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Impact of Constructivist Teaching Strategy on the Performance of the Learners in Basic Science

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Abstract

The study investigated the effect of the constructivist teaching strategy on the performance of third-grade students in Basic Science at Tingib Elementary School, Basey II District of Samar Division. This is an experimental study, which applied the randomized sampling method in splitting the participants into control and experimental groups. Each group involved 23 learners. A 30-item achievement test that covered the essential competencies in Basic Science was used as an instrument to assess the pretest and posttest scores, gains, and differences between groups. The study focused on the use of constructivist teaching strategies in giving instruction to the experimental group, specifically the inquiry-based learning, project-based learning, hands-on learning maximizing the available technology, collaborative learning, concept mapping, and case-based learning. The results showed a substantial change in the pre-test and post-test scores. This indicates that constructivist teaching approaches increase student outcomes and must be implemented in science instruction. It suggests that educators should receive training in adopting efficient teaching strategies and encouraging innovative, learner-centered teaching approaches.

Key words: constructivist teaching strategy, learners' performance, Basic Science

1. INTRODUCTION

In recent years, the educational spectrum has shifted towards dynamic, interactive teaching methods, promoting active student engagement and recognizing that learners are capable of constructing their own knowledge, rather than being passive receivers of information.

The recent educational culture requires the teachers to deliver high-quality instruction and learning that necessitates a diverse range of knowledge and abilities in teaching and assessment. For the teachers to become efficient, successful, and productive in their field, they must be skilled enough to use instruction appropriately. The success of teaching and learning relies on the use of appropriate instructional strategies that cater to the diverse needs and interests of learners. Using effective instructional strategies enables learners to connect class concepts with real-life situations, allowing them to demonstrate their knowledge. Teachers also benefit from these strategies as they enable better monitoring and assessment of student performance through various evaluation methods. Likewise, teachers must also use effective teaching strategies to equip the learners with the 21st century skills that are essential in preparing them so as to succeed in school, work and life opportunities (Ross, 2017).

In the Philippines, the Department of Education (DepEd) emphasizes the empowerment of the teachers to carry out quality instruction that caters to the diverse needs of the learners. DepEd Order No. 42 (DepEd, 2016) mandates the utilization of teaching strategies that place the learners at the center of the teaching-learning process and provide them with an opportunity to build learning upon their background knowledge while using own skills, interests, styles and talents (Lego, 2014).

Teachers use various teaching strategies to promote all-round learning, including collaboration, demonstrations, differentiated instruction, hands-off and hands-on techniques, modeling, peer teaching, and problem-based instruction (Cox, 2009). One such approach is the constructivist strategy, which has gained prominence in the past decade and is influenced by the works of Dewey, Montessori, Piaget, Brunner, and Vygotsky. The constructivist teaching approach represents a shift from behaviorism to cognitive theory in education. This method, which emphasizes accommodation and assimilation from experiences, is perceived to be essential in improving the learners' academic performance (Adak, 2017). Hence, this study aims to investigate its effectiveness in improving learners' performance in Basic Science.

1.1. Rationale of the Study

Constructivism posits that knowledge is shaped by the learner rather than existing independently. Constructivism emphasizes that learning is an active process, with students actively participating in the meaning-making process. This approach ensures that the knowledge they construct is not inert but can be used in various situations, making it more adaptable. Constructivists acknowledge that the real world exists, but they contend that students need to grasp it in a variety of ways in order to completely comprehend it. Constructivists emphasize that classroom experiences should foster diverse perspectives, aligning with the claim that education should be inclusive and diverse (Moallem, 2001; Jones & Brader-Araje, 2002).

Constructivism is a growing theory in science education, focusing on the existence of knowledge beyond cognizing individuals and found in books. It is similar to objectivism, where knowledge is found in books and is independent of human thinking. Science is a search for truths and principles related to reality, with objectivity being a crucial aspect. Teachers use a curriculum to ensure students understand science subjects and absorb reality from textbooks. Constructivist epistemology suggests that the only instrument of the knower is their senses, allowing humans to engage with their surroundings and construct a picture of the world (Lorsbach, 2018).

Science is a compulsory subject in schools worldwide, but many students neglect it due to lack of enthusiasm and desire. Conventional teaching approaches, such as mere lecture and demonstration, are outdated. To improve science education, it is crucial to engage students in meaningful investigations, significant problems, simple experiments, and hands-on experiences. Instilling a scientific attitude and fostering imagination and reason is the best approach. Constructivist theory is essential in this field, as it emphasizes skills like exercise, updating, critiquing, and evaluating knowledge in the modern world (Adak 2017).

