

## Effect of Experiential Learning Approach on Junior High School Pupils' Performance in Finding Area of Plane Figures

Hatsu Edo<sup>1</sup>, Francis Ohene Boateng<sup>2</sup>, Vivian Maanu<sup>3</sup>, & Kennedy Gyimah<sup>4</sup>

### Abstract

The purpose of the study was to investigate effect of the experiential learning approach on junior high school pupils' performance in finding area of plane figures. The sample size consisted of seventy (70) pupils comprising 35 in the control group and 35 in the experimental group. A quasi-experimental design was used in which the experimental group was exposed to experiential learning teaching approach and control group was taught normally using the traditional method. Pre-test and later post-test, which were based on the Ghana Education Service junior high school mathematics syllabus requirements, were carried out simultaneously on both groups before and after the experiment respectively. A focus group discussion was held with five mathematics teachers to find out the impact of the experiential learning activities on their pupils' in performance in finding area of plane figures. An independent sample t-test analysis was carried out on the pre-test and post-test scores. The findings revealed that the experiential learning teaching approach led to better development of the pupils' performance in the concept than the traditional method of teaching. The performance of experiential learning group was higher than the comparable traditional group. The teachers confirmed in the focus group discussion that experiential learning impact on learners' performance in finding area of plane figures. The study recommends that teachers should incorporate experiential learning teaching approach into their lessons to help improve pupils' conceptual understanding of area of plane figures.

Keywords: area of plane figures; performance in mathematics; experiential learning; traditional method

### Introduction

The Ghanaian mathematics curriculum emphasized on some innovative ways of teaching, learning and assessment. Some of these methods of teaching are normally student-centered approach, meanwhile there has been a paradigm shift from teacher-centered approach to mathematics delivery in the classroom. The teacher centered approach involve the teacher taking the center stage of the teaching and learning process, where learners are supposing to depend fully on the teacher for information. The child has no power and influence over knowledge construction in the classroom. In

this case the traditional method of instruction is no exception.

Meanwhile the new mathematics curriculum depends on student-centered learning, problem solving and participatory learning of mathematics in the classroom. Application of basic mathematics concept to real life situation was a major concern to curriculum implementors. Hence teachers' knowledge of teaching and learning of mathematics should be directed towards innovation, application and problem solving (Sun & Xiao, 2023). However, teachers who are the major stakeholders when it come to the implementation of mathematics curriculum knew little about experiential

<sup>1</sup>Hatsu Edo, Department of Mathematics Education, St. Vincent College of Education, Yendi, Ghana.  
Email: hatsuedo26@gmail.com

<sup>2</sup>Francis Ohene Boateng, Department of Mathematics Education, Akenten Appiah Menka University of Skills Training and entrepreneurial Development (AAMUSTED), Kumasi

<sup>3</sup>Vivian Maanu, Department of Mathematics Education, Akrokerri College of Education, Obuasi

<sup>4</sup>Kennedy Gyimah, Department of Mathematics Education, Akenten Appiah Menka University of Skills Training and entrepreneurial Development (AAMUSTED), Kumasi

Open Access article distributed under the terms of the Creative Commons Attributions License [CC BY-NC-ND 4.0]  
<http://creativecommons.org/licenses/by-nc-nd/4.0>. DOI: <https://dx.doi.org/10.4314/ajesms.v19i2.10>

*Effect of Experiential Learning Approach on Junior High School Pupils' Mathematical Problem-Solving Abilities*

*Edo, H., Boateng, F. O., Maanu, v., & Gyimah, K.*

learning method of teaching and hardly implement it, even though majority of them knew about traditional method and other student-centered method of teaching. The core of the basic school mathematics curriculum did not emphasize on experiential learning though other methods were explicit. Experiential learning approach is different from the various types of students-centered approach outlined in the Ghanaian mathematics curriculum. Experiential learning is based on students' thoughts, feelings, and openness during the educational process. Student-teacher collaboration is also important in teaching and learning because it allows to better engage with and understand material. Among the ways question-and-answer, discussion, roleplay, activity, case study, interviews, educational tours, brainstorming, exercises, groupwork, debate are all examples of experiential teaching techniques that can help students participate actively, interact and communicate more effectively (Uyen, Tong & Lien, 2022). Meanwhile the Ghanaian mathematics curriculum made mention of mathematics being connected to the background, experience, and context of the learner. Also, mathematics teaching should be linked to everyday activities and relevant previous knowledge of the learners. However, all the concepts mention above are not the same as experiential learning but rather techniques to experiential learning approach. Hence experiential learning may be alien to the Ghanaian mathematics teacher and may be a novelty as far as teaching and learning is concern in the Ghanaian basic educational system for teachers, though educational policy makers knew about it.

Recognizing the significance of experiential learning, countries like the United States of America, Singapore, and Vietnam place much emphasis on experiential learning alongside the mathematics curriculum. In Vietnam, for instance a new general

education curriculum was officially announced by the Ministry of Education and Training in July 2017. In that curriculum, experiential activity is compulsory and experiential learning was necessary as mentioned in the mathematics curriculum. It aims at making a basic and complete innovations of the quality and effectiveness of general education. Mathematics teachers were trained on how to construct experiential activity themes for lower secondary school students congruent to the new mathematics curriculum (Tuyen, 2018).

