in chemistry. Because in (CG) and (EG) post test a statistical significance p value was 0.000 which was lower than 0.05 significance level. 0.000< 0.05 or P < 0.05 was significant. In other words the active learning method applied on grade 10 was effective. The null hypothesis H01:"There should be statistical significant difference in students chemistry achievement between active learning method applied (EG) and lecture based learning(CG) groups was accepted. The (EG) showed greater improvement than (CG) in chemistry achievement post test . There fore,the effect of active learning method on grade 10 students in the achievement of chemistry was higher in Roman Dega secondary school, Kedida Gamela administration.

This finding was in line with the study carried out by (Abogye 2012) which aimed to find effects of Active Learning Approach on learners' achievement in physical science

and showed that students who were treated with active learning approach resulted in more positive learning outcomes compared to those who were treated with traditional lecture method.

Similar positive findings were also revealed by (Soltanzadeh et al.,2013) that active learning approach in the classroom has positive impact on quality of the students' learning process and also motivated them to learn more; (Yoder and Hochevar 2005) also conducted study on encouraging active learning which can improve students' performance on examinations;(Mello and Less,2013) conducted a study on the effectiveness of active learning in the arts and science in the college level. (Mamashela and Kibirige, 2013) conducted study to examine the effects of active learning on grade 10 learners' performance in physical sciences and (Sesen and Tarhan , 2005) conducted study for effects of active learning on high school students' learning achievement and attitude towards chemistry lesson.

All their findings revealed that there were significant improvements on students academic students' learning outcome of the students when active learning was incorporated in the lessons.

The second major finding of the study was that grade 10 students had a positive viewpoint towards chemistry on the effect of active learning method. In post test the p value was 0.02 $P < 0.05$ was significant. There was statistically significant positive perception towards chemistry for active learning method applied group (EG) than lecture based learning group (CG) .The lecture based group (CG) showed no significant perception change towards chemistry after intervention.Therefore,active learning method had positive impact on (EG) students perception towards chemistry. The null hypothesis H02:"There should be statistical significant difference in students perception towards chemistry between active learning method applied group (EG) and lecture based learning(CG) groups was also accepted.

This result was parallel with the findings of (Alzyoud 2013) who found out in his study that students had positive perspective for active learning approach as compared to traditional approach. also found out that the use of active learning approach in the classroom helped students engage in the activities, interact, discuss, share and express their thoughts which motivated them to learn more.

The major findings of the third objective was almost 90% of the interviewed teachers and 100% principals and supervisor responded that there was no implementation of active learning techniques in the school, Therefore, Standing from this information the researcher believed that most of the school chemistry teachers were highly immersed to use the traditional teaching method. Including this (EG) and (CG) groups, the students background in the school was identified in practice of teacher centered method in which students were considered as an empty barrel expected to be filled by the teacher's knowledge and little experience of active learning method.

All(100%) of the desks were arranged in straight order. Such kind of arrangement is only important for the traditional lecture method.

There was little attention given to implement active learning method in teaching learning process. Due to this reason the current students background identified as no special luck or opportunity was afforded for them. As the researcher investigated the main constrains were: Lack of instructional materials ,class size problems, lack of interest of teachers towards teaching and some students participation towards teachers negatively affect the implementation active learning method and in turn chemistry learning achievement of the students.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The results of the study revealed that by using statistically significant value, $p \leq 0.05$ significance, the researcher concluded active learning methods which were applied on grade 10 were effective to enhance grade 10 students' achievement and positive point of view towards chemistry. On the other hand, the mean scores of EG in pretest and post-test was significantly increased in both achievement and perception cases. $p < 0.05$ Which was significant. There were significant differences between the groups. This was due to the implemented active learning methods on EG. To sum up this, the proposed H01 and H02 were accepted. EG showed greater improvement than CG. Majority of students in the experimental group shared that active learning approach helped them to develop their interest, curiosity and provided them with lots of enjoyment and fun. Finally, the researcher concluded that the significant change on EG in achievement test and positive perception towards chemistry was nothing else but effect of active learning method.

