**AKENTEN APPIAH-MINKA UNIVERSITY OF SKILLS TRAINING AND ENTERPRENEURAL DEVELOPMENT. (AAMUSTED).**

# EFFECT OF CONVENTIONAL AND 7E TEACHING METHOD ON SCIENCE STUDENTS' PERFORMANCE IN RESPIRATION

**AMPEM DARKO MABEL**

**JANUARY, 2024**

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**BY**

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**A thesis submitted to the School of Graduate Studies, Akenten Appiah-Menka University of Skills Training and Entrepreneurial Development in partial fulfillment of the requirements for the award of a Master of Education (Science)**

**JANUARY, 2024**

# DECLARATION

**Student's Declaration**

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree at this university or elsewhere.

**Ampem Darko Mabel**

**Signature: ……. Date:…..……**

**Supervisor's Declaration**

We hereby declare that the preparation and presentation of this thesis was supervised in accordance with the guidelines on supervision of thesis as laid down by the Akenten Appiah-Menka University of Skills Training and Entrepreneurial Development.

**Dr. Charles Amoah Agyei**

**Signature: ……. Date: ……**

# ABSTRACT

The respiratory system is a complicated biological system that permits the exchange of oxygen and carbon dioxide between an organism and its environment, hence enabling the important activity of breathing. Nevertheless, for students to grasp the concept of the respiratory system, a variety of teaching approaches should be considered. The study investigates the effect of conventional and 7e teaching method on science students' performance on respiration. The study used a quasi-experimental methodology using a quantitative research strategy to determine the cause-and-effect relationship between independent and dependent variables. Primary and secondary data were used in the study to meet the study objectives. The study employed the simple random sampling (SRS) technique to select one senior high school and two Science two classes from Bepoaso Senior High School. The study involved 80 science two students. The study contained two groups: experimental and control. A pre-test and post-test were used to collect data. The study discovered that there was no statistically significant difference in respiratory system performance when students were educated using the 7E and conventional approaches. The study found that teaching methods (7E and Conventional) have a significant impact on student performance in post-test scores related to respiratory systems. The study's findings show that there was a statistically significant difference in respiratory system performance between students taught utilising the 7E and conventional techniques. The 7E technique was also found to have a substantial effect on respiratory system performance based on gender. The study suggests that educators perform a comparison study of the efficiency of the 7E method to current techniques for teaching the respiratory system.

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To you all, I say thank you.

# DEDICATION

I dedicate this work to the glory of God almighty. I also dedicate this work to all those who have contributed tirelessly in adverse ways towards my education especially my parents, Hon. Patrick and Mad. Christiana, my siblings Emmanuel, Eddy and Manel, Boakye and also to my little baby. Lastly, to I dedicate this work to Derby and Mike and to all friends. God bless everyone.

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# CHAPTER ONE

# INTRODUCTION

## 1.1 Background

Understanding biology, specifically the respiratory system, is critical and has been a significant concern for all stakeholders across the educational landscape. The respiratory system describes the process of air inspiration or, inhalation, and expiration, or exhalation. Science, comprehending the network of bodily tissues and organs that aid in breathing and exhalation, the exchange of gases between bloodstream and lungs, and gaseous exchange between bloodstream and body tissues has been one of the most difficult challenges confronting senior high school science students (Lumb & Thomas, 2020). The current study compares the effects of conventional and 7Es teaching methods on science students' performance in respiration with a particular interest in Bepoaso Islamic SHS in the Ashanti Region.

According to Rahmahati, Sholihin and Rusyati (2015), for meaningful science education and learning of the respiratory system to achieve its purpose, the choice of instructional method is one of the essential factors that cannot be overlooked. It is therefore important to acknowledge Ozkan and Umdu Topsakal's (2021) findings that students' learning with a conceptual understanding of science depends on how their teachers select teaching methods and teach science courses. This study, in turn, agrees with the fact that the choice and use of the inappropriate instructional method by science teachers in science

classrooms could lead to ineffective teaching and learning of science (Taber, 2018: Schmidt & Fulton, (2016: Lilian, Paul, Ciumuari & Juliet, 2019).

Several scholars have ascribed different interpretations to the respiratory system. According to Man, de Steenhuijsen Piters, and Bogaert (2017), the respiratory system is the organs and other sections of the body engaged in breathing when people trade oxygen and carbon dioxide. Rose (2019) built on Man, de Steenhuijsen Piters, and Bogaert's (2017) definition, stating that the respiratory system is a network of systems and cells that aid respiration. It consists of the airways, lungs, blood arteries, and the lungs' musculature. These components transport oxygen throughout the body, removing toxic gases like carbon dioxide. Miguel-Tomé and Llinás (2021) concluded the discourse on the meaning of the respiratory system by stating that the respiratory system is a biological system in mammals and plants that consists of systems and structures used for gas exchange. The anatomy and physiology that allow this to happen to vary widely based on the organism's size, habitat, and evolutionary past.

The respiratory system contains the muscles that propel the airways of an organism. These components collaborate to transfer oxygen all over the body and eliminate waste gases like carbon dioxide. The physiological and anatomical features that enable this to happen differ significantly based on the creature's size, habitat, and evolutionary past. Millions of tiny air sacs identified as alveoli in mammals and reptiles and atria in birds swap gases in the lungs. The air is in close touch with the blood because these tiny air sacs have a robust blood supply. The air sacs communicate with the outside world via a

network of airways, the most important of which is the trachea, which divides the chest into two primary bronchi in the centre. These penetrate the lungs and branch into shorter secondary and tertiary bronchi, which branch into a slew of smaller tubes known as bronchioles.

Asano (2021) discovered that most senior high schools could not correctly answer most questions about the architecture and components of the human respiratory system when evaluated in WASSCE.

Before Asano's (2021) assertions, Khasanah, Widoretno and Sajidan (2017) had considered the effectiveness of critical thinking indicator-based module in empowering student's learning outcomes in the respiratory system at the Faculty of Education, Universitas Sebelas Maret, Surakarta, Indonesia. The research found that building critical thinking skills to comprehend the respiratory system depends on the resources and techniques used to empower learning results. Furthermore, teaching students to develop cognitive learning skills necessitated the clarification of concepts and the encoding of knowledge to handle respiratory system problems. Asano's findings prompted authors such as Tripto, Assaraf and Amit (2018): Russell et al. (2020), Töman et al. (2015), and Brooks (2018) considers ways to instill techniques in grasping concepts and understanding most topics in biology, including the respiratory system. The researchers concluded that science instructors' teaching methods are essential to students' understanding of the respiratory system. As a result, most advanced nations' educational institutions have standardized teaching methods to help students comprehend critical

ideas related to the respiratory system in most secondary schools (Aboagye, Yawson, and Appiah, 2021).

An in-depth review of the Chief Examiners Report of the West African Senior School Certificate Examination (WASSCE) on Biology performance over the last decade shows a poor performance among SHS students. Most researchers, including Kayode (2020) and Issifu (2019), have established that poor achievement in biology in senior high schools is due to teachers' inability to select and implement the appropriate teaching technique. According to Mapulanga, Ameyaw, Nshogoza, and Sinyangwe (2023), most secondary schools science teachers in Ghana rarely select the appropriate teaching techniques to teach their students biology classes, particularly the respiratory system.

