EFFECT OF LEARNING MODELS ON LEARNING OUTCOMES OF PHYSICS STUDENTS IN MINNA METROPOLIS, NIGER STATE

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ABSTRACT

This study investigated the effect of learning models on the learning outcomes of physics students in Minna Metropolis, Niger State. The study used a quasi-experimental research design, with a pretest-posttest control group. The participants were 50 physics students, who were randomly assigned to two groups: the experimental group and the control group. The experimental group was taught using a student-centered learning model, while the control group was taught using a teacher-centered learning model. The study's objective was to determine whether there was a significant difference in the learning outcomes of the physics students who were taught using a student-centered learning model compared to those who were taught using a teacher-centered learning model. The data collected were analyzed using descriptive statistics and inferential statistics (t-test). The results of the study revealed that the experimental group (the group taught using the student-centered learning model) had significantly higher mean scores on the posttest compared to the control group (the group taught using the teacher-centered learning model). This implies that the student-centered learning model was more effective in improving the learning outcomes of physics students in Minna Metropolis. Overall, the findings of this study suggest that the learning model used by physics teachers can significantly affect the learning outcomes of their students. Therefore, it is recommended that physics teachers should adopt student-centered learning models in their classrooms to enhance the learning outcomes of their students. This study contributes to the literature on the importance of using student-centered learning models in teaching physics in Nigeria, particularly in Minna Metropolis, Niger State.

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CHAPTER ONE

6.0 INTRODUCTION

6.1 Background to the Study

Learning outcomes can be understood in various literature as what is expected of students, ability, or perceived value in a component of learning (Nitko, 2001). The goal of learning science in elementary school is for pupils to develop the ability to learn, be responsible, understand, and be interested in learning, all of which will help them survive in society (Close, 1973). The issue that arises as a result of learning science is that the results have not been adequate (OECD PISA 2013, Kemendikbud, 2011). The learning process is still based on cognitive capacity, and mastering 21st century learning abilities necessitated a lot of bias on the part of the pupils (Trilling & Fade, 2009). As a result, there is a need to improve the learning process and learning outcomes in order to meet science learning objectives.

The ability to think critically is one of the 21st century skills that pupils must possess (Trilling & Fades, 2009). One of the internal characteristics that influences learning outcomes is critical thinking ability (Kowiyah, 2012). This talent can be honed and researched (Trilling, & Fades, 2009, Paul, 1995). Gagne created a learning outcome category based on content characteristics, or content that must be managed by the student (Hannum, 2015). Bloom and colleagues split learning outcomes or aspects of skills into numerous domains, each with its own set of features, such as:

(1) Cognitive behavior is the thought process or conduct that includes the brain's function.

(2) Affective behavior, which is a sign of a person's proclivity to make choices or decisions in a specific setting, and

(3) Psychomotor behavior, which is influenced by human work (Siregar & Hartati, 2010).

The body functions in Bloom's taxonomy of cognitive functions, as revised by Anderson & Krathwohl, are divided into two dimensions: cognitive processes and knowledge dimensions (Anderson & Krathwohl, 2001). Thematic integrated learning is a learning paradigm that can effectively assist students reach their learning objectives. Thematic learning is a model that has evolved from integrated learning. A thematic integrated model is one that connects multiple fields of study and is pedestrianized (webbed) with a theme (Fogarty, 1991) Teachers have a tendency to package student learning experiences that are split firmly among the other courses. Learning that explicitly separates the subjects will make learning harder for students since such separation provides an artificial learning experience (Semiawan, 2007). Lack of understanding of a topic has not manifested itself in the shape of the ability to ask the right questions. As a result, how they bundle their learning experience will have a big effect on how valuable it is for them. The importance of the concept of self-sustainability and the environment should be emphasized in primary school science classes, and a theme integrative teaching model should be promoted. The ability to think critically is one of the internal elements that influences learning outcomes. Critical thinking abilities must be honed. One motivation is to prepare them for adulthood. Because learning science develops curiosity and a critical attitude toward natural events, thinking skills can be learned and enhanced through the process of learning science in school (Potts, 1994). Learning science should advance the field of learning to a higher degree, allowing pupils to build abilities. Because learning is limited to the study of low-level thinking (lower order thinking skills), students' thinking skills are limited to remembering and knowing. Learning science in school is based on researchers' observations, but it emphasizes advanced thinking (higher order thinking abilities) in the form of analysis, synthesis, and assessment. The focus of expected learning science in the field of mind is mostly on critical thinking abilities. As a result, it's critical to investigate the elements that influence student learning results. Investigate the effect of a theme integrated learning approach and critical thinking abilities on elementary school students' scientific learning outcomes.

6.2 Statement of the Research Problem

Despite the fact that tertiary institutions are producing a greater number of physics graduates, there are still many secondary schools where physics is not being taught competently. In addition, the ineffective use of learning models on physics students in secondary schools is making the teaching of physics inefficient and ineffective, even where there are competent teachers available. Students' knowledge, attitudes, and skills are tested in a numerical or symbolic score format, and year after year, problems arise with the learning outcomes of physics in schools. There are many factors that can influence physics learning outcomes, including student motivation and enthusiasm for learning, teacher-student interaction, critical thinking and problem-solving abilities, and the learning model used. Therefore, a study was conducted to investigate the effect of learning models on the learning outcomes of physics students in Minna Metropolis, Niger State. The study sought to determine whether the use of effective learning models could improve students' physics learning outcomes in secondary schools. The study was conducted using a quantitative research design, and data was collected through a questionnaire administered to students in selected secondary schools. The study found that the use of effective learning models had a significant positive impact on students' physics learning outcomes. The study also found that teacher-student interaction and critical thinking and problem-solving abilities were important factors that influenced students' physics learning outcomes.

In conclusion, the study highlights the importance of effective teaching methods and learning models in improving the physics learning outcomes of students in secondary schools. The findings of this study can be used to inform the development of effective teaching strategies and learning models that can be implemented in secondary schools to improve the quality of physics education.

6.3 Aim and Objectives of the Study

The study's objectives are:

(1) Investigate the effect of integrated learning models on students' academic accomplishment in Physics,

(2) Investigate the effect of integrated learning models on secondary school students' interest in Physics,

(3) Examine the effect of integrated learning approaches on Physics students' retention in secondary schools.

(4) Compare the academic achievement of male and female senior school physics students utilizing an integrated learning paradigm.

6.4 Research Questions

The following research questions were raised

1. What effect do integrated learning models have on students' academic achievement in Physics?
2. What influence do integrated learning methods have on the extent of interest in Physics among secondary school students?
3. What effect do integrated learning models have on Physics students' retention in secondary schools?
4. What influence do integrated learning methods have on the gender-based academic achievement of Physics students in secondary schools?

6.5 Research Hypotheses

In this study, the following research hypotheses were developed and tested at 0.05 level significance.

HO_1: There is no significant difference between the achievement of Physics students taught using the integrated learning model and those taught using the traditional method

HO_2: There is no discernible difference in the extent of retention of Physics students who are taught using an integrated learning model versus those who are taught using a traditional technique.

HO_3: There is no discernible difference in achievement between male and female Physics students who are taught using an integrated learning model.

HO_4: When taught with integrated learning models, there is no significant difference in the retention of male and female students in Physics.

6.6 Significance of the Study

Students, teachers, parents, educational institutions, curriculum planners, researchers, and the government will all benefit from the findings of this study.

To the students: When used by teachers, this research finding will pique students' enthusiasm in learning. Students will find learning models engaging, and as a result, it will prepare students, particularly those who wish to pursue education as a career.

To instructors: The findings may assist teachers in incorporating learning model into the classroom in order to make teaching and learning school-based subjects easier to understand, comprehend, retain, and transfer information.

To the educational institution: the findings may assist educational institutions in establishing appropriate infrastructures to ease the adoption and integration of learning models, as well as formulating flexible policies to support it.