Research on students' constructive learning processes, mental models, and misconceptions is crucial for teachers to effectively model scientific reasoning in their students. Fostering the love of science and the development of the learners' skills in this field is very important especially in their early childhood years because similar to literacy and numeracy, these skills have significant bearing on their future academic and career endeavors. For instance, the nation's higher education system is experiencing a decline in quality, leading to skills-jobs mismatch, low productivity in research and development, and a deficient science and innovation culture (Licuanan, 2017). This can be attributed to the foundation that the learners have acquired. So, the emphasis is now placed on the early development stage of learning that serves as an impetus for the teachers to utilize appropriate teaching approach that allow the learners to reach at the optimum level of development.

Studies have also proven the effectiveness of constructivist approach in teaching like in the secondary science, in higher education, and in other fields of discipline, accentuating that traditional methods can no longer thrive with the learning demands in this modern world (Adak, 2017; Cakir, 2008, Kim, 2005; Oakley, et al., 2004). Yet, the application of the approach in the elementary level, specifically in Basic Science is underexplored. Therefore, this study looked into the impact of the constructivist approach on the achievement level in science of the 3rd Graders in public school.

1.2. Theoretical Framework

The context of this study is based on the foundational theories in education and psychology. This is basically anchored on the the Constructivist Learning Theory, that is developed by Jean Piaget. This emphasizes active learning, where students create their own understanding through experiences and reflection. This approach emphasizes interaction with content, hands-on activities, and cooperation with peers (Elliott et al., 2000). This study uses the constructivist method to teach Basic Science with the aim to improve students' performance in the experimental group through these active learning approach.

Also, this study acknowledged the concept of Lev Vygotsky's Social Development Theory strengthens constructivist concepts by emphasizing the importance of social interaction in learning. According to Vygotsky, cognitive growth is primarily a socially mediated process, and learning takes place within the Zone of Proximal growth (ZPD), which is the gap between what a learner can do without assistance and what they can do with instruction and encouragement from a trained partner (David, 2014). In this study, the constructivist teaching style integrates collaborative activities and scaffolding approaches, which are consistent with Vygotsky's theory, to improve student learning and performance in basic science.

This study also recognized Jean Piaget's Cognitive Development Theory, which describes how children move through many stages of cognitive development, each marked by distinct ways of thinking and comprehending the environment. The constructivist approach considers these developmental phases when developing learning activities that are both developmentally appropriate and difficult enough to foster cognitive progress (Cherry, 2017). This alignment guarantees that the teaching approach used in the experimentation is customized to the cognitive capacities of third-graders, thereby enhancing their learning potential.