Wodaj and Belay's (2021) asserted that, until recently, the primary instructional strategy in scientific teaching-learning evolved from behaviourism and constructivism learning theories - hence, the teacher-centred (conventional) instructional approach. Their assertion also pointed to the fact that the conventional technique primarily fosters passive and superficial learning; due to these flaws, an alternate strategy, known as the 5E teaching approach, has emerged. Unlike traditional teaching methods, the 5E approach involves students in classroom teaching and learning by making them active participants. According to Muliyati, Marizka, and Bakri (2019), the 5E stands for engaged, explained, explore, elaborated, and evaluated. The 5E approach to teaching is an inquiry technique that offers students a framework for connecting scientific ideas to earlier experiences and applying what they have learned to new circumstances. The 5E teaching method is based

on the constructivist approach to teaching and learning, which asserts that students draw knowledge and meaning from their experiences.

Eisenkraft (2003) expanded the 5E teaching model to make it more suited than the previous one – hence the 7E instructional approach. The 7E acronym depicts elicit, engage, explore, explain, elaborate, evaluate, and extend. Phillips and Johnson (2022) recognized three essentials for adapting the 7E educational technique:

1. It encourages students to acquire new information actively since instructional materials based on the 7E learning cycle assist students in grasping the issues and occurrences they meet in the environment.
2. The 7E educational strategy inspires students to recall the subject matter or topic they have previously learned, motivates them to become effective, and increases their interest.
3. It educates students to grasp respiratory ideas through experimental exercises, encourages them to articulate the concepts acquired vocally, and allows them to explore and search for answers independently.

Consequently, using appropriate instructional methods allows students to participate in lessons actively. It helps them become self-directed independent learners capable of monitoring their learning and using prior knowledge to understand the respiratory system (Wodaj & Belay, 2021). Among the various learner-centred techniques, the 7E educational model helps extract students' previous knowledge and teaches students to understand the respiratory system.

Most science instructors feel at ease instructing using the conventional or traditional technique, according to Tsybulsky and Muchnik-Rozanov (2019). The traditional method of instruction, however, allows pupils to respond to questions without using long-term critical reasoning skills. Additionally, students need to gain more chances to show their reasoning abilities; however, using the conventional method by teachers deprives students of exercising such abilities. However, writers like Mazana, Montero, and Casimir (2020) expressed reluctance. According to the authors, teachers employ different teaching styles for several factors, including subject, topic, availability of teaching materials, and the grade level of the students to be taught. To the best of Abdullahi, Asniza, and Muzirah's understanding, 2021, there is a need for more study and a comparison of traditional, 5E, and 7E teaching techniques to determine their effects on students' performance in scientific education, particularly in the respiratory system.

The current study compares the effects of conventional and 7E teaching methods on science students' performance in respiration.

## 1.2 Statement of the Problem

Although students are expected to achieve the desired outcomes from, what they have been taught, results from the West African Examination Council pertaining to Ghanaian SHS students over the last decade indicated that most students after completing the SHS, are unable to fulfil the fundamental learning competencies and grades required to usher them into tertiary institutions to further their education (Adu-Gyamfi et al., 2020). It would be inaccurate to conclude that SHS students performed poorly in all the subjects tested; however, while most SHS students fared well in most WASSCE subjects in most

years, candidates' performance in science-related courses, particularly biology, could have been better.

In several examination reports, the West African Examination Council (WAEC) Chief Examiner indicated that the science paper questions in the Senior High School Examination remained the same almost all past years. Every question examined diverse ideas in all science programs; nonetheless, in most years, including 2010, 2015, and 2016 notably, candidates' performance recorded pass scores below the specified accomplishment. The WAEC Chief Examiners' Report on WASSCE in 2010 highlighted severe worry about students' inability to adequately describe simple biological themes (WAEC Chief Examiners' Report, 2010). Biology students need help explaining the respiratory system concept, according to the 2015 Chief Examiners' Report. In the 2016 report, the Chief Examiner remarked that candidates lacked in-depth knowledge and techniques for answering questions related to the respiratory system. In addition to the Chief Examiners' Report, investigations have demonstrated that senior high school students in the Ashanti Region had difficulty completing West African Examination Council respiratory system questions (Kusi, 2017: Danso, 2016).

The Chief Examiner attributed the low student achievement to a lack of in-depth understanding of scientific ideas, incorrect spelling of scientific terminology, and an inability to use scientific knowledge to explain biology-related concerns, particularly those relating to the respiratory system. Meanwhile, a lack of biological information and understanding impedes comprehension of the living world and its many species,

including humans and plants. According to academics such as Dandala (2013), low performance in scientific classrooms is caused by a lack of teaching and learning resources, students' personality traits, personal goals, and teachers' experience levels.

Other researchers have linked science students' incapacity to solve biological problems, particularly those involving the respiratory system, to insufficient respiratory system teaching materials and poor selection of teaching methods (Sherwood, 2015: DeBoer, 2019). Although the SHS biology syllabus recommends constructivist teaching approaches, it does not define which constructivist teaching methods should be used for teaching the respiratory system. As a result, different constructivist teaching approaches may be investigated to establish their efficacy in teaching Biology concepts, especially the respiratory system.

Students' low performance in science disciplines, notably biology, has motivated parents, pressure organizations, educational institutions, the Chief Examiner of the West African Examination Council (WAEC), and the Ministry of Education to work together to find a long-term solution to the problem. The study, therefore, focuses on the effect of conventional and 7E teaching methods on science students' performance on Respiratory system.

### 1.3 Purpose of the Study

The study compares the effects of conventional and 7E teaching methods on science students' performance on respiratory system.

## 1.4 Objectives of the Study

Based on the problem statement, the study has set the following objectives to:

1. Investigate the effect of the conventional and 7E teaching approaches on student performance in the respiratory system.
2. Investigate the effect of 7E methods on gender in the respiratory system.

## 1.5 Research Questions

1. What is the effect of the conventional and 7E methods on students' performance on respiratory system?
2. What is the effect of the 7E method on gender on the respiratory system.

## 1.6 Significant of the Study

Students, pressure organizations, educators, and educational institutions worry about students' low biology performance and potential remedies. The study outcomes would therefore help teachers construct instructional materials for teaching biological topics, notably the respiratory system, utilizing traditional and 7E teaching approaches. The research would also aid in identifying academic success gains from using traditional and 7E teaching approaches appropriately. The research will help instructors, students, and stakeholders identify the effects of traditional and 7E teaching approaches on student achievement. Curriculum developers can use the study's results and suggestions to create new curricula or revise existing curricula by integrating the 7E teaching technique and traditional methods.

## 1.7 Delimitation

Not all Ghanaian schools can participate due to the survey's primary random selection method. As a result, just one SHS in Ghana's Ashanti Region was chosen to participate in this research. The study was limited to only SHS 2 biology students. There are a lot of difficult topics in biology, but the study focused on the respiratory system.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Introduction

Chapter two reviewed existing literature about the study. The literature is evaluated under theoretical studies applicable to the current study as well as empirical literature on the effect of the conventional and 7E teaching approaches on student performance in the respiratory system, and the effect of 7E methods on gender in the respiratory system.