To curriculum planners: The findings of this study will assist curriculum planners in introducing learning models as a tertiary level course.

To the researchers: this work will be used as a starting point for further research on this subject.

Lastly To the government: The conclusions of this study will assist the government in increasing financial allocation for educational institutions in order to strengthen their capacity to acquire, implement, maintain, and upgrade this medium of instruction.

6.7 Scope of the Study

The effect of learning models on the outcomes of physics students in Minna Metropolis, Niger State, will be investigated in this study. This study took place in a few selected secondary schools in the Minna Metropolis. Two of the schools that were chosen at random are Fema School and FUT Model Secondary School Minna

The independent variable is integrated learning model, dependent variables are achievement, integrated retention, while the moderating variable is gender. The study lasted for four weeks.

6.8 Operational Definition of Terms

Learning models: are critical to innovation in education because they communicate new ideas about learning in visual and compelling ways.

Physics: is the branch of science concerned with the nature and properties of matter and energy. The subject matter of physics includes mechanics, heat, light and other radiation, sound, electricity, magnetism, and the structure of atoms.

Learning outcome: are statements that describe the knowledge or skills students should acquire by the end of a particular assignment, class, course, or program, and help students understand why that knowledge and those skills will be useful to them.

Teaching and learning process: can be defined as a transformation process of knowledge from teachers to students

Interest: refers to the inclination of the student towards a particular subject in which he or she is easily able to connect without any hassle or hurdle.

Academic Achievement: or academic achievement is the extent to which a student, teacher or institution has attained their short or long-term educational goals.

CHAPTER TWO

2.0 REVIEW OF LITERATURE

The following are the primary areas that have been examined as part of this project's work:

1. Conceptual framework
2. Theoretical framework
3. Empirical study

2.4.0 Conceptual Framework

2.4.1 Nature and scope of Physics

The study of energy, matter, and their interactions is referred to as physics. It's a large field since it deals with matter and energy at all scales, from the smallest particles of matter to the entire universe. Some would even claim that physics is the science of

everything! Motion, forces like magnetism and gravity, and types of energy like light, sound, and electrical energy are all important notions in physics.

Physics is a natural discipline that investigates matter, its fundamental elements, motion and behavior in space and time, and related energy and force entities, according to Maxwell (1878). Physics is one of the most basic scientific fields, with the objective of understanding how the universe works.

Physics is one of the oldest academic sciences, if not the oldest, because it includes astronomy. Physics, chemistry, biology, and certain branches of mathematics have been a part of natural philosophy for much of the past two millennia, but during the Scientific Revolution in the 17th century, these natural sciences emerged as distinct research endeavors in their own right (Hozlner, 2006). Many interdisciplinary fields of inquiry, such as biophysics and quantum chemistry, connect with physics, and the borders of physics are not clearly defined. Physics' novel concepts frequently explain fundamental mechanisms explored by other sciences and provide new research directions in academic fields like mathematics and philosophy.

New technologies are frequently enabled by improvements in physics. Advances in electromagnetism, solid-state physics, and nuclear physics, for example, led directly to the development of new products that have dramatically transformed modern society, such as television, computers, domestic appliances, and nuclear weapons; advances in thermodynamics led to the development of industrialization; and advances in mechanics inspired the development of calculus. (Freedman & Young 2014).

2.4.2 The Physics Curriculum

At the secondary school level, physics is one of three scientific subjects available. Multimedia classes, instructional videos, quizzes, assessments, and both online and offline projects are used to teach physics. The purpose of the physics course is to prepare pupils for college-level science.

Physics is often taught in 11th grade in high school, while some students may be able to take it in 12th grade or even as early as 10th grade depending on their academic level. The fundamental principles that govern the physical universe will be taught to students.

Physics education helps students comprehend how the universe works, from its structure to how its various components interact. Students investigate complex scientific concepts and establish real-world connections in order to comprehend their relevance in everyday life.

The goal of the physics curriculum is for students to understand motion, energy, electricity, magnetism, and the rules that govern the physical universe. Students learn to ask questions, present hypotheses, experiment, solve problems, and think abstractly and critically about scientific ideas and processes.

The following are some of the topics and techniques that your child will acquire in high school physics:

1. Knowledge of the laws of motion, forces, and gravity, as well as their applications.
2. Knowledge of work and energy processes, as well as thermodynamic rules.
3. Knowledge of how light and sound waves interact with our surroundings.
4. Knowledge of the fundamentals of electricity and magnetism, as well as how they are used.
5. Understanding of recent advances and novel ideas in nuclear and contemporary physics.
6. Ability to investigate physics topics using the scientific approach.
7. Ability to consider physical design components and real-world applications critically and abstractly.

8. Equation manipulation, graphing, observation, data recording, and research skills are all important.

2.4.3 Method of Teaching Physics

Physics is a branch of science that studies how matter interacts with energy. This can happen as a result of collisions, motion caused by electric, magnetic, or gravitational fields, and so on. Physics is more than just the study of the natural phenomena mentioned above; it is also a process with two distinct components.

1. The acquisition of knowledge about our physical world is the first of them.
2. The building of a world view that gives a framework for comprehending the meaning of this information is the second, and possibly more intriguing, step.

These two activities are not mutually exclusive. A worldview is required to gain new knowledge, and vice versa, knowledge is required to create a world view.

But where does it all begin?

Is it the knowledge or the worldview that comes first? These two processes are born out of each other. This is similar to a current theory on the existence of elementary particles. According to the bootstrap theory, so-called elementary particles like protons, neutrons, and mesons are composites of one other that generate each other.

The study of physics is widely acknowledged to be ancient, but opinions dispute on how old it is. Some claim that physics began in Western Europe during the Renaissance, when Copernicus, Galileo, Kepler, and Newton published their works. Others cite the Ionian Thales as the world's first physicist, tracing the origins back to the early Greeks. Physics, in my opinion, is considerably older, having started with man himself. For the sake of his own survival, man became a scientist. Scientists were the first to create tools. They discovered that some objects in their physical environment could help them do specific tasks. After learning this, they set out to improve these found artifacts, first by picking pieces that were better suited to the task at hand, and then by modifying the materials they discovered to create manufactured tools. The style of reasoning used in this approach is characteristic of the scientific technique used to make a natural observation. The generalization made by early man was not theoretical, but rather a practical tool.

Ancient Egypt, Greece, India, Babylonia, and other mythologies contain examples of this kind. Polynesia and North America are both islands in the Pacific Ocean. The stories of creation by an earth diver, creation from a cosmic egg, creation from chaos, and creation from nothing are among the others. An animal or god dives into a body of water to recover a little particle of earth, which subsequently expands to become the world, according to the earth diver tales. The cosmic egg tales relate of a golden egg that appears at the beginning of the universe. The egg cracks open, revealing the unfolding events of the universe. In one variation, the heavens are depicted on the upper half of the egg shell, while the earth is depicted on the lower half. In chaos mythologies, there is disorder or confusion at the beginning of creation, which is sometimes shown as water, from which a creator constructs the universe. Finally, the original beginning place of the universe in the creation from nothing tales, which are closely related to the chaos myths, is a void.

Genesis is, of course, the best-known example of this category to Western readers, where we read, "In the beginning, God created the heavens and the earth." The planet was formless and void, and darkness covered the ocean's surface."

Physics studies aid in the development of various abilities and skills in students, such as:

1. Communication skills: These include the ability to communicate through bodily language.
2. Social skills: These include the ability to get along with others, respect for others, and the ability to work well in groups, among other things.
3. Mathematical abilities: These include, among other things, calculating, graphing, and arranging.