In the context of the Ghanaian mathematics curriculum, since much emphases were placed on problem solving, I think it is necessary to look at the effectiveness of experiential learning with other teaching method. This gap was identified by Wynn (2018) when a study was conducted to investigate the effect of experiential learning on mathematics achievement and mathematics anxiety of African-American students, the study recommends that much research has not been done in the area of experiential learning and learners' achievement in mathematics. Hence this study seeks to fill the gap proposed by Wynn (2018). The study seeks to assess the performance of learners taught mathematics with the experiential learning approach and the traditional method. Traditional method was chosen because it is commonly used by teachers even though it has a lot of disadvantages.

### **Statement of the Problem**

There are several teaching methods mentioned in the Ghanaian mathematics curriculum, notably among them are the student-centered method of teaching. Some of these methods are problem solving, discovery, activity, exploratory method etc. However, little was said about experiential learning which mostly foster application of concepts and learning through experience. Majority of Ghanaian mathematics teachers

do not make use of experiential learning as a tool for mathematics instruction, this is because the teachers themselves were not trained for it, so teachers have little knowledge when it comes to experiential learning. In view of the above findings there has been a gap between classroom mathematics and the world of application/practice. Meanwhile countries like Vietnam and the United State of America were able to run experiential learning programs alongside the main curriculum (Tuyen, 2018). However, there has been some studies on experiential learning in countries practicing them. Meanwhile, in Ghana there has not been enough studies on experiential learning even though curriculum planners and implementors knew the significance of it. Hence this study was meant to investigate mathematics teachers view and knowledge on experiential learning and also to assess the impact of mathematical achievement of learners using experiential learning approach and traditional method of instruction. The traditional method of teaching was chosen because it is the most commonly used method even though the method has much disadvantages compared to other method. In the study of Wynn (2018) there has not been much work done in the area of assessing the mathematics achievement of students taught using experiential learning with those taught using traditional instruction. This was the gap on which our study is based and situating it in the Ghanaian context, it is a novelty since it is one of the few studies conducted on assessing mathematical performance of learners using the experiential learning approach at the basic school level in Ghana.

*Research Objectives:*

1. To explore the impact of mathematics teachers' knowledge of experiential learning on learners' performance in finding area of plane figures.
2. To assess the impact of using experiential learning approach on

learners' performance in finding area of plane figures.

**Literature Review**

*Experiential Learning and Traditional Method*

Raja and Najmonnisa (2018) conducted a study on traditional teaching method and experiential learning using experimental research design. The aim of the study was to investigate the effectiveness of experiential learning and traditional method. The findings revealed that experiential learning method improves undergraduate students' performance better. It was recommended that school administration should encourage the use of experiential learning in the classrooms. Similarly, Jeyaraj (2019) was of the view that experiential learning method is preferred to traditional method because it facilitates participation, interaction, cooperation and collaboration and application. Nguyen (2022), experiential learning shows a vital role during teaching as well as learning process of students. Nguyen (2022) recommends that students and teachers should take into consideration the activities of experiential learning. Silver (2021) concluded that teachers who integrates the stages of experiential learning will enhance the performance of all learners compared to other teaching methods.

*Mathematical Problem Solving*

Mathematics is a science related to abstract objects hence most students have difficulties in understanding mathematical concepts. Mathematical problem solving is an important thing that should get teacher's attention, especially to develop students' ability in their problem solving. Problem-solving involves many cognitive processes that require students to understand information, find solutions to problems and apply mathematical knowledge in real world situation. Mathematics curriculum aims to provide student environments in which students can make observation, discover, solve problems, share, and discuss their solutions with friends and apply what they

*Effect of Experiential Learning Approach on Junior High School Pupils' Mathematical Problem-Solving Abilities*

Edo, H., Boateng, F. O., Maanu, v., & Gyimah, K.

learn in class (Rokhima, Kusmayadi & Fitriana, 2019). "Real Problem Solving" enables pupils to practise their mathematics skills or learn new ones, by using mathematics as a tool to address a problem. It has been suggested that problem-solving techniques can be made available most effectively through making problem solving the focus of the mathematics curriculum. Hence mathematical problem solving is the heart of most mathematics curriculum (Aydogdu & Ayaz, 2008). This was similar to the study of (Klang, Karlsson, Kilborn, Eriksson & Karberg, 2021), they noted that overall performance of students taught using problem-solving and cooperative learning in geometry increased. The students had higher scores on the selected tests of mathematical problem solving. Thus, mathematical problem-solving in heterogeneous classrooms, greatly impact students' results. problem solving method on students' achievement in teaching mathematics at elementary level. problem solving method enhanced the achievement of the students in mathematics. Hence problem-solving method was effective over traditional method in teaching mathematics at elementary level. Teachers are encouraged to employ problem solving method in teaching mathematical concepts like set, information handling and geometry etc. Regular training, workshops and seminars should be arranged for teachers to give them knowledge and understanding of problem-based learning (Ali, Hukamdad, Akhter & Khan, 2010). Problem – solving approach is an effective instructional strategy to improve student Mathematics achievement. This was done by providing students appropriate opportunities to be engaged freely in problem – solving activities. General problem-solving strategy has been successful in secondary schools' practice even in all categories. Peer partners and small problem-solving groups gave learners opportunities to see different ways including

teammates approach to mathematical problems (Kigamba, Wanjiru & Marguerite, 2021).