## 2.2 Theoretical Review

Theories, according to Blumer (2017), are developed to clarify, deduce, grasp, and make connections between studied variables. Furthermore, a theoretical framework is created to relate the degree to which already established ideas can aid in testing specific questions. The study compares the effects of the 7E educational strategy with the standard approach on students' respiratory system performance. This research is guided by the Cognitive Learning Theory of the 1930s and behaviourism theory of 1930.

### 2.2.1. Cognitive Learning Theory (CLT).

In response to the prevalent behaviourist school of psychology, Jean Piaget developed Cognitive Learning Theory from 1896 to 1980. Cognitive learning theory focuses on the internal processes that surround knowledge and memory. Willingham (2021) describes cognitive learning as being highly interactive, involving learners in a variety of tasks that optimise brain efficiency, enabling the acquisition of novel knowledge. According to

Barrouillet (2015), an analysis of Piaget's theory reveals that cognitive development is a complete theory regarding the nature and development of human intellect. Thus, the theory is concerned with the nature of knowledge and how humans gradually grow to acquire, build, and use knowledge. Piaget was intrigued by the notion that children of different ages make different types of mistakes when solving issues.

Brooks et al. (2021) divide cognitive learning theory into two cognitive models: Cognitive Behavioural Theory (CBT) and Social Cognitive Theory (SCT). According to the authors, social cognitive theory (SCT) has been used in psychology, education, and communication to explore how people watch or gain knowledge from others. Thus, the SCT explores how pupils' social engagement influences their cognitive development. It was also seen that SCT human behaviour development and change occurs as a result of interactions with the world around them. This demonstrates how an individual's behaviour choices are influenced by internal and external factors such as the environment, model selection, and previous experiences.

According to Ugwuanyi et al. (2020) SCT is based on three assumptions: reciprocal determinism (RD), positive and negative reinforcement, and observational learning. Concerning the RD, the students, their behaviour, and the environment in which they find themselves all come together to affect and interact with one another to take in what has been observed, considered, and learned. The positive and negative responses are based on the premise that certain factors, such as reward and punishment, influence students' future learning behaviours: while students may observe someone else performing a behaviour

and then repeat that behaviour themselves, the positive and negative responses are based on these premises.

Applying the theory to the current study, teachers should allow pupils to experiment with other ways of thinking that lessen psychological suffering. Educators must also understand how students' mental processes about scientific facts influence learning and the interpretation of physical events. Furthermore, educators consider both the internal and external factors that influence a student's ability to learn. It is feasible to change the internal and external elements that influence students' thinking to improve learning. Students and teachers should understand the role that thinking processes play in the learning process and how those thoughts can be guided to assist students acquire knowledge more rapidly by applying the theory to the current study.

### 2.2.2 Behaviourism Theory

B.F. Skinner, an American psychologist, created behaviourism theory in the 1930s. Behaviourism, also known as behavioural learning theory, according to Mcleod (2022) is a psychological theoretical perspective that emphasises the importance of learning and observable behaviours in interpreting human and animal behaviour. The author again emphasized that all behaviours are taught through conditioned interaction with the environment. Thus, behaviour is merely a reaction to external stimuli. Only observable stimulus-response behaviours can be investigated in a systematic and observable manner, according to behaviourist theory. The theory's central assumption is that all behaviours are learnt through the process of conditioning and stimulus, and that conditioning

happens because of interaction with one's environment. The Skinner behaviourism paradigm described learning as the acquisition of new behaviours in response to changing environmental conditions, with the major focus on observable behaviours.

According to Lai (2021) behavioural theory recognised student conditioning as part of the whole educational process. Conditioning is classified into two types in the theory: classical conditioning and operant conditioning. Classical conditioning was a learning approach in which a biologically powerful stimulus is matched with a stimulus that was inconsequential in the learner's previous experience. In contrast, operant conditioning is a type of learning in which a person is rewarded or penalised based on their actions.

Laato, Islam, Farooq, and Dhir (2020) examined the behaviourism theory and concluded that students' behaviours are affected by the environmental stimuli they face. Based on Laato, Islam, Farooq, and Dhir (2020), Khalid (2015), a psychologist, stated that behaviourism is solely concerned with observable stimulus-response behaviours since they can be examined in a systematic and observable manner. Thus, the behaviourism theory requires a thorough examination because students' behaviours are influenced not only by the outside influences they encounter, but also by the students' internal stimuli as they study in a systematic and observable approach.

Applying the theory to the current study would mean that teachers make sure learning is based on a framework of routines that instil information into a student's understanding and positive feedback from both teachers and students. The classroom environment can

influence a learner's behaviour. Positive reinforcement should be used by teachers to keep pupils engaged and motivated. Teachers should not utilise excessive negative reinforcement with their pupils during the learning process.

Furthermore, when children perform well, they are singled out and offered opportunities for positive reinforcement and recognition. The theory's consequence also alludes to the fact that behaviourism guides pupils through acceptable reactions and responses to varied stimuli. In practise, such instruction must be given in a repetitive manner to remind students of the behaviour that is required of them in the classroom and learning environment. Positive reinforcement is heavily emphasised in the idea of behavioural learning.

## 2.3 Empirical Literature Review

Existing literature was reviewed following the study objectives, which include. These objectives include investigating the effect of the conventional and 7E teaching approaches on students' performance in the respiratory system, and the effect of 7E methods on gender in the respiratory system.

The review is carried out to unearth existing literature and its conclusions, which may be used as comparison points for the current study. Furthermore, prior to performing new research, a thorough review of the literature helps to raise awareness and comprehension of current research in a certain topic. A literature review can help you fine-tune what has already been done and uncover what is unknown about a topic.

**Effect of the Conventional and 7E Teaching Approaches on Student Performance in the Respiratory System.**

Primanda, Distrik, and Abdurrahman (2019) studied the usefulness and efficacy of student printouts on Newton's Law material in improving conceptual comprehension and solving issues capability in Indonesia. The Newton Law of Motion Conceptual Survey (NLMCS) and pretest-posttest with control group design were employed in the investigation. The NLMCS was utilized to collect data on conceptual understanding and problem-solving abilities, while questionnaires were used to obtain observational data on implementation and student answers. The findings of observations and positive responses of students to worksheet-based learning activities yielded an exceptional score of 83%. According to the study, employing the 7E approach to teaching and learning, students grasped NLMCS in the experimental setting. The study also found that students performed better (N-gain value =0.66) than the control group (=0.55). Students in the experimental class did better in problem solving (=0.64) than in the control class (=0.28). According to the findings of the study, the 7E learning cycle student worksheet generated was practical and effective in improving conceptual comprehension and problem-solving skills in Newton Law of Motion themes.

Egilmezer et al. (2018), for example, conducted a comprehensive analysis of the influence of point-of-care testing for influenza on the outcomes of patients with acute respiratory tract infection. Wodaj and Belay (2021) investigated the impact of the 7E instructional model with metacognitive scaffolding on students' conceptual knowledge in biology. Nonetheless, most of such studies focused on advanced countries (Gordon et al.,

2014; Lumb & Thomas, 2020). The current study evaluated analysis from various parts of the world, mainly Africa, and was highly weighted towards Ghanaian analysis.