To enhance the students learning achievement, the implementation of active learning method should be assured .Factors such as class size, facilities, skilled man power, and interest were identified as challenges. In Roman Dega secondary school to conduct this research the students' background was identified. Both groups came across through lecture based teaching learning process. There was no more active learning implementations on the groups before. In this study the prior background in chemistry achievement and perception towards chemistry of CG & EG were fairly identified.

5.2 RECOMMENDATIONS

Based on the findings of the study, the following recommendations have been made for the better teaching and learning of chemistry.

Teaching through active learning approach had positive impact on learning outcome of the students. The result from this study showed that the learning outcome score of the posttest was higher than the pretest score. Therefore, use of active learning approach into daily classroom in teaching chemistry is highly recommended. The study also recommends the school administration to focus on active learning approach and provide professional development to teachers.

- ✓ Teachers may also use active learning as a teaching strategy to enable students to be engaged in the teaching learning process rather than using the traditional way.
- ✓ Further research may be carried out to study the effectiveness of Active Learning Approach in other subjects and other level of education.
- ✓ The curriculum designers also take to account, whether the contents of grade 10 chemistry text book are advisable to practice active learning approaches or not.
- ✓ Stake holders should take part to facilitate active learning by minimizing the hindering factors of AL such as class s size, facilities, skilled man power, etc

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APPENDIX I

WOLKITE UNIVERSITY

SCHOOL OF GRADUATE STUDIES

DEPARTMENT OF CHEMISTRY

Chemistry achievement test on electrochemistry (pre-test)

For both Control and Experimental groups

The objective of this achievement test is to collect data on "The effect of active learning method on grade 10 students' in the achievement of chemistry in Roman Dega secondary school, Kedida-Kembata". Since the reliability of the information depends on the objectivity of your responses, you are kindly requested to be as frank and honest as possible.

I. Personal information

Sex ….....Male……..... Female……. Age …….

Instructions

The test consist of 20 questions (multiple choice items).Please provide your responses by circling the letter that contains the correct answer. If you come across with vague questions ask for clarification. Do not write your name finally, your answer remains strictly confidential and will not affect your class room results of chemistry.

Instruction: Choose the correct answer from the suggested options

1. Which one of the following solutions shows no current flow in an electrolytic cell? a) .water solution of table salt c) hydrochloric acid solution
   b) sugar solution d) molten sodium chloride

2.Which of the following is not correct about voltaic cells?
   a) the anode is negative c)oxidation takes place at the cathode
   b) the cathode is positive d) redox reactions produce electricity in the cell

3. Which of the following conditions is not used to electroplate a tray made of iron with chromium?

a) using chromium as the anode b) using an electrolyte containing iron (III) ions
c) using the tray as the cathode d) using an electrolyte containing chromium ions

4. Electrolysis is not used for the: a) purification of metals b) production of metals

c) electroplating of metals d) production of electricity

5. Which substance is not used in the Leclanche cell?

a) H_2SO_4 b) NH_4Cl c) MnO_2 d)powdered carbon

6. Which one of the following is correct about automobile batteries?

a) the electrodes in the battery are graphite electrodes

b) each cell in the battery delivers 1.5 volts

c) the electrolyte is aqueous H_2SO_4 solution

d) lead (IV) oxide is used as anode

7. Which of the following occurs during electrolysis of the molten binary salt of a metal:

a) the metal in the salt will deposit on the cathode

b) reduction will take place at the anode

c)oxidation will take place at the cathode

d) no current will flow through the molten salt

8. Which substance does not conduct electricity?

a) Solid $CaCl_2$ b) dilute aqueous solution of HCl

c) aqueous NaCl solution d) molten $PbBr_2$

9. Two copper electrodes dipped in copper sulphate solution are connected to a 12 volt battery. The electrode connected to the end of the battery marked with a "_" is:

a) anion b)anode c)cathode d)cation

10. The charge-carriers in electrolytic conduction are:

a) Cations only c) anions only

b) Cations and anions d) delocalized electrons

11. When electric current is applied externally, which of the following produces a redox reaction? a) Wood b) solid sugar c) electrolytic cells d) diamond