*Meaning and Importance of Experiential Learning*

Experiential education is a philosophy that informs many methodologies in which educators purposefully engage with learners in direct experience and focused reflection in order to increase knowledge, develop skills, clarify values, and develop people's capacity to contribute to their communities. The distinguishing feature of experience-based learning (or experiential learning) is that the experience of the learner occupies central place in all considerations of teaching and learning. This experience may comprise earlier events in the life of the learner, current life events, or those arising from the learner's participation in activities implemented by teachers and facilitators. A key element of experience-based learning (henceforth referred to as EBL) is that learners analyse their experience by reflecting, evaluating and reconstructing it (sometimes individually, sometimes collectively, sometimes both) in order to draw meaning from it in the light of prior experience. This review of their experience may lead to further action (Chan, 2023). In view of the significance of experiential learning, the work of Slanvich and Zimbardo (2012) was cited in Kolb (2017) as:

*Experiential lessons provide students with an opportunity to experience concepts first-hand and, as such, give students a richer, more meaningful understanding of course concepts and of how they operate in the real world.... They enhance the affective quality of the course content. This occurs both when students are engaged in solving problems that are part of the activities and when they are analysing, sharing, discussing, and reflecting on their personal reactions.... It can significantly improve students' memory*

*for concepts insofar as the information gets stored in autobiographical memory.... Experiential lessons have the ability to shape students' beliefs about learning and about the self.... They can lead to significant personal insights, including a greater awareness of one's personally held perspectives—as well as an improved awareness of other people's experience—with the possibility to enhance these attributes through critical reflection.*

### *Experiential Learning and Mathematics Achievement*

Adeniyi and Kuku (2020) conducted a study on the impact of gamification and experiential learning on achievement in mathematics among learners with hearing impairment in Lagos State, Nigeria. The study found out that achievement in mathematics differs as a result of exposing learners with hearing impairment to gamification and experiential learning methods of instruction. The study recommended that gamification and experiential learning strategies can be adopted among learners with hearing impairment during mathematics lesson. The works of Adeniyi and Kuku implies that experiential learning strategies has much significant as learning is done through experience of the learner. In view of this it is necessary to conduct a study on experiential learning within the context of the Ghanaian educational system since much study has not been done.

Similarly, Wynn (2018) conducted a study on the effect of experiential learning on mathematics achievement and mathematics anxiety of African – American students. The study examined whether or not there were any significant differences between the anxiety and achievement levels of African – American students taught using traditional method of instruction and experiential learning. The results showed that there is no significant difference in anxiety between experiential learning and traditional instruction group. In the study of Wynn (2018) there has not been much work done

in the area of assessing the achievement of students taught using experiential learning with those taught using traditional instruction. This was the gap on which my study is based and situating it in the Ghanaian context, it is a novelty since a study may yet to be conducted on assessing mathematical achievement of learners using the experiential learning approach at the basic school level.

Kong (2021) asserted that experiential learning, is a strong instrument for bringing about positive modifications in academic education which allow learners to apply mathematical concept of what they have learned in school to real world problems. Experiential learning has direct impact on problem solving in mathematics and science achievement (Bibi, Muhammad & Sajid, 2022). They concluded that experiential learning method was more effective than the traditional methods of teaching. The study recommended that the experience learning method should be applied for all students to increase the academic achievement of the students. Similarly, Chanua (2020) conducted a study on the effect of experiential learning course on secondary student achievement and motivation in geometry. The results of the study indicate there was a significantly higher achievement in geometry and motivation to learn geometry for students experiencing the geometry in Construction curriculum. The effect is more pronounced among females. On this basis, it is recommended that geometry curricula incorporate experiential learning focused on solving real problems that are relevant to further research is needed to determine how this instructional model could be applied to other courses in order to improve interest in geometry. Chesimet, Githua and Ng'eno (2016) noted that students have higher academic achievement if they like mathematics and have positive feelings about it. The study found a positive relationship between mathematical creativity and achievement. He asserts that mathematical creativity facilitates achievement of students because students

*Effect of Experiential Learning Approach on Junior High School Pupils' Mathematical Problem-Solving Abilities*

*Edo, H., Boateng, F. O., Maanu, v., & Gyimah, K.*

enjoy creative thinking in the use of mathematical principles. Mathematical creativity teaching strategy has also been shown to improve achievement in mathematics. These results therefore indicated that experiential learning activities (ELA) has a positive effect on students' Mathematical Creativity. Experiential learning activities (ELA) instructional approach produced a significant impact on mathematical creativity among secondary school students. Mathematical creativity should be emphasised in all mathematics classes.