Khashan (2016) investigated the effectiveness of using teaching approaches to instruct year two preparation students at King Saud University (KSU) in Saudi Arabia. The study explicitly examined the Learning Cycle Strategy of the 7Es with the traditional approach to teaching on academic attainment. The researchers looked at 73 Preparatory Year students at KSU and divided them into two groups: 35 students who were taught using the 7E's Learning Cycle and 38 students who were taught using the traditional technique. All the groups studied the same material. ANCOVA was used to analyse the scores. The results showed that the 7E's Learning Cycle outperformed the traditional method in terms of immediate and delayed mathematical idea achievement. The paired-samples t-test results also revealed that the 7E's Learning Cycle has a favourable longitudinal effect on retention among KSU Preparatory Year students, but the traditional technique is ineffective in this regard.

A study was conducted in Singaraja, Indonesia, to analyse the effectiveness of the 7E instructional method and the discovery learning model of teaching on students' capacity for critical thinking in chemistry (Suardana et al., 2018). Singaraja's 111 eleventh-grade senior high school pupils were sampled. The students were divided into two groups: the experimental group, which included 57 students, and the control group, which included 54 pupils. The experimental students were assigned the 7E learning cycle model, whereas the control students were assigned the discovery learning model. The acquired data was

analysed using an independent sample T-Test and a Mann-Whitney U-Test. According to the study, the average critical thinking skills score of students in the experimental and control groups was 64,5 and 55,3 respectively. Students were also able to Elicit Analyse Describe Develop, assess, and critical thinking skills.

In Nigeria, the impact of 7E and traditional biology teaching techniques on pupils in two public secondary schools in Adamawa State was studied (Abdullahi, Asniza, & Muzirah, 2021). The inquiry was divided into two groups: experimental and control. The study randomly assigned 30 students from each school to the experimental and control groups, which were taught using the 7E approach and the traditional method, respectively. Data was investigated using descriptive statistics and the independent samples t-test for the two variables. According to the research, pupils retain more lessons when they use the 7E approach rather than traditional ways. Furthermore, the 7E teaching style enhances students' biology achievement. According to the findings of the study, pupils remember lessons taught after some time has passed, which boosts their chances of passing exams. Shuaibu and Ishak (2020) investigated the influence of the 7E instructional technique on the overall attitude of students in biology in Adamawa state, Nigeria. The study explicitly addressed four attitude constructs, including attitude towards Biology as a subject, attitude towards the Biology teacher, perception of relevance of Biology, and perception of difficulty of Biology. The experimental and control groups were two randomly chosen schools that were taught utilising the 7E instructional technique and teacher-centered methods, respectively. A 38-item Likert-based questionnaire was utilised to collect data before and after the intervention. The averages and standard deviations provided answers

to the study question, while the hypothesis was examined using Analysis of Covariance (ANCOVA) statistics.

The conclusions of Gök (2014) are difficult to deny. The study examined sixth-grade students' conceptual understanding of human body systems utilising the REACT and 7E teaching models to close the achievement gap between low and high performers. According to the findings of the study, students had favourable perceptions of the REACT and 7E teaching models. According to the study, the 7E model of education boosts student happiness, self-reported engagement, and achievement significantly.

In Ghana, a comparison of the effectiveness of the REACT, 7E, and traditional teaching approaches on the achievement of Senior High School students in molecular genetics was conducted (Quainoo, 2019). The study's specific purpose was to find out how students felt about the REACT and 7E biology teaching methodologies. 79 of the 2 science students were chosen at random using computer generated random numbers to participate in the study. The three science classes were randomized to REACT, 7E, or conventional groups at random. To collect data, semi-structured interview questions and two and two achievement assessments were used. The study found that students in the REACT and 7E groups performed well, while their peers in the conventional group performed poorly. In Ghana, Winneba, Baiden, and Agbene (2022) investigated the impact of computer-aided instruction (CAI) and traditional teaching techniques on high school biology performance. Participants in the study were chosen at random from two science classrooms. An uneven, quasi-experimental, pre-test, and post-test design was used.

Students in the experimental group utilised their CAI to study cellular respiration (a biological concept), whereas students in the control group learnt the same cellular respiration using a traditional approach. Independent and paired-samples t-tests were employed to analyse pre- and post-test findings for both the experimental and control groups. The results showed that students taught using the traditional technique did better on the post-test than those taught using the CAI. Students in the experimental group, on the other hand, fared better after being told to utilise the CAI. Furthermore, underperforming pupils performed better after receiving tutoring at CAI.

**Effect of 7E Methods on Gender in the Respiratory System**

There is emerging evidence that the 7e teaching technique has a significant impact on female respiratory system performance. However, its larger impact has not been thoroughly investigated (Celli et al., 2015). Nevertheless, scholars such as Shaheen and Kayani (2015) have called for more research into the impact of the 7e style of teaching on gender.

Wodaj and Belay (2021) conducted a qualitative study at Addis Abeba University on the effect of the 7E teaching model with metacognitive scaffolding and gender on 9th grade students' conceptual comprehension of human biology ideas and misunderstandings. Design of quasi-experimental research including pre-test, treatment, and post-test. The study was done on four purposefully selected schools, four classes, and four teachers (one from each school) who were randomly allocated to treatment groups 1, 2, 3, and 4. For 10 weeks, these groups were taught human biology using the 7E teaching model

alone, the 7E teaching model with metacognitive structure, the conventional approach with metacognitive scaffolding, and the traditional method. The human biology conceptual comprehension test was given to all groups as a pre-test and a post-test. The ANOVA results revealed that the 7E instructional model, when combined with metacognitive tactics, outperformed the other instructional methods in terms of improving students' conceptual knowledge and decreasing misunderstandings. However, no significant difference in conceptual understanding was detected between males and girls. As a result, metacognitive scaffolding combined with the 7E instructional paradigm may help students understand biology ideas and reduce misunderstandings better than other instructional methods.

Almasri, Hewapathirana, Ghaddar, Lee, and Ibrahim (2021) investigated the attitudes of biology learners regarding gender, team design, and learning environment. The study employed the experimental research approach, with students divided into experimental and control groups to investigate the hypotheses. 240 people were randomly assigned to single and mixed-gender classrooms with and without groups, as well as single-gender groups. These findings indicate that gender-specific and context-specific learning pedagogies are required, and instructors should choose gender grouping carefully while teaching undergraduate scientific courses.

Darmaji, Kurniawan, Astalini, and Rini (2022) conducted a descriptive quantitative study that focused on science processing competence and critical thinking: gender reviewed. 60 practitioners assisted in gathering data through observation and testing. Data from

science process skills were regarded good, however female students outnumbered male students. Based on the findings of the study, it was concluded that science process skills had an impact on students' critical thinking abilities.

The emotional effect of putting in little effort in high school was investigated (Heyder & Kessels, 2017). The study included two separate experimental vignette experiments with distinct populations of German ninth-grade students (N = 210) and German teachers (N = 176). The purpose of the study was to discover why male students put in lower levels of effort and achieve less academically than their female counterparts. In each group assessed utilising the 7E teaching model, male participants gained grades ranging from 65% to 80%, but female participants received grades ranging from 70% to 90%. The implication was that teaching the 7E approach to female pupils was beneficial.