12. During the electrolysis of fused sodium chloride, the anode half reaction involves:

a) oxidation of sodium atoms to ions

b) reduction of chlorine atoms to give chloride ions c) reduction of sodium ions to form free metal

d) oxidation of chloride ions to elemental chlorine

13. Metals conduct electricity. This is because metals possess:

a) freely moving ion b) all electrons held in fixed position

c) delocalized electrons d) valence electrons that are strongly bound to the nucleus

14. Increasing the concentration of ions in an electrolyte solution:

a) increases the extent of conduction of electricity through it

b) decreases the extent of conduction of electricity through it

c) has no effect on the conduction of electricity

d) changes the direction of electron flow

15. Voltaic cells and electrolytic cells are similar in that:

a) the anode is positive and cathode is negative in both types of cells

b) oxidation half-reaction occurs at the cathode in both types of cells

c) both types of cells contain two electrodes in contact with electrolytes

d) reduction half-reaction occurs at the anode in both types of cells

16. The conduction of electricity through each of the following substances is caused by the migration of ions except in one case; the exception is:

a) fused lead bromide c) molten KCl

b) Aqueous solution of NaCl d) graphite

17. Four different solutions of equal volume (1 L) were prepared by dissolving one mole of each of the following substances. The conduction of electricity is least in the solution containing: a) HCl b) HNO_3 c) CH_3COOH d) KCl

18. Strong electrolytes differ from weak electrolytes in that strong electrolytes:

a) are poorer conductors than weak electrolytes

b) ionize to a smaller extent than weak electrolytes

c)produce greater numbers of ions in aqueous solution as compared to weak electrolytes d)do not conduct electricity in aqueous solutions

19. Which of the following is a wet voltaic cell?

a) Leclanche cell c) cells used in electroniwriwatches

b)cells used in mobile telephones d) lead-storage cell

20.The basic components of conductivity apparatus do not include:

a) electric wires, b electrodes c) ad.c. source or dry cells d)condenser

Prepared by: chemistry department

APPENDIX **II**

WOLKITE UNIVERSITY

SCHOOL OF GRADUATE STUDIES

DEPARTMENT OF CHEMISTRY

Chemistry achievement test on electrochemistry(post-test)

For both Control and Experimental groups

The objective of this achievement test is to collect data on "The effect of active learning method on grade 10 students' in the achievement of chemistry in Roman Dega secondary school, Kedida-Kembata." Since the reliability of the information depends on the objectivity of your responses, you are kindly requested to be as frank and honest as possible.

I. Personal information

Sex …..... Male……....female…….. Age …….

Instruction

The test consist of 20 questions (multiple choice items).Please provide your responses by circling the letter that contains the correct answer. If you come across with vague questions ask for clarification. Do not write your name finally, your answer remains strictly confidential and will not affect your class room results of chemistry.

Instruction: Choose the correct answer from the suggested options

1.Which of the following occurs during electrolysis of the molten binary salt of a metal:

a) the metal in the salt will deposit on the cathode

b) reduction will take place at the anode

c)oxidation will take place at the cathode

d) no current will flow through the molten salt

2. The charge-carriers in electrolytic conduction are:

a) Cations only c) anions only

b) Cations and anions d) delocalized electrons

3. Which substance does not conduct electricity?

a) solid $CaCl_2$ b) dilute aqueous solution of HCl

c) aqueous NaCl solution d) molten $PbBr_2$

4. Strong electrolytes differ from weak electrolytes in that strong electrolytes:

a) are poorer conductors than weak electrolytes

b) ionize to a smaller extent than weak electrolytes

c)produce greater numbers of ions in aqueous solution as compared to weak electrolytes

d)do not conduct electricity in aqueous solutions

5.The basic components of conductivity apparatus do not include:

a) electric wire b)electrodes, c) ad.c. source or dry cells, d)condenser

.6.Two copper electrodes dipped in copper sulphate solution are connected to a 12 volt battery. The electrode connected to the end of the battery marked with a "_" is:

a) anion b) anode c) cathode d)cation

7. Which one of the following solutions shows no current flow in an electrolytic cell?

a) water solution of table salt c) hydrochloric acid solution

b) sugar solution d) molten sodium chloride

8. Which of the following conditions is not used to electroplate a tray made of iron with chromium?

a) using chromium as the anode

b) using an electrolyte containing iron (III) ions

c) using the tray as the cathode

d) using an electrolyte containing chromium ions

9.Which one of the following is correct about automobile batteries?