Ayeni (2022) believed that experiential learning allows students to be active in the learning process through interaction, cooperation and collaboration. The study used problem solving strategy followed by the experiential group, the result show that the experimental group taught with problem solving strategy had a higher mean score than the control group taught with conventional group. The study recommended that teachers should upgrade their knowledge on experiential learning and problem-solving strategies through seminar or workshop, students should be encouraged to use their experience to solve problems in any given concept to enhance their performance. A similar study by Ng'eno and Chesimet (2020) acknowledge that students in the experimental groups were found to perform significantly better than those in the control group. experiential learning approach is effective in developing the four dimensions of mathematical creativity in learners. The study recommend that secondary school curricula should encourage the use of experiential learning approaches in mathematics classrooms. This is because experiential learning approach develop learners' creativity skills through hands-on and minds-on activities. It also recommends that pre-service teachers and in-service teachers should be prepared to be able to teach mathematics through

experiences that make learners to be active participants in learning.

Tong, Loc, Uyen, and Cuong (2020) assessed the performance of activities through experience in solving problems about the equation of a circle and investigate students' attitudes as well as beliefs in such activities. The results showed that the experimental class achieved better mathematical results than the control class as well as had a positive learning attitude, showing interest in the learning topic. Kihwele and Mkomwa (2022) explored the impact of the King and Queen of Mathematics Initiative (KQMI) in promoting students' interest in learning mathematics and improving their achievement. The initiative has promoted interest as students actively participated in learning activities. Comparing the achievement before and after the initiative and with other non-KQMI classes, the KQMI has significantly improved students' achievement in mathematics. experiential learning is very helpful since students were able to retain information in the long-term memory and able to find solutions to problems, sometimes creative, to other problems that occur in real life. Students taught through experiential learning have the opportunity to reflect on how his result is related to theory and how it is different from that of his colleagues. This analysis increases understanding and application of the concepts learned in other real situations (Ardeleanu, 2021).

Teachers are of the view that they had significant challenges in adapting to their classroom and school environments, with regard to experiential learning, that is integrating experiential learning in lesson delivery was a challenge (Dakwa, 2016). Teachers reported that, after going through experiential learning program, the knowledge acquired has help them to develop skills to navigate the world of

students, mentors when given opportunities to learn experientially and to incorporate background knowledge into the teaching profession (Widyastuti, Probosari, Saputro, Soetikno, & Sajidan, 2019).

**Theoretical Framework**

The study was based on the experiential learning theory. The theory focuses on learning by doing. Using this theory, students are encouraged to learn through experience that can help them retain information and recall facts. Experiential learning theory, or ELT was identified by David Kolb in 1984. To Kolb, effective learning is seen as the learner goes through the cycle of experiential learning theory. Students can enter the cycle in any way and at any point.

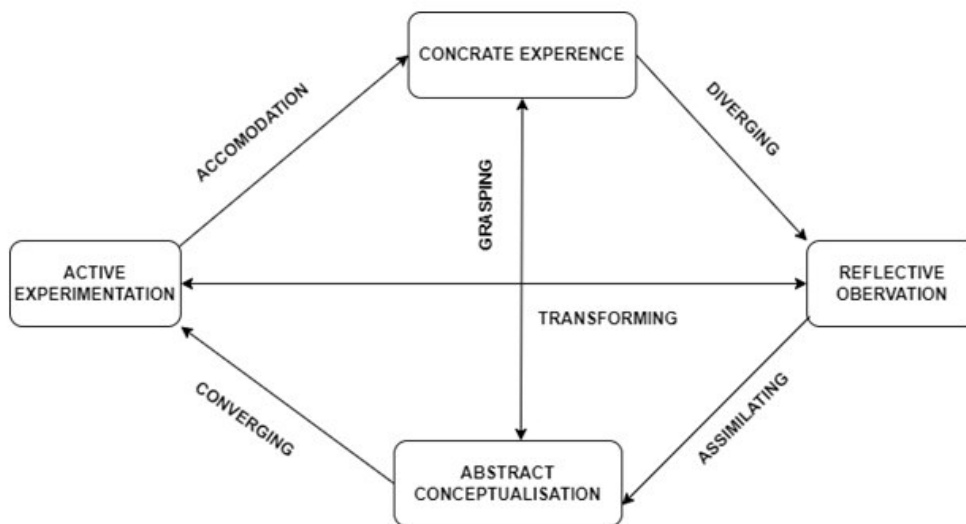
Some examples of this form of learning include taking students to zoo to learn about animals instead of just reading about them or growing a garden to learn about photosynthesis instead of a video about it. It

The conceptualize framework will be based on the key words in David Kolb’s experiential learning model (cycle). The model emphasized on experience, reflection, conceptualization and experiment.

*Concrete Experience:* Engaging directly in authentic situation. The cycle begins with the learner having a concrete experience – this means either learning something brand new or experiencing something familiar in a new way.

*Reflective Observation:* Noticing what happened and relating to past experience and conceptual understanding. The next stage of the cycle is very important, and it’s all about reflection. After having a concrete experience, the learner should spend some time thinking about what happened, or watching others doing the same thing and reflecting on what’s occurring.