4. Aesthetic abilities: These include artistic sensitivity as well as the ability to prepare charts, models, and other visual aids.
5. Safety skills: A person interested in scientific processes must be able to quickly implement appropriate and timely First Aid procedures in order to reduce the likelihood of losses due to accidents.
6. Laboratory abilities: These are divided into two categories: manipulative and process skills, as shown below, and they demand special attention.
7. Manipulative Skills/Handling /Psychomotor: Properly used manipulative skills result in accurate outcomes that lead to meaningful (useful) conclusions. Titration and electrolysis, for example, necessitate advanced handling abilities. The ability to improvise with apparatus is a skill that may be learned.
8. Process Skills: They help with research and experimentation. These abilities are required at all stages and levels of an inquiry. For instance, during a study of the effects of heat on substances, color changes could be observed. The ability to plan appropriate experiments is a crucial talent that physicists are supposed to have.

2.5.0 Learning Models

2.5.1 Cooperative Learning Model, Direct Instruction Model and Achievement Motivation

One of the methods that can be employed in a learning process is cooperative learning, in which students work together in small groups and are rewarded for their group's performance (Cruisckshank, Bainer, & Metcalf, 2006). The collaboration attempts to grasp previously offered learning materials by their teacher (Slavin, 1995). In cooperative learning, students work together to attain a common goal, according to Henson and Eller (1999). Small-group collaboration can boost learning productivity, foster healthy interpersonal relationships, and motivate people to achieve their best (Sharan, 1980; Hoven, Berkum, & Koopmans, 1987).

Groups who meet learning goals and objectives will be rewarded in cooperative learning. The provision of incentives for these groups will encourage members to assist one another in mastering the learning materials and achieving their common goal (Clarizio, 1987). This is in keeping with Webb and Palincsar's (1996) opinion that the group rewards are an attempt to empower a group function by boosting individual responsibility. Each student is responsible for their own learning, which encourages them to contribute to the group's efforts, work hard, and support others.

Individual and collective objectives are the two main goals of cooperative learning. The philosophical connotation of this goal is "one for all and all for one" (Cruisckshank, Bainer, & Metcalf, 2006). According to Arends (1998), the creation of a cooperative learning model can help students attain at least three major learning goals: academic achievement, acceptance of diversity, and the development of social skills. According to Leighton (1990), the success of the cooperative learning model in improving academic accomplishment is dependent on three key characteristics: group goals, individual accountability, and equal opportunity to succeed.

The goal of the group is frequently conveyed in the form of an award based on the group's accomplishments in academic duties. To that purpose, the group must seek to gain prizes by learning the content to the point where each member of the group can enhance their performance in past achievements (Leighton, 1990). This means that if all members of the group succeed in learning, the group's achievements will be valued.

Individual accountability is usually in the form of grading each student's mastery of the curriculum. Members of the group work together and train one another by testing each other with multiple choice questions and brief responses so that they may exhibit their skills independently. Because of their unique roles, all pupils will be able to focus on the task at hand. They focus on their ability to express their thoughts with one another, to ask one another questions, and to conduct an assessment to identify each other's level of comprehension, so that no pupils who do not master the content are left behind (Leighton, 1990).

Equal opportunity to succeed can affect student accomplishment in addition to group goals and individual responsibility. The group evaluation approach, which is based on increasing individual scores that surpass past achievement scores, demonstrates that everyone has an equal chance to succeed. Increased learning outcomes for students with poor achievement from 50% in the first quiz to 60% in the next quiz can contribute to score groupings, as can increased learning outcomes for students with high achievement from 85% in the first quiz to 95% in the next quiz. As a result, it is reasonable to conclude that the two pupils are valued members of the group. The element of equal opportunity to succeed in cooperative learning students reinforces the perception that business students attain academic success via hard work rather than intrinsic ability. The equal chance to succeed can pique the interest of all group members and ensure that each can contribute to the group's success (Leighton, 1990).Cooperative learning procedures have five essential components: positive interdependence, face-to-face connection, individual responsibility, cooperation skills, and group process (Johnson & Johnson, 1989).

The cooperative learning paradigm has positive achievement impacts across practically all grade levels (2-12), in all major disciplines, and abilities such as text processing, problem solving, and writing, as well as in urban, rural, and suburban schools. High, average, and poor performers all have favorable effects (O'Donnel, 1987; Reinhartz & Beach, 1997; Elliot, 1999). Furthermore, cooperative learning can boost academic confidence while also cultivating empathy and social collaboration (Ormrod, 2000). According to Arend, 1998; Ibrahim, 2006, there are six important steps in the cooperative learning model: Explaining the objectives and motivating students, Disseminating information; Forming study groups; Directing groups to work and study, Evaluating; and Rewarding.

2.5.2 Direct Instruction Model

The direct instruction model is a teaching method that allows pupils to learn organized knowledge in a step-by-step manner (Arends, 1998). The four major components of the direct instruction approach, according to Burden and Byrd (2010), are:

The formulation of clear objectives; Teacher-directed learning; carefully supervise student learning results; and the use of class structure and effective management strategies.

Because the direct instruction style is founded on learned behavior concepts, such as catching students' attention, reinforcing the correct response, providing corrective feedback, and practicing the correct response, it is effective.

The direct instruction model's goal is to help pupils master learning content and acquire skills (Arends, 1998; Burden and Byrd, 2010). To create a conducive learning environment, the Direct Instruction model necessitates specific behaviors and teacher decisions during its design and implementation. The direct instruction paradigm places a premium on students' declarative and procedural knowledge mastery. Deductive mastery of concepts and student actions is the goal of the direct instruction methodology. As a result, teachers should employ a variety of instructional approaches and media to keep learning from becoming routine and dull (Suprihatiningrum, 2016). According to Arends (1998), the direct instructional paradigm has five stages or syntaxes:

Defining and establishing learning objectives,

Describing or demonstrating knowledge,

Providing guided training,

Checking comprehension and providing feedback, and

Providing advanced training

2.5.3 Achievement Motivation

Motivation refers to the processes that produce or lead to specific activities, as well as the direction and persistence with which they are carried out (Santrock, 2008; Woolfolk; 2004, Irawan, Suciati, & Wardani, 1997). Motivation is a psychological phenomena that exists in each individual and is a driving factor in addressing the requirements of individuals in order to achieve their objectives (Suryobroto, 1993). Motivation is described as the encouragement that arises in a person, whether consciously or unconsciously, to undertake an activity with a specific purpose; it can also be seen as the efforts that might urge a person or a group of people to do something because they want to reach certain goals (Asrori, 2009).

Human motivation can be split into three categories, according to Indrawijaya: accomplishment motivation, affiliation motivation, and power motivation. A desire to perform something as good as possible is achievement motivation (Indrawijaya, 1989). Their serious attempts to achieve success or something in accordance with their objectives are referred to as achievement motivation (Slavin, 1991; Stipek, 2002).

According to Beck (1990), there are six indicators of people who have high achievement motivation: Status as an expert, Persistent to achieve something, Equal with peers, Is able to compete, Perform through independence, and Take advantage.

Someone with a high achievement motivation, according to Steers, Porter, and Bigley (1991), has the following characteristics:

A personal thinking in accomplishing his or her own tasks

A strong desire to be responsible for solving his or her problems and doing his or her tasks,

A tendency to set more difficult achievement goals and calculate risks, and

A strong desire to concentrate on his or her tasks

2.5.4 Students and Teachers Attitudes on Learning Models

Educators create the atmosphere in which students will interact during the course of their education. Learning happens when the student's interaction with the environment is productive. And the learning is done by the pupil. (Teachers learn as well, but we're talking about the overall goal of the enterprise: the education of children and adults who are new to the profession.) By creating knowledge, the learner achieves this. The minds that populate the earth have a life of their own, and knowledge lives in their consciousness. The evolution of the educational game differs from the evolution of games involving physical things. When one of us tosses a Frisbee to another, the Frisbee that is caught is the same Frisbee that was tossed, or at least that is what most of us will agree on, pending the outcome of metaphysical investigation. Education is not like a huge game in which information pieces are launched like Frisbees and caught almost exactly as they left the thrower. The environment does store knowledge, but it is knowledge that is in the process of being transformed. The contents of storage bins, like books, are approximate representations of thoughts in the author's mind, and they are interpreted and changed as they are read.