a) the electrodes in the battery are graphite electrodes

b) each cell in the battery delivers 1.5 volts

c) the electrolyte is aqueous H_2SO_4 solution

d) lead (IV) oxide is used as anode

10. Which of the following is not correct about voltaic cells?

a) The anode is negative c) oxidation takes place at the cathode

b) the cathode is positive d) redox reactions produce electricity in the cell

11. Voltaic cells and electrolytic cells are similar in that:

a) the anode is positive and cathode is negative in both types of cells

b) oxidation half-reaction occurs at the cathode in both types of cells

c) both types of cells contain two electrodes in contact with electrolytes

d) reduction half-reaction occurs at the anode in both types of cells

12. Which of the following is a wet voltaic cell?

a) Leclanche cell c) cells used in electronic wrist watches

b) cells used in mobile telephones d) lead-storage cell

13. Increasing the concentration of ions in an electrolyte solution:

a) increases the extent of conduction of electricity through it

b) decreases the extent of conduction of electricity through it

c) has no effect on the conduction of electricity

d) changes the direction of electron flow.

14. When electric current is applied externally, which of the following produces a redox reaction? a) Wood b) solid sugar c) electrolytic cells d) diamond

15. Four different solutions of equal volume (1 L) were prepared by dissolving one mole of each of the following substances. The conduction of electricity is least in the solution containing: a) HCl b) HNO_3 c) CH_3COOH d) KCl

16.Metals conduct electricity. This is because metals possess:

a) freely moving ions b) all electrons held in fixed position

c) delocalized electrons d) valence electrons that are strongly bound to the nucleus

17. The conduction of electricity through each of the following substances is caused by the migration of ions except in one case; the exception is:

a) fused lead bromide c) molten KCl

b) aqueous solution of NaCl d) graphite

18. Electrolysis is not used for the: a) purification of metals b) production of metals

c) electroplating of metals d) production of electricity

19.During the electrolysis of fused sodium chloride, the anode half reaction involves:

a) oxidation of sodium atoms to ions

b) reduction of chlorine atoms to give chloride ions

c) reduction of sodium ions to form free metal

d) oxidation of chloride ions to elemental chlorine

20. Which substance is not used in the Leclanche cell?

a) H_2SO_4 b) NH_4Cl c) MnO_2 d) powdered carbon

APPENDIX III

WOLKITE UNIVERSITY

SCHOOL OF GRADUATE STUDIES

DEPARTMENT OF CHEMISTRY

Questionnaire to be filled by students'

Dear student: First of all, I would like to say thank you for your cooperation to fill these questionnaires. The main objectives of these questionnaires is to study The effect of active learning strategies on grade 10 in the achievement of chemistry in Roman Dega secondary school in Kedida Kembata. Please respond honestly and frankly as the information obtained confidently and be used only for research purposes.

Part one: Background information

Name of the school _____

Please put a tick (√) mark in the following box in front of the given information

1. Sex Male Female

2. Age A. 15 – 18 B. 19 – 22 C. 23 – 26 D. 27 and above

3. Grade level 10^{th}

I. Students perception towards active learning strategies on grade 10 in the achievement of Chemistry in Roman Dega secondary school kedida-Kembata

№	Students view(perception) To Wards chemistry through Active Learning strategies	Mean scores in pre test & post test			
		Control (CG)		Experimental (EG)	
		Pretest	Post test	pretest	Post test
1	I feel happy when I learn Chemistry	4.25	4.25	4.26	4.61
2	Students understand chemistry better through Active Learning strategies	4.22	4.23	4.21	4.90
3	Experiment method makes students active learners than traditional lecture method does in chemistry.	4.19	4.30	4.00	4.58
4	I positively perceive chemistry while I learn it in active learning approach than lecture based metho	4.22	4.23	4.21	4.90
5	When teachers use group discussion method students engagement is high in Chemistry classes	4.19	4.30	4.00	4.58
6	Visual based learning process make students alert and active in chemistry classes.	4.22	4.28	4.25	4.76
7	I like chemistry subject when teacher facilitate lear	3.86	4.00	3.84	4.24
8	Active learning is time killing process in chemistry	4.25	4.30	4.20	4.70
9	Chemistry becomes my first choice because of its importance in life	4.17	4.17	4.20	4.60
10	All chemistry contents are difficult	1.67	1.67	2.10	3.70
11	**I** enjoy chemistry because of its importance in life	3.89	3.82	4.00	4.80
12	I don’t feel comfort while I learn Chemistry	4.11	4.20	4.20	4.60