*Abstract Conceptualization:* Distilling perceptions into abstract concepts. After the learner has reflected on their concrete



**Figure 1 Kolb’s Experiential Learning**

involves creating an environment where students can learn and experience at the same time, teachers offer students the opportunity to immediately apply their knowledge and get real world experiences (see Figure 1).

experience, it’s time to make sense of their experience and reflections. They may think about their next steps for improving, come up with a plan of action, or confide in literature or an expert who can offer insight. This allows them to form new ideas, or modify existing abstract ideas so that they can take action afterwards.

## *Effect of Experiential Learning Approach on Junior High School Pupils' Mathematical Problem-Solving Abilities*

*Edo, H., Boateng, F. O., Maanu, v., & Gyimah, K.*

*Active Experimentation:* Testing new ideas; honing skills in new experience. The final stage of Kolb's experiential learning is about acting on your previous reflections and thoughts, and this is known as active experimentation. The learner applies what they have learnt from the initial experience and sees if there are any modifications when they try the experience for a second time. This is essentially an opportunity to test new ideas. As a result of this active experimentation, the learner will have a new concrete experience and the cycle will start all over again. This cycle can keep going until the learner feels confident about the area at hand and they're happy with how the concrete experience pans out. By allowing learners to test their knowledge practically like this, you can ensure a higher retention of information.

### **Methodology**

#### *Research paradigm*

A research paradigm is a theoretical framework comprised of a set of beliefs and values, which guides how research is conducted and knowledge conceptualized within scientific communities. The study was based on pragmatism. Pragmatism as a paradigm is based upon the premise of utilizing the best method to investigate real-world problems, allowing for the use of multiple sources of data and knowledge to answer research questions. This lends to it appropriateness for mixed methods of research, whereby quantitative and qualitative data are collected and integrated within a single study.

The pragmatic paradigm arose out of desire to focus efforts on solving practical problems in real world through inquiry. It relies heavily on the tenets of modern science, including the experimental method as a model for human problem-solving (Kaushik & Walsh, 2019). According to the pragmatist, knowledge is explicitly linked

with experience. To the pragmatist knowledge is both constructed and based on the reality of the world we experience and live in, implying that although knowledge does not exist in the external world, it must be experienced by individual. There is a connection between pragmatism and the value placed on experiential knowledge. Hence this study "the assessment of mathematical achievement of learners using the experiential learning approach" relies on pragmatism.

#### *Research design*

The researchers made use of experimental design in this study on experiential learning. Experiential learning activities were designed based on the learning objective as prescribed in the basic school mathematics curriculum. In this case, learners were engaged with those experiential learning activities that were designed by the basic school teachers and the researcher. During the activities, the pupils were given the opportunity to touch and observe real learning experiences outside classroom. Experiential learning activities were designed on activities regarding how to find the area and perimeter of a plane figure such as a square, rectangle and a circle. Exercise and examples were not picked from available books in the school. However, pupils were made to share their own experiences as they go through the teaching learning process. The teachers were made to teach both control and experimental groups because of their knowledge of the scope and contents of the basic school mathematics. During the experiential learning, learners were taught using the experiential learning activities designed by the researcher in collaboration with the mathematics teachers. Before and after the teaching experiment, the two groups were given mathematics achievement test on the concept of "Area of plane figures". This was meant to assess how the performance of the learners have



improved in both groups in learning area of plane figures. The five teachers were engaged in a focused group discussion with the researchers to find out how the teachers' knowledge of experiential learning influenced their own as well as their learners' achievement. The focus group discussion was also used to elicit the teachers' views on the scope of the topic "Area of plane figures".

#### *The Experiment and Data Collection*

Junior high school Form 2 pupils from a basic school located in the Ga-West municipality of Ghana constituted the population for the study. Simple random sampling techniques was used to select pupils for the study. The sample selection of pupils was based on Gill et al. (2010) tables for sample selection. A sample of seventy (70) pupils were selected for the study since a large sample of more than thirty-five (35) pupils may not be conducive for using the experiential approach. The study sample was divided into two groups of thirty-five pupils, one for the control group and the other for the experimental group. All five junior high school mathematics teachers in the school were involved in the study.

Experiential learning activities were designed in collaboration with the junior high school mathematics teachers in the school. This was very necessary since the teachers were coached to do the teaching in the experiment. In order not to interrupt classroom teaching and learning, the study was carried out on Fridays after school at 1 pm for a duration of 90 minutes. For the control group, learners were given more exercises from the books available to the teachers and pupils. The mathematics teachers in the junior high school taught concurrently on the topic "Area of plane figures" to the control and experimental groups. Two teachers each was assigned to the control and experimental group on different days respectively. The teaching was done by the Junior High School teachers on the topic "Area of plane figures".

The pupils in the experiential learning group were taken to the school football field to identify the various parts of the football field. Each small group within the experiential learning group was made to draw or sketch the pitch in an exercise book. This activity went on for some time, pupils were told to identify and describe the various compartment of the football pitch and describe the kind of shape it represents. Majority were able to identify the center circle, the rectangular portions, and the penalty box of the football field. Pupils used tape measure to take the dimensions of the various compartments of the football field, this activity went on the following day. On the third day, pupils were made to find the area of the center circle, the rectangular portion and the penalty box of the school football field, after taking the dimensions on the previous day. On the fourth day of the experiential learning, pupils were taken through the concept of perimeter of plane figures. To conceptualize perimeter of plane figures, learners were made to move around the school football pitch. Learners were made to understand that the distance they took round the school football pitch was the perimeter of the playing field. The pupils worked in small groups under the guidance of the teacher as they calculated the perimeter of the whole school football pitch after taken the actual measurement of the pitch.