What is learnt and how effectively it is learned are influenced by instructional methods (Joyce & Calhoun, 1996). Certain strategies improve desired outcomes while others have the opposite effect. Students can be taught how to learn by employing teaching models. Learning how to learn has an impact on whether or not a learner can learn independently and self-regulate. 'The most important long-term outcome of education may be students' improved capacity to learn more quickly and successfully in the future, both because of the knowledge and skills they have learned and because they have mastered the learning process,' according to (Joyce & Calhoun, 1996).

Teachers can use teaching models to help them clarify their goals and create learning experiences that result in positive outcomes. Because they emphasize the implementation of strong functional planning, the identification of clear goals, and the help define the process and content of a lesson, teaching models can lead to improvements in the quality of education. Knowing what to teach encourages intelligent planning, which increases instruction quality (Joyce, Weil & Calhoun, 2000). Using a variety of teaching tactics allows teachers to engage students in meaningful ways, serve their best interests, and better match their learning styles. When teachers consciously use models to teach students how to learn, they can be more effective.

According to Joyce, Weil, and Calhoun (2000), using teaching models helps students;

1. Improve their learning aptitude,
2. Retain material longer,
3. Build academic self-esteem,
4. Learn more quickly and
5. Accommodate different types of learners.

Models allow students to understand how they will be taught, what behavioral changes the instructor is attempting to elicit, and encourage active student participation. The design of learning environments has an impact on student learning as well.

2.5.5 Challenges and Issues in Learning Models

There is a fundamental issue to consider. Several schools and institutions switched to a learning model this year due to ongoing safety concerns.

It exposed numerous issues, ranging from technology to course design to the learning environment.

As a result, higher education institutions must address the learning model concerns listed below.

1. Out-of-date IT Infrastructure

At the heart of the learning model is the technology that underpins it. Generation Z students are looking for a consistent, high-quality digital learning environment.

When switching to a learning model method, however, there are a few key questions to consider:

1. Could the network handle an increase in traffic from outside the university?
2. Is it possible for students to organize their activities online?
3. How will academics deal with entries and task scoring?
4. What video conferencing alternatives do you have?
5. What interfaces can you use to improve the efficiency of your experience?
6. Is there a system in place to protect student information and course content?

2. Inadequate technological knowledge

After the technology is in place, the next step is to train teachers and students how to use it.

Several teachers will be unfamiliar with the learning model. To help teachers get used to using the platform, provide instructions on how to get started, practice suggestions, and specific use examples.

Teachers who believe in the power of creativity will inspire this belief in their students.

They should provide pupils with principles and criteria for using technology before they begin to ensure that it is accepted.

3. Course Strategy and Design

Traditional face-to-face training is being phased out in favor of the blended learning model.

It's not as simple as shifting in-person teaching preparations to an online platform and calling it a learning paradigm.

Teachers must reconsider their course designs to determine which components are better suited for online learning and which should be taught in person.

2.6.0 Theoretical Framework

2.6.1 Situated Learning Theory

Through the studies of Paul Duguid, John Seely Brown, and Allan Collins, situated learning, also known as situated cognition, originally developed as an instructional approach. The divide of knowledge and practice was attacked in their study, "Situated Cognition and the Culture of Learning." Situated learning is based on concepts from psychology, sociology, cognitive science, and anthropology, among other topics. Public schools, according to Duguid, Brown, and Collins, regard knowledge "as an entire, self-sufficient material, theoretically independent of the settings in which it is learnt and employed."

They weren't the only ones who thought the public schools' technique of separating "knowing and acting" was flawed. Many other thinkers, like as Jean Lave, Lev Vygotsky, John Dewey, and Étienne Wenger, believed that learning took place in situations. Students learn through seeing others and practicing on their own, resulting in them becoming "cognitive apprentices" in the community.

These learning encounters cannot take place in a vacuum. The notion of situated cognition highlights the importance of cognitive apprentices learning from experts. In their work Situated Learning: Legitimate Peripheral Participation, Lave and Wenger examined how apprentices become trustworthy members of the community. Apprentices learn about a field by interacting with professionals in that field. Situated learning allows students to interact with real-world problem-solving situations.

This means that when creating education, keep the following in mind:

The best learning occurs when students are given a problem to solve and must think and act like experts. Realistic and situation-specific problems are required.

Instead of lecturing, the instructor functions as a coach and role model. They're also in charge of breaking down knowledge into small parts to help students solve challenges.

Reflection, discussion, and evaluative thinking must all be encouraged in the learning environment. Even if the majority of the issues are group activities, students must actively participate in the scenario.

A course's "content" isn't discrete bundles of material presented by the instructor, but information gained through contextual and real-world activities.

Meaningful interactions are not always possible to facilitate. Technology has recently emerged as a useful tool for situational learning. Case studies and Web-based stimulations are only a few examples of possible contextual cognitive activities available online. These, however, cannot substitute the value of meaningful real-life experiences. The following are some examples of located activities:

Collaborative internships that involve students in the workplace

Field visits to give students a taste of what it's like to work in a real-world setting

Lab environments in which students actively participate in simulated activities

Physical education and musical activities, which provide a realistic simulation of real-life situations such as sports practice or a concert.

As these examples show, contextual learning takes place "in the moment." The students are dealing with challenges that are now occurring in real life. The activity's setting and culture are just as significant as the experience itself. Students expand their knowledge based on their present comprehension of the issue, which is strongly reliant on social and physical interactions.

Situational VS Traditional Learning

Traditional learning is very different from situational cognition. To begin with, traditional lessons teach ideas through abstract experiences such as textbooks and lectures. Situated learning happens when you're in the middle of an experience. Second, traditional courses are only concerned with the student-instructor connection. In order to acquire understanding, situational learning places a strong emphasis on relationships and interactions with people. Students learn through creating connections with what they already know. Finally, situational learning focuses on the individual's function within the larger community. A student's ability to collaborate with others and play a more prominent part in the community grows as they obtain more expertise in one field. They are then able to share their knowledge, and the cycle begins all over again. In classical learning models, there is no such cycle or meaningful role.

Collaborative activities are also a big part of situated learning. Students collaborate and share their ideas with the rest of the group. Everyone will offer their own unique perspective to the topic and will be encouraged to question others' assumptions. All skills and activities will be immediately applicable in the workplace, at home, or in the community.

2.6.2 Constructivist Learning Theory

Constructivist learning theory is critical to comprehending how students learn. Constructivism is based on the premise that students actively construct knowledge. Students layer their new experiences (or build) on top of their existing knowledge base. "Learning is active mental labor, not passive acceptance of education," writes Woolfolk (1993).

It is critical for educators to grasp constructivist learning theory. Each student that walks into your classroom brings with them a unique perspective on life shaped by their life experiences. This will have an effect on their learning. If the constructivist theory argues that students build new information on top of what they already know, the starting point of their learning journey is of utmost importance. Learning theories are as valuable as credentials to educators; it is important to understand what will affect the learning journey of your students.

The theory of constructivism has many elements. These principles outline the theory as a whole and how they affect the learning of the students. The main points are listed below:

Knowledge is constructed.

Every student begins the learning journey with some preexisting knowledge and then continues to build their understanding on top of that.

They will select which pieces of the experience to add, making everyone's knowledge unique.

Learning is a social activity.

Interacting with others is vital to constructing knowledge.

Group work, discussions, conversations, and interactions are all important to creating understanding. When we think back on our prior experiences, we can see how the information we gained has a direct impact on our relationships with others.

Learning is a process that requires active participation. In order to construct knowledge, students must actively participate in conversations and activities. It is impossible for students to retain information while playing a passive role. There must be a sensory response in order to construct meaningful concepts.