1.3. Conceptual Framework

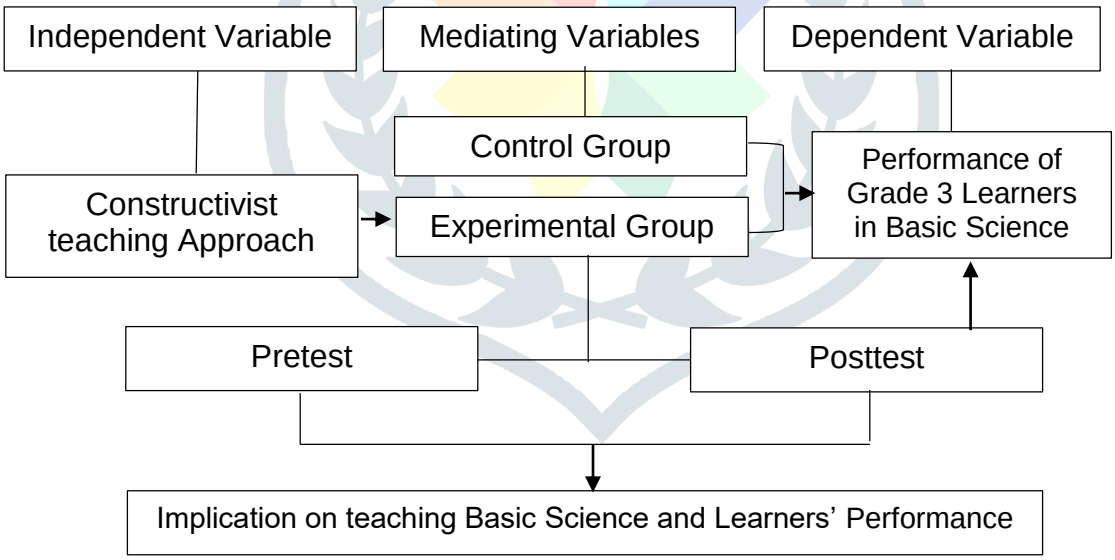

Figure 1. Concept Paradigm of the Study

The figure shows the process by which the constructivist teaching style is intended to impact student performance in basic science. The goal of the study is to give empirical evidence on the usefulness of constructivist teaching approaches by comparing the pretest and posttest results for control and experimental groups. The constructivist teaching approach served as the independent variable used with the experimental group, while the traditional method is applied with the control group. The results of the pretest and posttest of both groups determines whether there is a significant difference in the performance of the learners, thereby give insights on the effectiveness of the constructivist teaching strategy. The

framework guides the research process, enabling a planned and methodical examination of the influence of novel teaching practices on educational results.

1.4. Purpose of the Study

As this study aimed to examine the effect of a constructivist teaching approach on the performance of 3rd-grade students in Basic Science at Tingib Elementary School, this has for its purpose to compare pretest and posttest scores, gains, and differences between groups. The results of the study are aimed at providing empirical evidence on the effectiveness of constructivist teaching strategies in improving student outcomes, offering valuable insights for educators and curriculum developers for the enhancement of the teaching approach in Basic Science and in other discipline.

1.5. Research Questions

This study investigated the impact of the constructivist teaching approach on the performance in Basic Science of the 3rd Graders in Tingib Elementary School, Basey II District, Samar Division for school year 2019-2020.

Specifically, this sought answers to the following questions:

1. What are the mean pretest scores of the pupils in both control and experimental groups?
2. What are the mean posttest scores of the pupils in both control and experimental groups?
3. What are the mean gain scores of the pupils in the pretest and posttest of the control and experimental groups?
4. Is there a significant difference in the mean pretest scores of the two groups?
5. Is there a significant difference in the mean posttest scores of the two groups?
6. Is there a significant difference between the pretest and posttest scores of the two groups?
7. Is there a significant difference in the gain scores of the pupils in the pretest and posttest of the two groups?
8. What is the implication of the results of the study on teaching Basic Science and on the performance of the learners?

1.6. Null Hypothesis

The null hypotheses below were tested in the study:

$H0_1$ There is no significant difference in the mean pretest scores of the two groups?
$H0_2$ There is no significant difference in the mean posttest scores of the two groups?
$H0_3$ There is no significant difference between the pretest and posttest scores of the two groups?
$H0_4$ There is no significant difference in the gain scores of the pupils in the pretest and posttest of the two groups?

1.7. Significance of the Study

The significance of this study stems from its potential to provide empirical data on the efficacy of constructivist teaching practices in improving the performance of third-grade students in Basic Science. This study compared standard and constructivist teaching techniques to investigate if active, student-centered learning approaches improve the learners' performance in science. The findings have significant implications for educators and curriculum makers, directing them toward more effective teaching techniques that promote

deeper engagement and improved learning outcomes in Basic Science. In addition, this study serves as a significant resource for additional research, establishing a basis for future studies to examine and develop constructivist teaching approaches across multiple disciplines and educational levels, thereby contributing to the ongoing advancement of educational standards and methods.

1.8. Scope and Limitation

The purpose of this study is to investigate the influence of constructivist teaching practices on the performance of third-grade learners in Basic Science at Tingib Elementary School, Basey II District, Samar Division, during the school year 2019-2020. The constructivists strategies applied in this study are inquiry-based learning, project-based learning, hands-on learning with the use of available technology, collaborative learning, concept mapping, and case-based learning- all are activity-driven, allowing the learners to construct their own knowledge based on the learning experiences. These methods were applied in instructions focusing on particular competencies for 3rd Grade within the 1st quarter, where lesson contents and activities were adjusted based on the learners' aptitude. The lesson contents were also adjusted to fit to the learners' abilities based on the assessment results. The study explicitly compared pretest and posttest results across control and experimental groups to assess the effectiveness of the instructional approaches. However, the study is constrained by its emphasis on a particular and single grade level and topic within a narrow geographical location, which may alter the applicability of the findings to other settings. Furthermore, the duration of the study and sample size may restrict its potential to capture the long-term impact and the broader relevance of the constructivist approach.