Three constructed-response (or show working) test items were set on finding area and perimeter of squares, rectangle and circles with various dimensions. Both experimental and control groups answered the same questions for a duration of forty-five minutes (45) at the same time. The aim of the test was to find out which method of instruction was more effective for classroom teaching and learning. The tests were given to an expert for scrutiny to assure content validity. This was very necessary for conformity of the instruments with the research objectives and to remove vague items.

## *Effect of Experiential Learning Approach on Junior High School Pupils' Mathematical Problem-Solving Abilities*

Edo, H., Boateng, F. O., Maanu, v., & Gyimah, K.

### *Data Collection Procedure*

Mathematics achievement tests on finding area of plane figures was administered to two groups of learners. Mathematics achievement test was administered to both groups after teaching, using experiential learning and traditional method. Focus group discussion was used to find out how mathematics teachers' knowledge of experiential learning impact on pupils' mathematical achievement. Five mathematics teachers were involved in the focus group discussion.

### *Data Analysis*

The test scores were keyed into the SPSS software and the independent sample t-test analysis, was used to compare the means of the experimental and control groups. A focus group discussion interview data were transcribed accordingly and analyzed using emerging themes.

## **Results**

### *Impact of mathematics teachers' knowledge of experiential learning on the pupils' achievement*

To address the first research objective, a focused group discussion involving junior high school mathematics teachers and the researchers was carried out and the responses of the teachers to the questions posed are presented next.

Have you heard of the term experiential learning?

Members responded "yes". Some of the explanations the teachers offered for the meaning of experiential learning are:

*Basically, experiential learning is learning by doing. Is a process of learning in which people do practical work rather being taught in abstract? In this case children are taken out of the class to have and share experience through learning and this can*

*also be connected to what we teach in the classroom. (Teacher 1)*

*Experiential learning deals with learning through experience and practice. (Teacher 2)*

*Every child is made of experiences and it is the responsibility of the teacher to practicalize the learning process within the experiences of the learner. In the learning process the environment is a factor, language and culture of the learner play a key role in the experience of the learner. Learning by doing has to be connected to experience of the learner. (Teacher 3)*

*Learning practically and putting what you have learnt into realism. When the child sees, feel and touch what he/she has learnt it will rather enhance the conceptual understanding of the learner. (Teacher 4)*

*Using concrete materials to teach the child rather writing a question on the board. Relate the life of the learners to what you are teaching, mathematics is practical. (Teacher 5)*

How different is experiential learning from other teaching method?

The view of a teacher on the differences is "experiential learning is not limited; other teaching methods are limited". Probing further, a respondent said,

*The group stress that in experiential learning learners work in groups, assignments are given in group, learners share their experiences with each other through peer teaching. Learners are made to construct and discover their own learning.*

As they talked about these characteristics of experiential learning, we related these characteristics to student-centered learning in the basic school mathematics curriculum demanded their view. They acknowledged the fact that these characteristics are techniques to experiential learning. Hence

**Table 1 Shows Means of Experimental and Control group on Experiential Learning**

Group	N	Mean	Std. Deviation	Std. Error Mean
<i>Pre-test</i>				
Experiential learning	35	15.4	4.99	.85685
Traditional learning	35	16.2	4.90	.82959
<i>Post-test</i>				
Experiential learning	35	36.8	5.99	1.0763
Traditional learning	35	25.1	6.82	1.2667

students centered methods or approach are not experiential learning but rather a technique to experiential learning.

Have you ever used experiential learning in your teaching and how did it impact on your pupils' mathematics performance?

The teachers responded "yes" to the question but some of the explanations they offered for engaging learners in experiential learning were unconvincing as they were referring to approaches that are not really experiential learning. Two of the participants in the focus group discussion gave a description of experiential learning activities and how they designed experiential learning to teach a concept to the basic school pupils.

**Impact of the experiential learning approach on the learners' performance in area of plane figures**

The results of the mathematics achievement tests on finding area of plane figures, which

were administered before and after the experiment to the two groups (control and experimental groups) were used to address the second research objective. Table 1 shows the descriptive statistics of the students' performance on the pre-test and post-test on finding area of plane figures. The pre-test results reveal that when comparing the performance of the students, the mean scores of the control group and experimental groups were not too different. An independent sample t-test shown in Table 2 demonstrates that there was no statistically significant difference [ $t(7.70) = 0.117$ ;  $p > 0.05$ ] between the pre-test mean scores of students in the experimental group [ $M = 15.4$ ,  $SD = 4.99$ ] and control group [ $M = 156.2$ ,  $SD = 4.90$ ].