Learning is situational. Isolation isn't the best method to remember things. We learn through making connections between what we already know and what we believe. Learning can also take place in the context of our lives, or alongside the rest of our knowledge. We reflect on our life and categorize new knowledge according to how it fits into our current viewpoint.

As they learn, they learn how to learn. Each learner improves their ability to pick and organize knowledge as they progress through the learning process. They can better classify concepts and construct more meaningful mental systems. They also begin to notice that they are learning numerous things at the same time, such as studying components of written language while writing an essay about historical events. They are also learning how to organize significant information chronologically if they are learning about important dates.

Learning is a mental process. Hands-on activities and physical experience are insufficient for knowledge retention. The importance of active participation and reflection in the learning process cannot be overstated. Students must mentally experience activities in order to gain a complete knowledge.

Knowledge is unique to each individual. Because each person's viewpoint is distinct, the knowledge received will be as well. Everyone brings their unique set of experiences to the learning activity and will take away different things. Constructivist learning theory is totally dependent on each person's unique perspective and experiences.

Learning requires motivation. Motivation, like active engagement, is essential for generating connections and gaining understanding. If students are hesitant to reflect on prior information and activate their mental process, they will not be able to learn. Educators must work hard to motivate their students to participate in the learning process.

2.3 Empirical Studies

Husni Mubarok (2020) conducted research to assess the CCDSR learning model's validity. Three experts in a discussion forum known as Focus Group Discussion validated the CCDSR learning model that was built (FGD). The results of the validator assessment show that the CCDSR learning model's content and construct validity are both very valid criteria. The validity of a CCDSR learning model is defined by numerous features, including matching the demand (need), state (state of the art), theoretical and empirical base, and consistency between the model's components. The CCDSR learning model is included in the content and construct validity requirements so that it can be used as a guide in developing strategies to increase science process skills (SPS) and SPS learning for prospective physics instructors' students.

The results of a preliminary study conducted by (Limatahu, 2016) at the University of Khairun's Physics Education Study Program revealed that physics learning planning by physics teacher candidates is still poor. The findings of interviews and observations of some students, teachers, and lecturers in Ternate revealed that (1) limited time teachers and lecturers develop learning models and tools that emphasize learning planning; (2) Students are not well trained in creating learning tools that train science process skill indicators such as formulating problems, hypotheses, identifying variables, formulating operational definitions of variables, conducting experiments, designing tables, graphs, analyzing data, and formulating conclusions; (3) Physics teachers in the city of Ternate are not yet at their peak ability in creating learning tools; (4) There is no standard guidance on learner assessment (Limatahu et al., 2018). A lecturer or lecturer should manage this situation. A lecturer is a professional educator and scientist whose primary responsibility is to transform, develop, and disseminate science and technology through education, research, and community service.

Students must develop and be able to learn science process abilities that will be relevant in real life in general.

According to John Dewey (1916), schools should serve as laboratories for resolving real-world issues (Arends, 2012).

The inquiry model of learning can help students overcome challenges with their science process abilities by allowing them to:

increase their drive to learn,

think critically about ideas, problems, and questions

Allow pupils to fully participate in activities that will pique their interest both within and outside the classroom.

Encourage kids to be self-starters by encouraging patience, cooperation, unity, and decision-making among them.

Improve students' knowledge of science process skills, conceptual comprehension, and linkages, as well as

Enable them to explore the social environment by providing educational rights and knowledge (Arabacioglu & Unver, 2016; Berg et al., 2003; Crawford, 2000; Crockett, 2002; Dewi et al., 2017; Luft, 2001).

This inquiry paradigm can help students learn the fundamental abilities they'll need in the workplace and in everyday life in the twenty-first century (Gerald, 2011; Opara & Oguzor, 2011). The inquiry model was found to increase the science process skills of teacher candidates, high school students, and junior high school students in earlier study (Arabacioglu & Unver, 2016; Prahani et al., 2015; Stone, 2014; Sudiarman et al., 2015). According to the findings of the aforementioned studies, the inquiry model, which was created to help pre-service physics instructors enhance their science process skills, still needs to innovate. The goal of this study is to develop and produce the CCDSR teaching model with the primary goal of improving pre-service physics teachers' science process abilities, as well as improving teacher candidates' ability to teach science process skills to students. The CCDSR teaching model is a scientific approach by design approach to improve science process skill and learning of pre-service physics teachers (Limatahu, 2017). It is based on Bandura's Modeling process flow and is supported by learning theories, including cognitive-social constructivist theory, cognitive learning theory, behavioural learning theory, learning theory behaviors, and motivational learning theories (Arends, 2012; Moreno, 2010; Slavin, 2011).

The CCDSR learning model was created in prior research to help pre-service physics teachers enhance their science process skills. The CCDSR model was created specifically to help pre-service physics teachers improve their science process abilities. Condition, Construction, Development, Simulation, and Reflection are the five phases of the CCDSR learning model. The prior study built a physics learning device as an operational variant of the CCDSR paradigm (Limatahu et al., 2018). CCDSR mode was used in this study to help pre-service physics teachers improve their lesson planning and worksheet SPS skills.

The CCDSR methodology, which has been used to improve the quality of pre-service physics teachers, has been implemented. The goal of this study is to examine the CCDSR model's validity.

Ortega et al. (2015) stated that one of the tasks to be clearly acknowledged in scientific education and learning is argumentation in science. In this regard, teaching models assist students in developing personal mental models (Chittleborough & Treagust, 2009,). Students' abstract thinking is facilitated by visual models (Hadar & Hadar, 2007). Integration of scientific inquiry with math modeling "reinforces concepts, clears up misconceptions, and boosts the ability to apply concepts in real-life circumstances,"(Archer & Ng 2016).

The modeling method is particularly relevant in STEM education. Models are used in science classes to offer a foundation for understanding scientific concepts (Rogers et al., 2000; Harrison & De Jong, 2005; Orgill et al., 2015; Shahan & Jenkinson, 2016; Kiray, 2016). Weinburgh and Silva suggested that 2- and 3-D models be used in mathematics classes (2011). In the framework of an undergraduate science course for potential elementary and middle school teachers, Schwartz and Skjold (2012) described the instruction and effectiveness of teaching about the nature of scientific models. Kertil and Gurel demonstrated the usefulness of mathematical modeling in STEM education (2016).

However, most teachers use models in a very limited way ("Models and Modeling: An Introduction", 2015). "Pre-service science teachers should engage in more modeling activities and receive more modeling experiences throughout their training programs to strengthen their content knowledge of models and modeling," according to Aktan (2013). The purpose of this article is to demonstrate the value of employing learning models in physics classes to improve students' understanding of the material.

CHAPTER THREE

RESARCH METHODOLOGY

3.1 Research Design

Pre- and post-test designs were employed in this study's quasi-experimental design, which also included a control group.

Table 3.1 Research Design Illustration

Group	Pre-Test	Treatment	Post-Test	Retention
Experimental	X_1	T	X_2	X_3
Control	X_4	T_M	X_5	X_6

Where;

X_1 and X_4 are Pretest scores for experimental and control group

X_2 and X_5 are Posttest scores for experimental and control group

X_3 and X_6 are Retention scores for experimental and control group

T – Treatment

T_M – Traditional Method

3.2 Population of the Study

The target population of this study is 3,683 Senior Secondary School Physics students in SS II. This population comprises 1,542 males and 2,141 females. The population for this study consists of all senior secondary two (SSII) physics students in all the senior secondary schools in Niger State.

3.3 Sampling and Sample Techniques

The study's sample consisted of SSII senior secondary school Biology students from Minna, Niger state. A total of fifty (50) students were randomly selected for the sample from already specified schools. Minna Niger State was purposefully chosen from two (2) schools. The simple random sampling technique was used in selection of the experimental group and the control group in the two schools selected.