2. LITERATURE REVIEW

Teaching is a profession that involves skilled individuals in education who are responsible for pedagogical ideas and practices, and ensuring student development at all levels. The process involves objectives, materials, methods, assessment, teachers and learners' quality. It is a complex process that includes assessment, marking, reporting. Among all the responsibilities of teachers, delivering instruction determines the success of the teaching process. This therefore requires the educators to be equipped with necessary skills that will effectively meet the diverse learning needs of the learners (Ayua, 2017).

The teacher is viewed as an agent of creativity and the center on which the success or failure of any educational program revolves. The teacher is the most important component in the educational system; and that without an excellent teacher, even if all other resources are available, it would be extremely difficult, if not impossible, to achieve the desired goals of the school. This is because no education can surpass the quality of the teacher (Akinwumi, 2007). The true efficacy of a teacher requires understanding of what to teach, how to teach it, when it should be taught, who should be taught, why it is taught, and even where to teach.

Along with the perspective on what makes the teacher effective is the emphasis on the strategy that he applies in instruction. Relative to this, the recent educational system accentuates the adoption of novel teaching techniques, while discouraging the traditional methods in teaching. Japitana (2018) purported that traditional teaching methods that rely on one-way communication between teachers and students may not necessarily result in significant learning outcomes. Throughout the decades, educators have recommended several instructional practices to improve education for all learners throughout the last decades. However, much emphasis is given on the application of constructivist strategies due to its vast significance.

Constructivism is a significant educational theory that significantly influences educators' teaching approaches and is one of the most influential learning theories of our time (Bencze, 2004). It is a cognitive approach that views learning as an active construction of concepts, with teaching playing a supporting role. It aims to address children's pre-instructional conceptions in subject matter, which are resistant to change. The approach allows students to develop new mental structures by building on or restructuring existing ones, allowing them to affect conceptual change. It is a learning approach that encourages active knowledge construction by learners through experiences and interactions with prior knowledge. It encourages learners to connect new experiences with existing beliefs, making them active creators of their own knowledge.

Teachers create situations for students to question their assumptions, ensuring learning is possible only when learners are involved (Gupta &Gupta, 2017).

Constructivist teaching strategies encourage active engagement with learning by constructing meaning from experiences, knowledge, and interactions. These strategies help develop higher-order thinking skills, problem-solving abilities, and enhance academic outcomes. Some effective teaching strategies include *inquiry-based learning*, which emphasizes questioning, investigation, and discovery, fostering critical thinking and problem-solving. *Collaborative learning*, which involves group work, promotes peer-to-peer learning, knowledge sharing, and constructive feedback, leading to improved academic outcomes. *Project-based learning*, which involves learners applying knowledge and skills to real-world situations, fosters creativity, problem-solving, critical thinking, and teamwork (Zajda, 2011).

Other constructivist strategies include *case-based learning*, which is seen to improve academic outcomes, including higher achievement and better problem-solving skills. This approach also positively impacted student motivation and engagement. Also, *concept mapping*, as a constructivist approach, is proven to help improve academic outcomes, including better understanding, retention, and problem-solving skills. Both studies highlighted the positive impact of these methods on student motivation and engagement (Akpan &Beard, 2016).

Constructivist teaching practices are increasingly being used in teacher education programs and public schools nationwide, demonstrating significant success in promoting student learning (Gordon & O'Brien, 2007)

In science pedagogy, constructivism serves as a theoretical framework for understanding, focusing on alternative conceptions, conceptual change testing, and cooperative learning. Research by Mintzes, Wandersee, & Novak, (1997). suggests that students have diverse alternative conceptions about objects and events when they enter formal instruction in science. These conceptions are rooted in personal experiences such as observation, perception, culture, language, and previous explanations of teachers, which are often held onto despite traditional formal instruction, leading to unintended learning outcomes. The research literature on constructivism supports these claims.

Science courses are essential for education as they involve knowledge about scientific phenomena and their application in new situations. However, teaching science faces challenges such as memorizing uncorrelated ideas, lack of investigative activities, and using methods that do not give learners a role. Science supervisors believe that teachers focus on the cognitive aspect and neglect other aspects. To overcome these challenges, a review of the education process, especially teaching methods, is needed. Focusing on how learners learn is crucial, and stakeholders should use activities and opportunities to develop mental and cognitive abilities, attitudes, and skills. Modern theories of teaching and learning, such as constructivism theory, should be utilized to enhance the learning process(Qarareh, 2016).