The mean post-test score for students in the control group was 25.1 out of 50, whereas that for students in the experimental group was 36.8 out of 50 which is higher than the control group score (see Table 1). From

**Table 2 Independent Sample t- test for Equality of Variance**

	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
<i>Pre-test</i>							
Equal variances assumed	7.70	67	.117	9.18151	1.19233	6.80161	11.56142
Equal variances not assumed	7.69	66.851	.117	9.18151	1.19265	6.80088	11.56214
<i>Post-test</i>							
Equal variances assumed	1.593	58	.000	2.63626	1.65520	-.67697	5.94950
Equal variances not assumed	1.586	55.849	.000	2.63626	1.66245	-.69423	5.96675

*Effect of Experiential Learning Approach on Junior High School Pupils' Mathematical Problem-Solving Abilities*

*Edo, H., Boateng, F. O., Maanu, v., & Gyimah, K.*

Table 2, the variation in post-test mean scores between the experimental and control groups of students was found to be statistically significant [ $t(15.98) = 0.000$ ;  $p < 0.05$ ]. The findings reveal that the performance of students taught using experiential learning approach is significantly higher than their counterparts taught using the traditional method.

### **Discussion**

Mathematics teachers involved in the focus group discussion had adequate knowledge on experiential learning. Some of the teachers gave precise definition of experiential learning, others also explain the meaning of experiential learning. The teachers were trying to bring out the difference between experiential learning and other teaching methods in the basic school curriculum. Emphasis was placed on the difference between student-centered method and experiential learning. The teachers came out with different student-centered methods; however, this actually could not bring out the difference. The group stressed that in experiential learning learners work in groups, assignments are given in group, learners share their experiences with each other through peer teaching. Learners are made to construct and discover their own learning. These are all features or characteristics of experiential learning. The teachers in the focus group discussion acknowledge the fact that the student-centered methods or approach are not experiential learning but rather a technique to experiential learning. The teachers knew the significance of experiential learning and how it can impact on students' learning. When the child is taken through an experiential learning, he/she understands mathematical concepts and application of mathematics in the real-world (Bibi, Muhammad & Sajid, 2022). In spite of the advantages of experiential learning

approach, mathematics teachers rarely use the approach during teaching and learning.

### **Conclusions**

Mathematics teachers have good knowledge of experiential learning. Experiential learning impacts on learners' performance in finding area of plane figures. Learners taught with experiential learning approach performed better than those taught with traditional method. Learners learn intuitively when engaged with experiential learning.

### **Recommendation**

Based on the findings of the study the following recommendations were made:

1. The Ghana Education Service should train Mathematics teachers on experiential learning.
2. Various Stakeholders in education should encourage Mathematics teachers to use experiential learning.
3. Ghana Education Service should have a standardized mathematics text books for learners that includes experiential learning activities on the various topic in the basic school mathematics curriculum.

### **References**

- Adeniyi, S. O. (2020). Impact of gamification and experiential learning on achievement in mathematics among learners with hearing with hearing impairment in Lagos State, Nigeria. *African Journal of Educational Studies and Sciences*, 16(2), Pages 51 - 54. doi:DOI: <https://dx.doi.org/10.4314/ajesms.16i.2.4>
- Ardeleanu, R. (2021). About Experiential Learning. Example for Higher Education. *Journal of Innovation in Psychology, Education and Didactics*,

- 25(2), 160 - 163. doi:DOI: 10.29081/JTPED. 2021. 25.2.04
- Ayaz, M. A. (2008). The Importance of Problem Solving in Mathematics Curriculum. e - Journal of New World Sciences Academy, 3(4).
- Ayeni, M. F. (2022). The Effects of Experiential and Problem-solving Strategies on Academic Performance of Biology Students in Senior Secondary Schools in Nigeria. *International Journal of Education, Learning and Development*, 10(4), 3 - 5.
- Bibi, M. A. (2022, January). Effect of Experiential Learning on Students' Academic Achievement at Elementary Level in the Subject of General Science. *Multicultural Education*, 8(1). doi:DOI: 10.5281/zenodo. 5866769
- Ng'eno, C., & Chesimet, M. (2020). Effects of Experiential Learning on Students' Performance in Mathematical Creativity Dimensions in Kericho East Sub - County, Kenya. *European Journal of Education and Development Psychology*, 8(4), 43 - 45.
- Cetin Torman, S. O. (2020). Analysis of the Relationship between Mathematics Achievement, Reflective Thinking of Problems Solving and Metacognitive Awareness. *International Journal of Progressive Education*, 16(2), 81. doi:DOI: 10.2932/ijpe.2020.241.6
- Chan, C. K. (2023). *Assessment for Experiential Learning*. New York: Routledge. doi:DOI: 10.4324/9781003018391
- Chesimet, M.C., Githua B.N., & Ng'eno, J.K.(2016). Effects of Experiential Learning Approach on Students' Mathematical Creativity among Secondary School Students of Kericho East Sub - County, Kenya. *Journal of Education and Practice*, 7(23).
- Raja, F. U., & Najmonnisa, D. (2018, December). Comparing Traditional Teaching Method and Experiential Teaching Method using Experiential Research. *Journal of Education and Educational Development*, 5(2), 10.
- Dakwa, L. (2016). Beginning Teachers' Experiential Learning in the Era of Common Core: A Case Study. *Journal of School Administration Research and Development*, 1(1), 46.
- Frank, J. (2001). Instructional Strategies while using Experiential Learning to Encourage Student Engagement in a Rural, Distance Learning Setting. A Thesis Submitted to the Faculty of Department of Leadership Education College of Education of Winona State University, in Partial Fulfilment of the Requirements for the Degree of Master of Science., 31 - 32.
- Gavillet, R. (2019, February). Experiential Learning and its Impacts on College Students. *Taxa Education Review*, 7(1). doi:https:// dx.doi.org/ 10.26153/tsw/21
- Jeyaraj, J. S. (2019, November 06). Traditional Vs. Experiential Learning. *SSRN Electronic Journal*. doi:DOI: 10.2139/ssm.3486129
- Kigamba, J.G., Wanjiru, B.N & Marguerite, M-O.C.(2021, January - February). Effects of Teaching through Problem-solving on Students Mathematics Attitude Achievement in Secondary Schools in Murang'a County, Kenya. *IOSR Journal of Research & Method in Education ( IOSR - JRME)*, 11(1), 53 - 56.
- Klang N., Karlsson N., Kilborn W., Eriksson. P., & Karberg M.(2021, August 24). Mathematical Problem-solving Through Cooperative Learning - The Importance of Peer Acceptance and Friendship. *Frontiers in Education*. doi:DOI: 10.3389/feduc.2021.710296
- Kolb, A. Y. (2017). *Experiential Learning Theory as a guide for Experiential*