Two experimental studies looked at the disadvantages that female students of ethnic minorities face in the evaluation process by both pre-service and in-service teachers. According to the statistics, (pre-service) teachers graded their pupils using two distinct teaching methodologies, 7E and traditional approaches. According to the first study's findings, educators evaluate students' scientific abilities using criteria influenced by gender stereotypes. Teachers had a low assessment of their female students' scientific abilities when compared to their male students' scientific abilities. Students who identified as masculine outperformed their female counterparts in terms of overall performance.

## 2.4. Conceptual Review

The conceptual review component of the literature review aids in determining study variables and how other studies quantify them. It serves as the theoretical underpinning for the study by clearly stating the justification for incorporating a variable based on the findings of other researchers.

### 2.4.1. Science Defined

According to Bynum, Browne, and Porter (2014) the history of science spans the evolution of science from antiquity to the present. It may be as old as the human species, and some of the earliest archaeological evidence for scientific reasoning dates back tens of thousands of years; as a result, its definition should be pivotal.

Various authors have described science in various ways. Kind and Osborne (2017) define science as "knowledge gained from observations and experiments to describe and explain the world in which people live. Patton (2018), for example, described science as the search and application of knowledge and understanding of the natural and social worlds using a systematic, evidence-based methodology. Paul and Elder (2019) built on Patton (2018) definition stating that, science is a systematic technique of accumulating knowledge because it uses logical reasoning to explain why things operate or how things happen based on data obtained through observation and experimentation. Boulton (2021), added to the discourse indicating that science is a rigorous, methodical endeavour that creates and organises information in the form of testable explanations and predictions about the cosmos.

Science, according to Lewin (2016), is divided into three categories: physical science, biological science, and social science. The inorganic universe is studied by the physical sciences, which include astrophysics, physical science, chemistry, and Earth sciences. Biology and medicine are biological sciences that investigate the natural world and its procedures. Anthropology and economics are social sciences that investigate the social and cultural influences on human behaviour.

### 2.4.2. Teaching Method

The meaning of "teaching method" according to Saleem, Kausar, and Deeba (2021) relates to the broad concepts, pedagogical tactics, and managerial strategies employed in the teaching and learning processes. Teaching strategies are ways for organising instructions and putting courses into action. Typically, the methods and techniques are founded on educational concepts that predict behaviour in specific pedagogical contexts.

Losco et al. (2017) described numerous strategies for teaching science to pupils to assist them understand their surroundings. Individual learning, 3E method of teaching, lecture-based instruction, 4E approach to teaching, technology-based learning, 5E Inquiry-Based Instructional Model, individual learning, 7E approach to teaching, differentiated education, and group learning are among these techniques. The authors contrasted that, while there are numerous techniques for teaching science, they ultimately boil down to either teacher-centered or student-centered instruction. Both styles of instruction have a place in the classroom, but they have quite distinct dynamics.

While there are several techniques to teaching, the most essential thing to remember is that the method used to teach science should aid students in understanding how the scientific process works and why science affects their own lives (Juleha, Nugraha & Feranie, 2019). In this study, the 7E and conventional methods of teaching are the most considered methods.

### 2.4.3. The 7E Method of Instruction

The 7E's learning cycle or teaching technique, according to Khashan (2016), consists of seven teaching and learning processes used by teachers to teach pupils. The strategy seeks to enable pupils to construct their own scientific knowledge acquisition. According to the author, the 7E technique involves seven phases: Elicit, Engage, Explore, Explain, Elaborate, Evaluate, and Extend. The 7E instructional model is a popular learning cycle among science teachers because it is a student-centered, exploratory learning strategy that use seven cycles of phases to establish the foundation for effective conceptualization by students.

Other actions included in the 7E model of educational delivery, according to Cherono (2021), include testing students' ideas against accepted scientific explanations and applying learned knowledge to new contexts. The activities also include a variety of ways that help students gain new knowledge by clarifying their mental processes, such as blended learning, group work, laboratory research, and direct instruction (Cherono, 2021). The author found that the 7E approach comprises a constructivist teaching strategy that encourages peer interaction in which students cooperate and discuss concepts to

successfully learn them. The 7E approach to teaching and learning, as a student-centered educational method, dramatically improves academic success.

### 2.4.4. Conventional Method

According to Abah (2020), traditional teaching methods, often known as conventional teaching methods, are still widely employed in schools. Teachers in traditional teaching methods ask students to repeat and memorise the content of the study and what they teach in the classroom, and pupils recite the lesson one by one when their turn comes. The method is founded on the idea of a teacher-centered method that includes face-to-face interaction, particularly between the teacher and the student. The traditional method of teaching is a teacher-centric method that promotes the teacher's dominance in the classroom setting. In the conventional method of teaching, teachers used the drill and rote method of memorization. With this method, children learn via repetition and memorization. Teachers' primary goal in traditional teaching is to prepare students for tests rather than to teach them and help them understand the topic and curriculum. Students only learn to pass exams and receive good grades.

Conventional instructional techniques according to Biggs, Tang, and Kennedy (2022), are used in the classroom in such a way that students are recognised for the effort they put in throughout each subject period. In the classroom, guidelines and standards are enforced in such a way that pupils' behaviour is kept in check. These norms and regulations were taken from established practises that schools had effectively used for many years.

Teachers are accountable for imparting knowledge and upholding school norms of behaviour.

### 2.4.5. Respiratory System

According to Zepp and Morrisey (2019), the respiratory system is a network of organs and tissues that aid in breathing. It consists of the airways, lungs, and blood vessels. The respiratory system includes the muscles that power the lungs. These components work together to transport oxygen throughout the body and remove waste gases such as carbon dioxide. The respiratory system allows us to inhale (breathe in) and exhale (breathe out). Furthermore, the respiratory system helps to regulate body temperature and moisturizes to the humidity level that the body requires.

The respiratory system (RS) has been defined in numerous ways by scientists. The respiratory system (RS), according to Aung et al. (2019), is a network of organs and tissues that aid in breathing. These organs include the airways, lungs, blood vessels, and the muscles of the lungs. These organs work together to deliver oxygen throughout the body and eliminate waste gases like carbon dioxide. The respiratory system, according to Rose (2019), consists of several components such as the mouth and nose, Sinuses, Pharynx (throat), trachea, bronchial tubes, and lungs, all of which work together to assist breathing. Each collection of pieces is made up of many separate components. For example, the bones and muscles of the respiratory system include the diaphragm and rips, whilst the lungs and blood vessels have Alveoli, Bronchioles, Capillaries, and lung lobes.