Science educators should prioritize the quality of students' understandings over surface learning or test scores. Conceptual understanding is crucial and should be a focus, rather than rote memorization. Teachers should focus on the process of science rather than just the content, as students who understand this process are better prepared to acquire science content independently (Cakir, 2008). These viewpoints are emphasized in constructivism context.

Apart from the views mentioned, studies have also shown the advantages that constructivist strategies offer. The study of Kim (2005) revealed that constructivist teaching is more effective in enhancing students' academic achievement, but not in enhancing self-concept or changing learning strategies. However, it can affect motivation to learn academic tasks, cause anxiety, and encourage self-monitoring for test preparation. Also, the paper of Hudu & Ibrahim (2018) explores constructivism, as a theory that emphasizes the active construction of knowledge by learners rather than passively receiving it from the environment. This highlights the importance of adapting learners' experiences to the world and its role in improving academic attainment.

Researchers have also explored the effectiveness of constructivist approach in various subjects, including social science, science, and language. The studies revealed that students taught through this approach scored higher than those taught using traditional methods (Saran, 2011; Hussein, 2009; Qarareh, 2016; & Miheso, 2002)

Lastly, the study of Adak (2017) revealed that students using the constructivist 7E-model outperformed those using traditional methods, achieving higher scores at all intelligence levels. This suggests that the constructivist approach strategy can enhance students' mastery of higher-order cognitive content.
The literature review emphasizes the importance of teachers in shaping pedagogical practices and fostering student development. It highlights the shift towards constructivist teaching strategies, such as inquiry-based learning, collaborative learning, and project-based learning, concept mapping and cas-based learning, which enhance student engagement, critical thinking, and problem-solving skills. These methods promote academic outcomes and student motivation, particularly in science education. However, there are gaps in understanding the full impact of constructivist strategies on student learning outcomes, particularly in Basic Science education for 3rd-grade learners. This study aims to address this gap by investigating the specific impact of constructivist teaching on student performance in Basic Science, providing insights for educators and policymakers.

3. METHODOLOGY

This section presents the research process and procedure. This includes the research design, research locale, the respondents and sampling method, instruments, validation of the instrument, data gathering procedure and statistical treatment of data.

3.1. Design

This study used the experimental approach, specifically applying the randomized controlled trials (RCTs) method, wherein the participants were randomly chosen and were assigned into two groups. One group received the intervention or the constructivist instruction, while the other group served as the control group (Ross & Morrison, 2013).
Experimental research is a scientific method involving manipulating independent variables to observe their effect on a dependent variable, while controlling for extraneous variables that could influence the results (Cohen et al., 2017). Researchers intentionally manipulate independent variables to observe their effect on the dependent variable, allowing them to assess causality (Van der Stede, 2014). In this study, two groups (the control and experimental) were used to determine the impact of constructivist approach (which is the independent variable) in teaching Basic Science on the performance of the learners (referred to as the dependent variable in this study).
Both groups were assessed twice at the same time, with the pretest as the first assessment and the posttest as the second.
The diagram of this design is as follow:

R_E	O_1	X_1	O_2
R_c	O_1		O_2

where:

R_E refers to the random assignment of pupils to experimental group
R_c refers to the random assignment of pupils to control group
O_1 refers to the pretest in the experimental and control groups
X_1 refers to the experimental treatment which is the utilization of constructivist approach in teaching Basic Science
O_2 refers to the pretest in the experimental and control groups

The pretest and posttest scores were used as the basis to determine whether there is an improvement in the performance of the participants in the experimental group compared to those in the control group.
The experimental design is illustrated in the flow diagram that follows.