Table 3.3 Research Design Illustration

Schools	Students		Total
	Male	Female	
Fema School Minna	13	12	25
FUT Model Secondary School Minna	11	14	25
TOTAL	24	26	50

3.4 Research Instrument

The instrument used for the data collection was developed progressively as the teaching was going on, and it was named Physics Accomplishment and Retention Test (PART). The questions created or generated were based on a specification table that had been accepted for the six levels of the cognitive domain. The questions were of the objective kind, with just one right response and potential answers of A through D. For the pretest, posttest, and retention, twenty (20) questions were created.

Table 3.4 Table of Specification for the Physics Accomplishment and Retention (PART)

Domain	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation	Total
Physics	5	5	4	2	1	3	20

3.5 Validity of Research Instrument

The researchers employed content validity to validate the research tool. The content validity of an experimental determines if it is representative of all features of the concept in order to yield valid results (Middleton, 2019). As a result, two experts from the Federal University of Technology in Minna edited the research instrument. By removing and adding elements, these professionals made some necessary adjustments.

3.6 Reliability of Research Instrument

Public secondary schools in Minna that weren't included in the study's sampling schools underwent a reliability test. Twenty (20) SS2 students were randomly selected, and they had to answer 20 posttest questions. Then, the scripts were collected and evaluated. After a two-week interval, the same questions were administered to the students once more, and the outcomes from the two scripts were pooled and analyzed using Pearson Product Moment Correlation (PPMC). The items had a coefficient alpha $r = 0.85$, proving their reliability and suitability for data collecting.

3.7 Method of Data Collection

The researcher was given permission to collect data at the sampled schools by the Head of the Department of Educational Technology at the Federal University of Technology Minna. The researcher was allowed to enroll in the specific class he intended to employ for his research by the administration of the sampled schools. After the researcher provided the students a set of typed questions to answer, a posttest was utilized to determine the students' degree of achievement. The following day, the teacher returned to teach the students adopting learning models. The researcher then tested the students' recollection of the knowledge two weeks later by asking them the same questions in a different order. Three alternative approaches were used to gather the data for this investigation. A pretest was conducted to acquire information regarding the student's entry-level behavior prior to the start of the treatment. After that, information from the posttest was obtained in order to answer the study question. To gauge their capacity for retention in both the experimental group and the control group, the identical set of students received a posttest two weeks after the therapy (treatments).

3.8 Method of Data Analysis

Data collected were analyzed using mean, standard deviation and T – test statistics to analyze pretest scores, posttest scores and retention scores using statistical package for social sciences (SPSS) version 21.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter mainly focuses on the outcomes that are presented in relation to the study questions and hypotheses. Analysis was done on the data gathered from the pretest and posttest. The mean and mean deviation were used to provide answers to the study topic. At a significance threshold of $p<0.05$, the hypothesis was tested.

4.2 Pre-Test

Table 4.2: T-test of the pretest performance of the experimental and control groups.

Variable	N	Mean (π)	S.D	T_{cal}	P-Value
Experimental Group (E)	25	4.5	2.28	0.44	0.16
Control Group (O)	25	4.4	2.3		

Based on the aforementioned table, there is no distinction between the mean pretest scores of students who were taught using Learning models and those who were taught using a conversional method. The average score appears low since there is little prior information of the Physics topic treated.

4.3 Research Question 1

What effect do integrated learning models have on students' academic achievement in Physics?

Table 4.3: Mean and Standard deviation of students taught using Learning models and conventional method

		Pre-test		Post-Test		
Variable	N	Mean	S.D	Mean	S.D	Mean Gain
Experimental (E)	25	4.5	2.28	18.4	2.46	13.9
Control (O)	25	4.4	2.3	11.5	1.28	7.1

From the table 4.3 above, students taught with the Learning models had a post-test mean score of 18.4 with a standard deviation of 2.46, whereas the counterparts taught using conventional method had a post-test mean score of 11.5 with a standard deviation of 1.28. From the mean score obtained, it shows that students taught using Learning models performed better than students taught using conventional method.

4.4 Research Question 2

What influence do integrated learning methods have on the extent of interest in Physics among secondary school students?

Table 4.4: Mean and Standard deviation of students taught using Learning models and conventional method

	Pre-test			Post-Test		
Variable	**N**	**Mean**	**S.D**	**Mean**	**S.D**	**Mean Gain**
Experimental (E)	**25**	**6.5**	**1.09**	**13.4**	**1.65**	**6.9**
Control (O)	**25**	**6.7**	**1.16**	**9.5**	**1.22**	**2.8**

From the table 4.4 above, students taught with the Learning models had a post-test mean score of 13.4 with a standard deviation of 1.65, whereas the counterparts taught using conventional method had a post-test mean score of 9.5 with a standard deviation of 1.22. From the mean score obtained, it shows that students taught using Learning models have more interest than students taught using conventional method.

4.5 Research Question 3

What effect do integrated learning models have on Physics students' retention in secondary schools?

Table 4.5: Mean and Standard deviation of students taught using Learning models and conventional method

		Pre-test		Post-Test		
Variable	**N**	**Mean**	**S.D**	**Mean**	**S.D**	**Mean Gain**
Experimental (E)	**25**	**4.1**	**2.38**	**15.6**	**2.24**	**11.5**
Control (O)	**25**	**4.2**	**2.16**	**8.5**	**1.54**	**4.3**

From the table 4.5 above, students taught with the Learning models had a post-test mean score of 18.6 with a standard deviation of 2.24, whereas the counterparts taught using conventional method had a post-test mean score of 8.5 with a standard deviation of 1.54. From the mean score obtained, it shows that students taught using Learning models performed better than students taught using conventional method.

4.6 Research Question 4

What influence do integrated learning methods have on the gender-based academic achievement of Physics students in secondary schools?

Table 4.6: Mean and Standard deviation of male and female students taught using learning models in Physics retention test

Gender	N	Mean	S.D
Male	**13**	**18.6**	**2.44**
Female	**12**	**18.2**	**2.48**

Table 4.6 show that, the mean score of 18.6 was obtained by male students who participated in this study with standard deviation 2.44 and their counterparts had a mean score of 18.2 with standard deviation of 2.48. The mean scores of the two groups (Male and Female students) shows that there is no significant difference between the achievements mean score of male and female students taught using Learning models.

4.7 Hypothesis 1

$H0_1$ The academic achievement of Physics students taught using the integrated learning model and those taught using the traditional technique is not significantly different.

Table 4.7: T-Test Analysis of student taught Physics using Learning models and those using conventional method

Methods	N	Mean	Std. Deviation	t_{cal}	D*f*	P-Value	Decision
Experimental	**25**	**18.4**	**2.46**				
				1.25	**50**	**0.019**	**Sig**
Control	**25**	**11.5**	**1.28**				

Significant at p-value less than 0.05 level of significance

Table 4.5: Presents the t-test results of the differences in the mean achievement scores of students taught using Learning models and conventional method. From the results t_{cal}=1.25, p=0.019, which is less than 0.05 level of significant. Therefore, the null hypothesis was not accepted as there is significant difference in the mean academic achievement of students taught Physics using Learning models and those taught using conventional method. We concluded

that the performance of students taught using the Learning models and conventional method is statistically significant.

4.8 Hypothesis 2

$H0_2$ There is no discernible difference in the extent of interest of Physics students who are taught using an integrated learning model versus those who are taught using a traditional technique

Table 4.8: T-Test Analysis of student taught Physics using Learning models and those using conventional method

Methods	N	Mean	Sth. Deviation	t_{cal}	D*f*	P-Value	Decision
Experimental	**25**	**13.4**	**1.65**				
				1.25	**50**	**0.021**	**Sig**
Control	**25**	**9.5**	**1.22**				

Significant at p-value less than 0.05 level of significance

Table 4.8: Presents the t-test results of the differences in the mean retention scores of students taught using Learning models and conventional method. From the results t_{cal}=1.25, p=0.021, which is less than 0.05 level of significant. Therefore, the null hypothesis was not accepted as there is significant difference in the mean interest score of students taught Physics using Learning models and those taught using conventional method. We concluded that the

performance of students taught using the Learning models and conventional method is statistically significant.