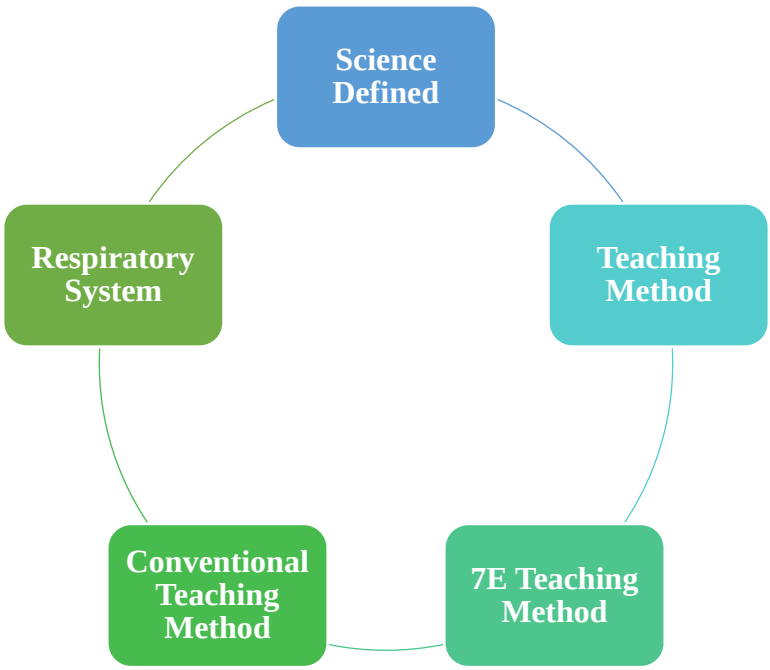


**Figure 2.1: Conceptual Framework of Study Variables**

## 2.5. Summary of Literature Review

During the literature study, many variables of 7E and traditional teaching techniques were identified to investigate their impact on students' performance in the respiratory system. The theoretical structure gave notions and insights into the issue of the study by clearly demonstrating the development of the study questions. The review investigated theories that extended on the topic under consideration in order to determine their linkages with the variables in the study and to see how far already established ideas may help in testing questions that had been established. This study was guided by two theories: behaviourism theory and cognitive learning theory (CLT). Behaviourism is an approach to learning that claims that all habits are learnt through conditioning, which occurs because of contact with one's surroundings. The cognitive learning hypothesis describes how internal and external influences affect an individual's mental processes to

augment learning. CLT was previously assumed to encompass both Social Cognitive Theory (SCT) and Cognitive Behavioural Theory (CBT).

The review incorporated analysis from different parts of the world, particularly Africa, with a heavy emphasis on Ghanaian study. The influence of the 7e and conventional methods on student respiratory system performance, as well as the impact of the 7e approach on gender performance in the respiratory system, were discussed.

During the conceptual review, several scientific knowledge ideas and research factors were discovered. The notion of science, the concept of teaching methods, the 7E teaching strategy, traditional teaching techniques, and respiratory system were all discussed. According to the review, the 7E learning technique motivates learners to recall lessons, improves their biology competence, and enables them to develop problem-solving skills. Furthermore, the 7E education improves students' Biology performance and helps them accomplish academic excellence. Pursuant to the review, the 7E teaching approach results in a significant difference between students with different biological status.

# CHAPTER THREE

# METHODOLOGY

## 3.1. Introduction

The method employed in this study, as well as the stages involved, are specified in detail in this chapter. The methodology covers the r research design, data source, target population, sampling procedure and sample size, data collection technique, ethical considerations, and a brief history of the subject being investigated.

## 3.2. Research Design

A quasi-experimental design was adopted in the investigation. QED is used to determine the cause-and-effect relationship between independent and dependent variables. Without interfering with the normal educational process, quasi-experimental designs enabled researchers to compare the performance of control and experimental groups in the effect of conventional and 7E teaching method. Researchers can compare the effects of different teaching approaches in naturally occurring groups using quasi-experimental methodologies. The researcher was able to address ethical concerns, maintain real-world relevance, work within resource constraints, conduct comparative analyses, and consider the longitudinal aspects of the study by using a quasi-experimental design in studying the effect of conventional and 7E teaching methods on science students' performance in respiration. This design choice ensured that the research findings are applicable to the intricacies of actual classroom contexts.

## 3.3. Research Approach

The study used a quantitative research approach. The study collected numerical data from the schools under study using tests. The quantitative research method was used in the study because it produces precise data that can be described using statistics and figures (Queirós, Faria, & Almeida, 2017). The quantitative research method was also used since it allowed for generalisations from a larger population as well as the quantification of behaviour, perspectives, attitudes, and other traits.

## 3.4. Source of Data

A data source is the point of reference from which data is derived (Liu et al., 2018). To achieve the study objectives, primary and secondary data were employed in the research. The study collected primary data through a self-administered questionnaire, as well as data from respiratory system teaching sessions and experiments conducted with the two schools under the study. Secondary data was gathered from books and publications on 7E and traditional teaching methodologies, as well as records of methods utilized in teaching biology in the schools under investigation.

## 3.5. Population

This study's population covers all science students in the Bepoaso Islamic SHS in the Sekyere Central in the Ashanti Region. The study’s target population included 370 science students.

### 3.6. Sampling Procedure and Sample Size

The study was conducted at the Bepoaso Islamic SHS at random. The researcher chose the study's location at random. Using the Bepoaso Islamic SHS courses registry, the researcher discovered three science - two classes 'A', 'B', and 'C', each with 40 students. Out of the 350 targeted scientific students at Bepoaso Islamic SHS, this equated to 120 science 2 students. Because not all the three science 2 classes were studied, a random sample method (RSM) was employed to pick two of the three science 2 classes. Consequently, consecutive numbers one (1) and two (2) were allocated, written, and placed in a box among other numbers. The researcher informed the classes that the class that picks number one (1) would participate in the control group, and automatically, the class that picked number 2 participates in the experimental group. The classes were asked to pick the numbers, and Science 2 'B' and 'A' chose numbers one and two respectively and were considered to participate in the study as control group and experimental group respectively. As a result, 80 science 2 students took part in the study and answered the quantitative questions.

### 3.7. Data Collection Instrument

The data collection instrument was test. The researcher obtained consent from the school and classes where the research was conducted to administer the questions designed to address the study objectives.

### 3.8. Data Collection Procedure

The text used to collect the data was developed based on the study's objectives. The researcher conducted two tests: Pre-test and Post-test. The tests were conducted to elicit students' prior knowledge on respiratory system before respiratory lesson was taught (Pre-test), and their knowledge after the lesson was taught (Post-test).

The researcher requested permission from the study setting to administer the questions to address the study objectives. The researcher explained the questions to the participants in depth so that they could address the questions correctly. The objective was to help respondents understand the research objective and eliminate assumptions and biases. Data were gathered in three sections: A, B, and C. Data on the study participants was collected using multiple choice question in Section A. Data on the effect of the conventional and 7E teaching approaches on student performance in the respiratory system was collected in Section B through open-ended questions. Data on the effect of 7E methods on gender in the respiratory system was collected in Section C.

Section 'A' identified three (3) nominal data questions regarding the participants in the study. These questions required the study participants to indicate their gender, age, and years spent in school. Section 'B' identified five (5) open-ended questions on the effect of the conventional and 7E teaching approaches on student performance in the respiratory system. Section 'C' identified five (5) open-ended questions about the effect of 7E methods on gender in the respiratory system.

Everyone in the study answered the same number of questions. All participants answered ten (10) questions in the quantitative study. The test was conducted in the classes of the participants.