*Effect of Experiential Learning Approach on Junior High School Pupils' Mathematical Problem-Solving Abilities*

Edo, H., Boateng, F. O., Maanu, v., & Gyimah, K.

- Educators in Higher Education. *A Journal for Engaged Education*, 1(1), 8.
- Kong, Y. (2021). The Role of Experiential Learning on Students' Motivation and Classroom Engagement. *Frontiers in Psychology*, 12. doi:doi: 10.3389/fpsyg.2021.771272
- Mkomwa, J. E. (2022, August 7). Promoting Students' Interest and Achievement in mathematics through " King and Queen of Mathematics" initiative. *Journal of Research in Innovative Teaching and Learning*, 16(1), 117 - 119. doi:DOI 10.1108/JRIT - 12- 2021 - 0083
- Nguyen, N. N. (2022). Research on the effect and effectiveness of experiential learning for university students. *Journal of Positive Psychology*, 6(8), 9. doi:4183 - 4192
- Riasat, A., Hukam D., Akhter, A., & Khan, A.(2010). Effect of Using Problem Solving Method in Teaching Mathematics on the Achievement of Mathematics Students. 6(2). doi:Doi: 10.5539/ass.v6n2p67
- Rokhima, W.A., Kusmayadi, T.A., & Fitriana, L.(2019). Mathematical Problem Solving based on Kolb's Learning Style. *Conf. Series: Journal of Physics*. doi:DOI: 1088/1742 - 6596/1306/1/012026
- Chanua, R. (2020, May). The Effect of an Experiential Learning Course on Secondary Students Achievement and Motivation in Geometry. A Co-Authoring Dissertation Submitted to the Graduate School at the University of Missouri - St. Louis in Partial fulfillment of the requirement for the degree of Doctor of Education with Emphasis in Educatioal Practice.
- Silver, T. (2021, March). Using Principles of Experiential Learning to Promote Effective Learning among English Language Learners. *Journal of Education & Social Policy*, 8(1). doi:doi:10.30845/jesp.8n/p12
- Tong D.T., Loc, N.P., Uyen, B.P., & Cuong, P.H. (2020). Applying Experiential Learning to Teach the Equation of a Circle: A Case Study. *European Journal of Educational Research*, 9(1), 240 - 243. doi:https: // doi. org/ 10.12973/eu - jer.9.1.239
- Tuyen, N. H. (2018, April 13). Designing Experiential Activity Themes in Teaching Maths to Lower Secondary Students Congruent with the new General Education Curriculum in Vietnam. *American Journal of Educational Research*, 16(5). doi:DOI: 10.12691/ education - 6 - 5 - 5
- Uyen, B.P., Tong, D.H., & Lien, N.B. (2022, April). The Effectiveness of Experiential Learning in Teaching Arithmetic and Geometry in Sixth Grade. *Frontiers in Education*, Pages 4 - 7. doi:doi: 10.3389/feduc.2022.858631
- Widyastuti, F., Probosari R.M., Soetikno, S., & Sajidan, S. (2019). Teachers Viewpoint of Teaching Science using Experiential Learning Related to Environmental Issues. *AIP Conference Proceedings*.
- Wynn, A. (2018). The Effect of Experiential Learning on Mathematics Achievement and Mathematics Anxiety of African- American Students. A dissertation Presented in Partial Fulfillment of the Requirements for the Degree of Doctor of Education, Liberty University, 32.
- Xiao, L. S. (2023). A Sem Model of Learning Engagement and Basic Mathematical Competencies Based on Experiential Learning. *Applied Science*. doi:https: //doi.org 10.3390/app13063650