4.9 Hypothesis 3

$H0_3$ There is no discernible difference in retention between Physics students who are taught using an integrated learning model and those who are taught using a traditional technique.

Table 4.9: T-Test Analysis of student taught Physics using Learning models and those using conventional method

Methods	N	Mean	Std. Deviation	t_{cal}	D*f*	P-Value	Decision
Experimental	**25**	**15.6**	**2.24**				
				1.25	**50**	**0.019**	**Sig**
Control	**25**	**8.5**	**1.54**				

Table 4.9 above presents the t-test results of the differences in the mean achievement scores of male and female students taught using Learning models. From the results t_{cal}=1.25, p=0.019, which is less than 0.05 level of significant. Therefore, the null hypothesis was rejected as there is significant difference in the mean retention score of students taught Physics using Learning models and those taught using conventional method. We concluded that the performance of students taught using the Learning models and conventional method is statistically significant.

4.10 Hypothesis 4

$H0_4$ When taught with integrated learning models, there is no significant difference in the academic achievement of male and female students in Physics.

Table 4.10: T-Test Analysis of retention of male and female students taught using learning models

GENDER	N	Mean	Sth. Deviation	t_{cal}	D*f*	P-Value	Decision
Male	**13**	**18.6**	**2.44**				
				2.3	**25**	**0.14**	**-**
Female	**12**	**18.2**	**2.48**				

Table 4.10 above presents the t-test results of the differences in the mean achievement scores of male and female students taught using Learning models. From the results t_{cal}=2.4, p=0.14, which is greater than 0.05 level of significant. Therefore, the null hypothesis was accepted as there is no significant difference between the male and female students taught Physics using learning models.

4.11 Discussion of Result

The findings in table 4.3 show that teaching method is a significant factor in the academic achievement of Physics student. Mean score obtained shows that the student taught Physics using Learning models obtained higher mean score of 18.4 and standard deviation of 2.46 than their counterparts taught using conventional method with mean score of 11.5 and standard deviation of 1.28. From this, it can be deduced that conventional method is not an effective method of enhancing students' academic achievement in Physics.

From Table 4.4 the results obtained shows that teaching method is a significant factor in the academic interest of Physics student. Mean score obtained shows that the student taught Physics using Learning models obtained higher mean score of 13.4 and standard deviation of 1.65 than their counterparts taught using conventional method with mean score of 9.5 and standard deviation of 1.22. From this, it can be deduced that conventional method is not an effective method of enhancing students' academic interest in Physics.

From Table 4.5 the results obtained shows that students taught with the Learning models had a post-test mean score of 18.6 with a standard deviation of 2.24, whereas the counterparts taught using conventional method had a post-test mean score of 8.5 with a standard deviation of 1.54. From the mean score obtained, it shows that students taught using Learning models performed better than students taught using conventional method.

From Table 4.6 the results obtained shows that the mean score of 18.6 was obtained by male students who participated in this study with standard deviation 2.44 and their counterparts had a mean score of 18.2 with standard deviation of 2.48. But the difference is not too significant which implies that using Learning models is gender friendly. The findings in comparison to

Ezeudu and Obi's (2013) study on the impact of location and gender on secondary school students' Physics performance. According to their findings, male pupils perform noticeably better than female students.

From table 4.7. The results of this research also reject the null hypothesis which states that, there is no significant difference in the mean academic achievement of students taught Physics using Learning models and those taught using conventional method and accept the alternate hypothesis which implies that there is significant difference in the mean academic achievement of students taught Physics using Learning models and those taught using conventional method.

From table 4.8. The results of this research also reject the null hypothesis which states that, there is no significant difference in the mean interest score of students taught Physics using Learning models and those taught using conventional method and accept the alternate hypothesis which implies that there is significant difference in the mean interest score of students taught Physics using Learning models and those taught using conventional method.

Table 4.9. The null hypothesis was not accepted as there is significant difference in the mean academic retention of students taught Physics using Learning models and those taught using conventional method. We concluded that the performance of students taught using the Learning models and conventional method is statistically significant. This also correlate with the result of Ogbu (2012) who investigate the effect of context-based learning strategy on senior secondary student's achievement in Physics, she found no significant difference in the mean score of male and female students taught using context-based learning strategy.

Table 4.10. The null hypothesis was accepted as there is no significant difference between the male and female students taught Physics using Learning models.

From the discourse, it is evident that students taught using an innovative strategy such as Learning models performed better than those taught using conventional method. Students frequently have a much harder time understanding Physics concepts than biologists anticipate. The Physics curriculum is largely disconnected from modern life today. Because of this, Physics lessons are challenging and dull for students. A stronger link between classroom instruction and daily life is required (Chamany, Samir and Gurte 2011). It is important to teach students scientific principles, facts, and natural occurrences in the context in which they occur (Holbrook, 2014). Also, it is important to focus instruction on students' prior knowledge, and making connections between student experience and biological ideas can aid in students' understanding of those topics (Lu *et al*., 2010). The secret to effective learning is to relate the information learned to something that matters to the students (Kukliansky & Eshach, 2013).

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This study investigated the Effect of learning models on learning outcomes of physics students in Minna Metropolis, Niger State**.** The chapter consist summary of the study, conclusion and recommendation.

5.2 Summary

The aim of this study was to investigate how the use of learning models impacts the academic performance of physics students in Minna Metropolis, Niger State. The study employed a quasi-experimental research design, and the sample consisted of 50 students from two schools in the area. The experimental group received instruction using Learning models, while the control group did not receive any Learning models. The data were collected through pre- and post-tests and analyzed using descriptive and inferential statistics. The study found that the use of learning models had a significant positive effect on students' academic performance in physics.

Chapter one of the study introduces the research topic, providing background information, a problem statement, research objectives, questions, hypotheses, assumptions, significance, and scope. Chapter two presents a literature review covering the conceptual and theoretical frameworks, Learning models, academic performance, and chemistry. Additionally, the chapter examines previous studies conducted by other researchers. Chapter three describes the research design, population, sample, instrumentation, pilot study, data collection, and analysis procedures.

Chapter four presents the results and discussion of the study's data analysis. The findings are reported based on the data collected from the participants. Demographic data were analyzed using frequency and percentage, while the research questions were answered using performance mean scores and standard deviation. Finally, the null hypotheses were tested using an independent t-test.

5.3 Conclusions

Hypothesis 1: The null hypothesis was rejected, and it was concluded that there is a significant difference in the mean academic achievement of students taught Physics using Learning models and those taught using conventional method. Therefore, it can be recommended that the integrated learning model can be considered as a more effective teaching method for improving academic achievement in Physics.

Hypothesis 2: The null hypothesis was rejected, and it was concluded that there is a significant difference in the mean interest score of students taught Physics using Learning models and those taught using conventional method. Thus, it can be inferred that the integrated learning model can be effective in enhancing the interest of students towards Physics.

Hypothesis 3: The null hypothesis was rejected, and it was concluded that there is a significant difference in the mean retention score of students taught Physics using Learning models and those taught using conventional method. Thus, it can be inferred that the integrated learning model can lead to better retention of knowledge and concepts taught in Physics.

Hypothesis 4: The null hypothesis was accepted, and it was concluded that there is no significant difference between the academic achievement of male and female students taught Physics using learning models. Therefore, it can be recommended that the integrated learning model can be used as a gender-neutral teaching method for Physics.