### 3.9. Reliability of Questionnaire

A pilot study involving forty (40) people, half of the study population was carried out. This helped the researcher evaluate the questionnaire's reliability. The selection of the 40 persons was consistent with Sovacool, Axsen, and Sorrell (2018) conclusions that a-half piloting an instrument on a subset of the study population is an important phase in the research process. It assures that the instrument is clear, practicable, and dependable, resulting in more accurate and useful data collection throughout the primary study. Reliability indicates that questionnaires are measuring the intended concept (Mohajan, 2017). According to Sürücü and Maslakci, (2020), According Grima et al. (2023), the most used internal consistency metric is the Cronbach alpha coefficient. There are no globally agreed-upon rules for defining internal consistency. Most experts do agree that the coefficient should be at least 0.70. It is suggested that the dependability for pilot research be at least 0.60 (Schwendicke et al., 2020). Amron, Ibrahim, Bakar, and Chuprat (2020) provided four cut-off points in their reliability study: high reliability (0.70-0.90), moderate reliability (0.50-0.70), low reliability (0.50 and lower), and good reliability (above 0.90). The pilot test's Cronbach alpha result, which showed very strong reliability, was 0.967 for the forty (40) participants. Table 1 displays the reliability coefficients from the questionnaire's subscales.

**Table 1: Reliability Test**

| Construct | Number of Items | Reliability Coefficient of Pilot Test |
|---|---|---|
| Conventional & 7E on Student Performance | 5 | 0.941 |
| 7E methods on gender. | 5 | 0.922 |
| Reliability coefficient | 11 | 0.967 |

**Validity**

The validity result from table 2 indicates that Convergent Validity (CR) for all the items (effect of conventional and 7E teaching approaches on student performance, and effect of 7E methods on gender in the respiratory system) were 0.947 and 0.837, respectively, which were more than 0.7 and Average Variance Extracted (AVE) for the two variables (0.817 and 0.564) were all greater than 0.5.

The discriminant validity indicates that the Maximum Shared Variance (MSV) for the two variables; effect of conventional and 7E teaching approaches on student performance, and effect of 7E methods on gender in the respiratory system) which were 0.368 and 0.417 respectively were all less than the Average Variance Extracted (AVE) for the two variables. Similarly Average Share Variance (ASV) for effect of conventional and 7E teaching approaches on student performance, and effect of 7E methods on gender in the respiratory system) were (0.132, and 0,190) respectively, were less than the Average Variance Extracted (AVE). The validity for the effect of conventional and 7E teaching approaches on student performance, and effect of 7E methods on gender in the respiratory system) were established.

**Table 2: Validity Test**

| | CR | AVE | MSV | ASV | Conventional & 7E on Student Performance | 7E on Gender |
|---|---|---|---|---|---|---|
| Conventional & 7E on Student Performance | 0.947 | 0.817 | 0.368 | 0.152 | 0.904 | |
| 7E Method on Gender | 0.837 | 0.564 | 0.417 | 0.190 | 0.171 | 0.751 |

### 3.10. Data Analysis

The quantitative data was examined using an independent sample t-test. The data was analyzed in accordance with the research questions. An independent sample t-test was used to examine research question number one. An independent sample t-test was used to examine research question number two.

### 3.11. Ethical Considerations

The study took into account ethical problems. Before the study began, the study participants were told of the purpose for their inclusion. Each subject or participant was advised that their participation in the study was voluntary and that they might opt out at any moment.

Individual identification information (such as name, phone number, videos, etc.) or participant replies were not collected as part of the study. Furthermore, to guarantee that all respondents knew how to answer the questions, the researcher explained the requirements of the questions to all participants. By following the ethical concept of secrecy, the study secured the privacy of all participants. The study considered

eliminating all potential sources of harm to participants, including psychological, social, physical, and legal harm.

# CHAPTER FOUR

# RESULTS, FINDINGS AND DISCUSSIONS

## 4.1 Introduction

This chapter entailed the techniques in collecting data, interpretations of findings, and presentation of outcome.

## 4.2. Response Rate

The study recorded one hundred percent regarding respondents' rate. All sampled participants participated in answering the study.

## 4.3. Background of Respondents

**Table 3: Biodata of Participants**

| **Gender** | **Frequency** | **Percentage** |
|---|---|---|
| Male | 54 | 68 |
| Female | 26 | 32 |
| **Total** | **80** | **100** |
| **Class** | | |
| Science 2 'A' | 40 | 50 |
| Science 2 'B' | 40 | 50 |
| **Total** | **80** | **100** |
| **Age Range (Years)** | | |
| 15 – 16 | 64 | 80 |
| 17 – 18 | 14 | 17.5 |
| 19 & above | 2 | 2.5 |
| **Total** | **80** | **100** |

*Source:* Field work 2022

The table on gender showed a disparity between male and female participants in the study. 55 participants with 68 per cent were male, while 25 participants indicating 32 per cent were females. The table also shows that 40 science 2 ‘A’ students and 40 science 2 ‘B’ students representing 50 per cent each participated in the study. Regarding age range, 73 students representing 80 per cent were recorded between the ages of 15 and 16 years, 14 participants representing 17.5 per cent were recorded between 17 and 18 years. 2 participants (2.5%) were recorded between 19 years and above.

### 4.4. Conventional and 7E’s Teaching Approaches

**Research question 1: What is the Effect of the Conventional And 7E Teaching Approaches on Student Performance in The Respiratory System?**

Research question 1 sought to investigate how conventional and 7e teaching approaches affect student performance in the respiratory system. To investigate if the two science 2 classes perform differently or similarly on the pre-test, an independent sample t-test was utilized. The results of the independent sample t-test on the pre-test scores are shown in Table 4.

**Table 4: Results of the Independent Samples T-test on the Pre-test Scores of 7E and Conventional Approach**

| Teaching Method | N | Mean | SD | t | df | p |
|---|---|---|---|---|---|---|
| 7E | 40 | 33.425 | 8.544 | 0.493 | 39 | 0.05 |
| Conventional | 40 | 33.275 | 7.727 | | | |
| p>0.811 | | | | | | |

Table 4 shows that the 7E approach (M=33.425, SD=8.554) did not perform substantially better on the pre-test than the conventional approach (M=33.275, SD=7.727; t (0.241), p-value (0.811). The outcome indicates that p-value is more than 0.05 ($p > 0.05$), indicating that there is insufficient evidence to reject the null hypothesis. Thus, there is no significant difference in pre-test scores between the 7E and conventional respiratory system training techniques. An independent sample t-test was used to determine differences in the effect the post-test results of 7E and conventional teaching approach. Results are shown in Table 5.

**Table 5: Results of the Independent Samples T-test on the Posttest Scores of 7E and Conventional Approach and their effect on respiratory performance**

| Teaching Method | N | Mean | SD | t | df | p |
|---|---|---|---|---|---|---|
| 7E | 40 | 65.3 | 7.167 | 4.563 | 39 | 0.05 |
| Conventional | 40 | 59.075 | 6.278 | | | |
| p<0.000491 | | | | | | |

From Table 5, the 7E approach (M=65.3, SD=7.167) scored significantly higher on the posttest than the conventional approach (M=59.075, SD=6.278; t (4.563), and p-value (0.000491}. In this case, the p-value is much smaller than 0.05 ($p<0.000491$), which means there is strong evidence to reject the null hypothesis. Therefore, based on the results of the t-test, there is a significant difference in the post-test scores between the 7E and Conventional teaching methods for the respiratory system.