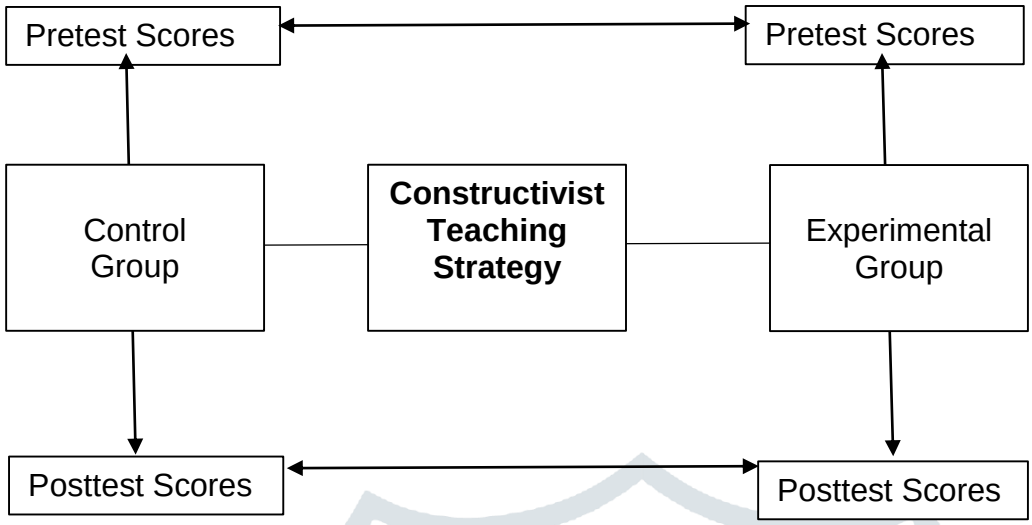

Figure 2. Flow Diagram of the Experimental Design

3.2. Research Locale

This study was conducted at Tingib Elementary School of Basey II District, Basey Samar. The locale is chosen, for a reason that this this is where the researcher is currently stationed and that she has a direct contact with the participants.

Tingib Elementary School is located in barangay Tingib, which is a coastal community of Basey that lies on the Western shore of Samar. It is reported in the feasibility study of the district-in-charge that the barangay has higher number of out-of-school youth and the schools face a problem on dropout rate of over 40% and low literacy rate of 15%. Hence, similar to other educational institutions, especially the public schools, Tingib Elementary school shares common problems such as literacy and poor learners' achievement level in the different discipline. This is why the researcher conducted the study in this school with a purpose of determining the effectiveness of constructivist approach in teaching to recommend its application in the classroom instruction.

3.3. Respondents and Sampling Method

The study involved the two classes of 3rd Grade students of Tingib Elementary School enrolled in school year 2019 to 2020. The total number of the Grade 3 learners is 46. After requesting that the learners will be split into two equal groups, the researcher randomly assigned the students into the experimental and control groups. Random assignment is a feature of experimental research that ensures comparison and allows the researcher to arrive at causal inferences about the outcomes of the intervention (Ross & Morrison,2013). In this study, the learners who were randomly assigned to two classes represent the two groups (experimental and control). They undergo pretest and posttest to identify if there is a significant difference in their performance in Basic Science.

3.4. Research Instrument

The instrument that was used in the study is the Achievement Test in Grade 3 Science. It was a 30-item multiple-choice test prepared by the researcher involving the most essential basic competencies in Science for Grade 3 (Lego, 2014). The basic competencies tested include the following:

a. Classify objects as solid, liquid, and gas based on some observable characteristics;
b. Describe changes in materials based on the effect of temperature;
c. Describe the functions of the sense organs of the human body;
d. Describe animals in their immediate surroundings;
e. Identify the external parts and functions of animals;
f. Classify animals according to their body parts and use;
g. Describe the parts of the different kinds of plants; and
h. Compare living with nonliving things

3.5. Instrument Validity

To ensure that the instrument measures what it intends to assess, the achievement test questionnaire was presented to the master teachers and other research experts within the district for evaluation and modification. Then this was administered for a dry run with other 3rd grade classes in the district. The result of the test was used for item analysis to identify the items that are subject for revision so as to improve the content of the test questionnaire.

3.6. Data Gathering Procedure

Prior to the conduct of the study, the researcher obtained the needed consent from the different offices concerned. Upon approval, arrangements were made with the principal regarding the set-up and conduct of the study. The parents were also informed about the study as well as the process.
During the conduct of the study, the student-– respondents were pretested using the 30-item achievement test covering the competencies for quarters 1 Within the quarter, the experimental group was exposed to the constructivist teaching approach, while the control group was taught using the traditional teaching strategy. After the experimentation, the learners in the two groups were post-tested. The data were tabulated, analyzed and statistically treated to answer the research problem and arrive at conclusions and recommendations.

Scoring Method

The raw and mean scores of the students were determined in order to have a working description of the learners' performance level. Each correct answer of the learner in the test is given 1 point. Then, the score ranges, ratings and adjectival interpretations were adapted as shown below.