II. Common Active learning techniques used by teachers

7. Do you know the common Active learning strategies used by your Chemistry teachers in Chemistry classes regularly?

A. Yes B. No

8. Which Active learning technique does your Chemistry teacher commonly used in Chemistry lesson?

A. Pair work C. Question and answer

B. Discussion method D. Group work E.All

III**. The knowledge of students on supplementary Active learning strategies**

9 Mention supplementary Active learning strategies?

_____

10. How do you perceive Active learning in providing students opportunities to be engaged in Chemistry classes?

VI. Hindering factors of implementing Active Learning Techniques in Roman Dega secondary school in kedida-Kembatta.

R. No	Factors towards the implementation of Active Learning Techniques	Strongly agree	Agree	Have no idea	Disagree	Strongly disagree
1	Lack of interest and motivation					
2	Shortage of well qualified teachers					
3	Facilities					
4	Large class size					
5	Shortage of text books					

Additional comments: What additional information or opinions do you have in relation to implementation of ALT in Chemistry Classes?

_____

APPENDIX **IV**

WOLKITE UNIVERSITY

SCHOOL OF GRADUATE STUDIES

DEPARTMENT OF CHEMISTRY

Interview Questions for Teachers

1. What do you think of Active Learning Techniques done in Chemistry classes at your school?
2. Do you think that all Chemistry teachers have good understanding of Active Learning Techniques?
3. What are the main techniques you use to assess learners understanding of the lesson in your class? Do you plan to keep it this way?
4. In what ways do you think your students are benefited from the implementation of Active learning methods in Chemistry classes?
5. Do you find Active learning helpful in the achievement of Chemistry? How?
6. What do you think should be done for the successful implementation of Active learning methods?

APPENDIX V

WOLKITE UNIVERSITY

SCHOOL OF GRADUATE STUDIES

DEPARTMENT OF CHEMISTRY

Students Achievement Tests(Pre-test & post test) Results of CG & EG(20%)

№	Pre-test(CG)	post test(CG)	pre-test(EG)	Post test (EG)
1	9.00	10.00	7.00	17.00
2.	7.00	9.00	9.00	15.00
3	7.00	8.00	7.00	19.00
4	9.00	10.00	10.00	20.00
5	10.00	11.00	9.00	17.00
6	6.00	8.00	9.00	19.00
7	9.00	10.00	6.00	17.00
8.	8.00	9.00	8.00	20.00
9	8.00	8.00	8.00	14.00
10.	9.00	9.00	7.00	19.00
11.	7.00	13.00	7.00	18.00
12	7.00	6.00	8.00	15.00
13	8.00	6.00	9.00	20.00
14	6.00	7.00	7.00	19.00
15 .	6.00	5.00	13.00	17.00
16 .	4.00	5.00	6.00	15.00
17.	13.00	13.00	7.00	19.00

18.	5.00	7.00	8.00	13.00
19.	9.00	9.00	8.00	10.00
20.	6.00	5.00	10.00	16.00
21.	3.00	11.00	7.00	20.00
22.	7.00	7.00	8.00	19.00
23.	9.00	9.00	9.00	17.00
24.	8.00	8.00	9.00	19.00
25.	7.00	7.00	8.00	11.00
26.	7.00	6.00	11.00	15.00
27.	5.00	9.00	9.00	20.00
28.	8.00	9.00	9.00	18.00
29.	6.00	15.00	7.00	20.00
30.	8.00	4.00	9.00	20.00
31.	8.00	10.00	8.00	17.00
32.	7.00	9.00	9.00	19.00
33.	8.00	8.00	5.00	16.00
34.	9.00	7.00	4.00	13.00
35.	7.00	6.00	7.00	20.00
36.	5.00	8.00	7.00	17.00