**Research question 2: What is the effect of 7E teaching strategy on the gender of students on respiratory system?**

Research question 2 sought to determine the effect of 7E teaching approach on gender. To achieve this, an independent sample t-test was conducted on the pretest for the 7E approach on gender in respiratory system. This aimed to determine whether males and females performed similarly or if there was a substantial difference in performance between them prior to the intervention. The result of the independent sample t-test on the pretest of 7E approach on gender in respiratory is presented in Table 6.

**Table 6: Result of Independent Sample T-test on the Pretest of 7E Approach in Terms of Gender**

| Gender | N | Mean | SD | df | t | *p* |
|---|---|---|---|---|---|---|
| Males | 27 | 34.074 | 7.54 | 23 | 0.909 | 0.05 |
| Females | 13 | 31.615 | 7.060 | | | |
| p>0.810 | | | | | | |

According to Table 6 the 7E strategy (M=34.074, SD=7.542) and the conventional approach (M=31.615, SD=7.060; t (0.909), and p-value (0.810) on the post-test. In this situation, the p-value is more than 0.05 (p>0.810), indicating insufficient evidence to reject the null hypothesis. As a result of the t-test results, males and females had similar pretest scores for the 7E method.

Thus, the study reveals that there is no significant influence of the 7E method on pretest scores when considering gender differences. The p-value exceeds the selected

significance level, indicating that there is no statistical significance in this case. Table 7 displays the results.

**Table 7: Independent Sample T-test of the Effect of Gender on Posttest Scores of Students in the 7E Approach**

| Gender | N | Mean | SD | df | t | *p* |
|---|---|---|---|---|---|---|
| Males | 27 | 65.296 | 6.151 | 17 | -0.00401 | 0.05 |
| Females | 13 | 65.307 | 8.913 | | | |
| p<0.00049 | | | | | | |

Table 7 compares the 7E strategy (M=65.296, SD=6.151) to the conventional approach (M=65.307, SD=8.913; t (-00401), p-value (0.00049). In this situation, the p-value is much lower than 0.05, indicating that males and females have significantly different posttest scores using the 7E technique. The results indicates that there is a statistically significant difference in posttest scores between males and girls using the 7E technique.

### 4.5. Discussions

**Effectiveness of the 7E instructional strategy and conventional approach on students' performance in respiratory system**

The Post-test Scores of 7E and Conventional Approaches and Their Effect on Respiratory Performance revealed that the teaching method (7E and Conventional) has a substantial effect on student performance in the post-test scores connected to the respiratory system. As a result, students trained with the 7E strategy performed better on the post-test than those instructed with the Conventional approach. This finding agrees with those of Khashan (2016). The study included 73 KSU Preparatory Year students who were separated into two groups: 35 students who were trained using the 7E's Learning Cycle

and 38 students who were instructed using the traditional technique. The ANCOVA results analysis of the students' scores revealed that the 7E's Learning Cycle is more successful than the traditional method. Furthermore, the findings of the paired-samples t-test study revealed that the 7E's Learning Cycle had a greater favourable longitudinal effect on retention among KSU Preparatory Year students than the traditional technique.

San Miguel's (2021) study findings on the effect of the 7E model inquiry-based approach on student achievement in the Philippines agrees with the current study's conclusions. San Miguel's study used experimental design research, which investigated two or more experimental variables. The study included 70 Masapang Elementary School science students. The students were divided into two groups, with one group receiving traditional education and the other receiving the 7E Model Inquiry-Based approach to teaching Science. The groups were examined using spot tests administered by the researcher. The study's findings revealed a substantial difference in academic accomplishment between learners instructed using the standard instruction strategy and those instructed using the 7E model inquiry-based approach. Students taught using the 7E teaching style outperformed those taught using the traditional teaching approach. The study recommends using the 7E model inquiry-based approach over traditional instruction methods since it helps students comprehend subject matter more easily and accurately.

**Effect of 7E instructional strategy on gender in respiratory system**

The results indicates that there is a statistically significant difference in posttest scores between males and girls using the 7E technique. The results contradict the findings of the Wodaj and Belay (2021) investigation. The primary goal of the study was to look at the

impact of a 7E instructional model with metacognitive scaffolding and gender on 9th grade students' conceptual comprehension of human biology concepts and misunderstandings. The quantitative research method was used, and the design was a non-equivalent pretest, treatment, post-test control group quasi-experimental research design. There is one comparison group and three treatment groups in the design. The study indicated no significant difference in conceptual understanding between males and females.

The current study finding is consistent with that of Adesoji and Idika (2015), who investigated the impact of the 7E learning cycle model, based on constructivist theory and case-based learning (CBL), on students' chemistry achievement and attitude. A total of 208 chemistry students from chosen secondary schools in Ibadan, Oyo state, Nigeria took part. The study used two instructional guides for the 7E Learning Cycle Model and Case-Based Learning Strategy, as well as instruments such as the Chemistry Achievement Test, Students' Attitude to Chemistry Questionnaire, and an Evaluation Sheet for Research Assistants. The study used a pretest, posttest, control group, quasi-experimental design. The 7E learning cycle model resulted in higher student scores ($\bar{x}$ = 8.40) compared to the conventional method ($\bar{x}$ = 7.50).

# CHAPTER FIVE

# SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

## 5.1. Introduction

The purpose of the study was to compare the effect of the 7E instructional and conventional approaches on students' performance in respiratory system. The research questions outlined drove the research.

1. What is the effect of 7E, and conventional approaches have on students' performance in respiratory system?
2. What is the effect of the 7E approach on gender in respiratory system?

## 5.2. Summary of the Results of the Study

The research questions served as a guide in analyzing the results.

1. The research question 1 sought to find out the effect 7E and conventional approaches on students' performance in respiratory system. The result revealed that the teaching method (7E and Conventional) has a substantial effect on student performance in the post-test scores connected to the respiratory system
2. Research question 2 assessed the effect of 7E teaching approach on gender. The results showed that students who were trained using the 7E strategy did better on the post-test than those who were taught with the conventional approach

## 5.3. Conclusions

The study's goal was to assess the effects of the 7E instructional technique and traditional approaches on students' respiratory system performance.

The study's findings reveal that there was a statistically significant difference in respiratory system performance when students are educated using the 7E or conventional technique.

The study also found that the 7E method had a significant effect on gender in terms of respiratory system performance.

## 5.4. Recommendations

1. Biology teachers can teach the respiratory system employing either the 7E approach or the traditional method. According to research, both strategies are equally successful in boosting students' comprehension of how the respiratory system works.
2. Schools and educational institutions should encourage gender-neutral teaching practices, emphasizing methods such as the 7E approach that offer equitable learning chances for all students regardless of gender.
3. Biology instructors at various high school levels should use the 7E teaching approach while discussing the topic of the respiratory system. This strategy has the potential to significantly reduce the achievement difference between male and female students.

## 5.5. Suggestions for Further Research

1. Conduct a long-term study to compare the effectiveness of the 7E approach to established techniques of teaching the respiratory system.
2. Investigate the larger impact of gender-neutral teaching practises in STEM (Science, Technology, Engineering, and Mathematics) areas other than the respiratory system. Investigate how gender-neutral teaching approaches, such as the 7E approach, affect students' performance, confidence, and enthusiasm in STEM disciplines.
3. Conduct qualitative study to look deeper into the various teaching strategies that contribute to the 7E approach's effectiveness.

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