Raw Score	Transmuted Score	Interpretation
26-30	95 – 100	Excellent
21-25	90 – 94	very good
16-20	85 – 89	Good
11-15	80 -84	Fair
6-10	75-79	Poor
1-5	70 – 74	very poor

To describe and interpret the gain score in the performance of the learners in the test, the following score ranges and interpretation was applied.

Gain Score	Interpretation
16 – above	Very High Increase
12-15	High Increase
8-11	Average Increase
4-7	Low Increase
3- below	Very Low Increase

3.7. Statistical Treatment

The data collected were analyzed via t-test, specifically the independent t-test, where two groups of comparison are independent of each other. This is a parametric statistical test used to see whether a difference between the means of two sample or groups is significant (Kim, 2015). The study utilized 0.05 level of significance of a two tailed test which means that if it is reached, the researcher customarily rejects the null hypothesis and concludes that a real difference exists.

Below are the t-test formulas to be used in order to answer the problems and hypotheses considered in this study.

$$t = \frac{\bar{d}}{S_d / \sqrt{n}}$$

where,

$\bar{d}$ = mean value of differences
Sd = standard deviation of the differences
n = number of students

$$t = \frac{\bar{x_1} - \bar{x_2}}{\sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}}}$$

where,

X_1 and X_2 = means for the two groups
S_1^2 and S_2^2 = variances of the two groups
N_1 and N_2 = number of participants in each of the two groups

The first formula is the t-test between means for correlated samples that used to identify if there is a significant difference between the pre-test and post test results of each group. The second formula is the t-test between means for independent samples used to determine the significant difference between the performance of the students in the pre-test, post-test and gain scores in the control and experimental groups.

The degree of freedom was computed as follows at 0.05 level:

$Df_{cor} = n - 1$
$Df_{uncor} = n_1 + n_2 - 2$

4. RESULTS, FINDINGS, AND DISCUSSIONS

This section presents the analysis and interpretation of the data gathered after the statistical treatment. The data are presented in accordance to the problems in the study. Responses to questions that can be combined relative to the tabular presentation are incorporated.

Pretest Performance of the Pupils in Control and Experimental Groups

Prior to the conduct of the study, a 30-item pretest was administered to the two sample groups to determine the entry performance of both groups at the beginning of the study.

Table 1

Raw Scores	Pre-Test				*t-value*	*p-value*
	Control		*Experimental*			
	F	%	F	%		
11-15	6	26.09%	3	13.04%	*0.11679*	*.90756*
6 - 10	16	69.57%	18	78.26%		
1 - 5	1	4.34%	2	8.7%		
Total	23	100%	23	100%		
X	8.86[a]		8.78[a]			
Sd	2.32		2.71			

Pretest Performance of the Learners

** Means with the same letter do not differ significantly α = 0.05*

It can be gleaned in the table, 16 of the learners in the control group and 18 students in the experimental groups got low scores ranging from 6 to 10, interpreted as “poor” level of performance. Only 26.09 percent of the students in the control group reached the score bracket of 11-15 and 13.04 in the experimental group, which means the learners performed fairly. The mean scores for both the control and experimental groups in the pretest are 8.86 (Sd = 2.32) and 8.78(Sd =2.71) respectively.

To determine the significant difference in the mean scores, the t – test for uncorrelated sample was employed and revealed a computed t-value of 0. 11679 and a p-value of 0.90756 at 0.05, which means not significant at $p < .05$. This supports the null hypothesis asserting no significant difference between the mean pre-test scores of the control and experimental groups, thus accepted.

The standard deviations (2.32 for the control group and 2.71 for the experimental group) indicate that score variability within each group is comparable, but somewhat greater in the experimental group.

The result indicates that neither the control group nor the experimental group perform better than the other and that the two groups exhibited the same level of performance in the pre-test. The data also suggest that the two groups were comparable at the start of the experiment.

The result is can be linked to the viewpoint of Ross (2017) emphasizing the significance of instructors providing high-quality education through diverse instructional styles that cater to learners' unique needs and interests. He emphasizes the need for effective teaching and learning strategies that relate class topics to real-world situations and enable successful monitoring and assessment of student performance, discouraging the application of traditional method of teaching.

Post-test Performance of the Pupils in Control and Experimental Groups

Similar type of test administered in the pre-test was given to the control and experimental groups after the experimental period. The results of the test for both groups were used to identify the learners' post-test performance. Table 2 summarizes the result.