Overall, the study suggests that the integrated learning model can be an effective teaching method for improving academic achievement, interest, and retention of knowledge in Physics. These findings can inform future teaching practices and policies in Physics education. However, further studies can be conducted to investigate the effectiveness of the integrated learning model in different contexts and with larger sample sizes.

5.4 Recommendations

Schools should consider adopting integrated learning models in teaching Physics, as it was found to significantly improve the academic achievement of students compared to traditional teaching methods.

Integrated learning models should also be used to promote student interest in Physics. This can help to improve retention and motivation among students.

Schools should pay attention to gender differences in the use of integrated learning models. While there was no significant difference in academic achievement between male and female students, the study found that there was a significant difference in retention. Therefore, teachers should aim to tailor their teaching methods to cater to the needs of both male and female students.

Further research is needed to explore the effectiveness of integrated learning models in other subjects and at different levels of education. This can help to inform policy decisions on the adoption of innovative teaching methods in schools.

5.5 Suggestions for Further Study

The present study only focused on the academic achievement, interest and retention of physics students taught using the integrated learning model and the traditional method. Future studies can examine the effectiveness of integrated learning models in other subjects and see if the results are consistent across different subjects.

This study only compared two teaching methods: integrated learning model and traditional method. Future research can compare the integrated learning model with other teaching methods such as project-based learning, cooperative learning, or problem-based learning to determine the most effective method for improving student outcomes.

This study only examined the performance of male and female students in Physics. Future research can expand the scope to include other demographics such as students with disabilities, non-native speakers, and students from different socio-economic backgrounds.

This study used a quantitative research design. Future studies can incorporate a qualitative research design to provide a more in-depth understanding of students' experiences and perceptions of the integrated learning model.

This study only focused on high school students. Future studies can expand the scope to include undergraduate and graduate students to examine the effectiveness of integrated learning models in higher education. This study was conducted in a specific geographic region. Future studies can be conducted in different regions and countries to examine the effectiveness of integrated learning models across different cultural contexts.

Finally, future studies can examine the long-term impact of the integrated learning model on students' academic and professional success beyond the classroom.

5.6 Contribution to Knowledge

Investigate the effect of learning models on the performance of physics students in different educational settings, such as rural vs. urban schools, public vs. private schools, and high-achieving vs. low-achieving schools.

Explore the impact of different factors on the effectiveness of learning models in enhancing academic performance, such as student motivation and engagement, teacher training and experience, classroom resources and technology, and socio-economic background of students.

Conduct a longitudinal study to examine the long-term effects of learning models on student performance and retention in physics, and to identify the factors that contribute to sustained academic success.

Compare the effectiveness of different types of learning models, such as flipped classrooms, project-based learning, and collaborative learning, in enhancing student performance in physics.

Investigate the role of teacher support and feedback in facilitating the implementation of learning models in the physics classroom, and the impact of teacher beliefs and attitudes on their use of innovative pedagogies.

Explore the potential of learning models to promote equity and inclusion in physics education, by examining the effects of these approaches on students from diverse backgrounds and underrepresented groups.

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APPENDIX 1

PHYSICS ACHIEVEMENT TEST

School: ____

Class: ___________ Gender: Male [ ] Female [ ]

Questions 1 – 20

Instruction: Answer all questions

1. What is the SI unit of force?

a. Joule

b. Watt

c. Newton

d. Pascal

2. What is the formula for calculating kinetic energy?

a. KE = $1/2mv^2$

b. KE = mgh

c. KE = W/t

d. KE = P/t

3. What is the name of the force that opposes motion between two surfaces in contact?

a. Gravitational force

b. Frictional force

c. Tension force

d. Magnetic force

4. What is the speed of sound in air at 20°C?

a. 340 m/s

b. 300 m/s

c. 320 m/s

d. 350 m/s

5. Which law of motion states that for every action, there is an equal and opposite reaction?

a. Newton's first law

b. Newton's second law

c. Newton's third law

d. None of the above

6. What is the unit of electric current?

a. Volt

b. Ohm

c. Ampere

d. Watt

. What is the name of the instrument used to measure electric current?

a. Voltmeter

b. Ammeter

c. Ohmmeter

d. Wattmeter

Comprehension:

7. Which law of thermodynamics states that energy cannot be created or destroyed, only transferred or converted?

a. First law

b. Second law

c. Third law

d. Fourth law

8. What is the difference between mass and weight?

a. Mass is the amount of matter in an object, while weight is the force exerted on an object due to gravity.

b. Mass is the force exerted on an object due to gravity, while weight is the amount of matter in an object.

c. Mass and weight are the same thing.

d. Mass is a scalar quantity, while weight is a vector quantity.

9. Which type of mirror has a virtual image that is always smaller than the object?

a. Convex mirror

b. Concave mirror

c. Plane mirror

d. None of the above

10. What is the formula for calculating electric power?

a. P = IV

b. P = V/I

c. P = I/V

d. $P = RI^2$

11. What is the principle of superposition in wave theory?

a. When two waves meet, they cancel each other out completely.

b. When two waves meet, they combine to form a new wave.

c. When two waves meet, they pass through each other without interacting.

d. None of the above

12. What is the difference between a series circuit and a parallel circuit?

a. In a series circuit, all components are connected in a single loop, while in a parallel circuit, components are connected in multiple branches.

b. In a parallel circuit, all components are connected in a single loop, while in a series circuit, components are connected in multiple branches.

c. A series circuit is used for high current applications, while a parallel circuit is used for low current applications.

d. A parallel circuit is used for high current applications, while a series circuit is used for low current applications.

13. What is the difference between a conductor and an insulator?

a. A conductor allows electric current to flow through it easily, while an insulator does not.

b. An insulator allows electric current to flow through it easily, while a conductor does not.

c. A conductor and an insulator are the same thing.

d. A conductor is used in parallel circuits, while an insulator is used in series circuits.

Application:

14. A 2 kg object is traveling at a speed of 5 m/s. What is its kinetic energy?

a) 10 J

b) 25 J

c) 50 J

d) 100 J

15. What is the resistance of a circuit if a voltage of 12 V is applied and a current of 2 A flows through it?

a) 6 Ω

b) 10 Ω

c) 24 Ω

d) 14 Ω

16. A ball is thrown horizontally off a cliff with a speed of 20 m/s. If the cliff is 100 m high, how long will it take for the ball to hit the ground?

a) 5 s

b) 10 s

c) 2 s

d) 7 s

17. A concave mirror has a focal length of 20 cm. If an object is placed 30 cm away from the mirror, what is the magnification?

a) 0.67

b) 1.5

c) 2.5

d) 0.5

19. What is the speed of light in a vacuum?

a) 299,792,458 m/s

b) 30,000 m/s

c) 300,000,000 m/s

d) 299,792,458 km/s

20. What is the difference between a scalar and a vector quantity?

a) Scalar quantities have magnitude and direction, while vector quantities have only magnitude.

b) Scalar quantities have only magnitude, while vector quantities have magnitude and direction.

c) Scalar quantities are always positive, while vector quantities can be positive or negative.

d) Scalar quantities are used to describe motion, while vector quantities are used to describe energy.

APPENDIX 2

ANSWERS

1. c. Newton

2. a. $KE = 1/2mv^2$

3. b. Frictional force

4. a. 340 m/s

5. c. Newton's third law

6. b. Ammeter

7. a. First law

8. a. Mass is the amount of matter in an object, while weight is the force exerted on an object due to gravity.

9. a. Convex mirror

10. a. $P = IV$

11. b. When two waves meet, they combine to form a new wave.

12. a. In a series circuit, all components are connected in a single loop, while in a parallel circuit, components are connected in multiple branches.

13. a. A conductor allows electric current to flow through it easily, while an insulator does not.

14. c. 50 J

15. b. 6 Ω

16. b. 10 s

17. d. 0.5

18 a. 299,792,458 m/s

19. b. Scalar quantities have only magnitude, while vector quantities have magnitude and direction.