Table 2

Post-test Performance of the Learners

Raw Scores	Post-test				*t-value*	*p-value*
	Control		Experimental			
	F	*%*	*F*	*%*		
21-25			5	21.74%		
16-20			15	65.22%		
11-15	12	52.17%	3	13.04%	*-9.47855*	*< .00001*
6 - 10	9	39.13%				
1 - 5	2	8.7%				
Total	23	100%	23	100%		
X	11.35[a]		18.43[b]			
Sd	2.82		2.21			

* Means with unlike letters differ significantly
α = 0.05

Table 2 depicts that in the range of scores from 16 to 20, 15 or 65.22% of the learners in the experimental group reached the bracket and 5 learners got a score of 21 to 25, indicating a considerable increase in their achievement level. The performance can be interpreted as "good" and "very good" In contrast, none of the learners in the control group scored within these ranges and their performance levelled up to "fair" score bracket of 11-15.

The result of the t-test for the significant difference between the mean scores revealed a computed t-value of -9.47855 which is less than the p – value of 0.00001 indicating highly significant difference, thus rejecting the null hypothesis that there is no significant difference between the mean post-test scores of the control and experimental groups.

The mean score for the control group is 11.35, whereas the mean score for the experimental group is much higher, at 18.43. This means that the experimental group performed significantly better on the post-test than the control group.

The control standard deviation for control group that is 2.82 indicate higher variability in the learners' scores. While the standard deviation for experimental group, which is 2.21, shows that pupils in this group perform more consistently and with less variability.

The post-test data showed that the experimental group significantly outperformed the control group, which can be attributed to successful application of constructivist teaching strategy, which aligns to the assertion of Ross (2017) and Adak (2017), emphasizing the significance of constructivist approaches in promoting better comprehension and retention of knowledge, leading to increased academic achievement.

Gain Scores of Pupils from Pre-test to Post-test in the Control and Experimental Groups

The performance of the control and experimental groups was assessed through gain scores, comparing and incorporating pre and post-test scores.

Table 3

Mean Gain Scores of the Control and Experimental Groups in the Pretest to Post Test

Raw Scores	Gain Scores			
	Control		*Experimental*	
	F	%	F	%
12-14	0	0%	4	17.39%
9-11	0	0%	12	52.17%
6-8	0	0%	6	26.09%
3-5	11	47.83%	1	4.35%
2 - Below	12	52.17%	0	0%
Total	23	100%	23	100%
X	2.48^a		9.65^b	
Sd	1.56		2.23	
t-value	*-12.64141*			
p-value	*< .00001*			

* Means with unlike letters differ significantly
α = 0.05

It can be gleaned in the table that there is a greater percentage of the learners in the experimental group that had a gain score of 9-11, which falls between the “average” and high “increase” of scores. Also, 4 learners or 17.39% of those who were in the experimental group gained a score of 12-14, which is a high increase.

On the other hand, 52.17% of the learners in the control group yielded a very low increase of 2 and below. The table also shows that the control group yielded a gain mean score of 2.48 (sd= 1.56) while the experimental group had a gain mean score of 9.65 (sd= 2.23).

In order to determine the impact of the constructivist strategies on the performance of Grade 3 learners in Basic Science, it was necessary to determine the difference in the gain scores of the control group and experimental groups obtained in the pre test and post test. As evidenced by a computed t-value of -12.64141 with a p - value of < 0.00001, there is a highly significant difference in the gain scores of the control and experimental groups, which rejects the null hypothesis of no significant difference between gain scores of the control and experimental groups at 0.05 level.

Thus, considering that the experimental group demonstrated a significantly higher mean score compared to the control group, it may be assumed that, if we take the gain scores as the basis, constructivist teaching strategy is instrumental to the improvement of the learners’ performance in Basic Science.

The study reveals that the experimental group significantly benefited from the constructivist instructional tactics strategy, resulting in higher gain scores and a significant statistical difference, which supports the argument of Cox (2009) highlighting that adopting successful teaching strategies, including constructivist ones, is crucial for promoting comprehensive learning and enhancing academic achievement.

Key Findings

1. The control and experimental groups had similar performance levels at the start of the study, with mean scores of 8.86 for the control group and 8.78 for the experimental group. There is no significant difference between the pre-test mean scores.
2. The experimental group exhibited a significant improvement in post-test compared to the control group. This is shown by the mean score of 18.43, which is way higher than the mean score of the control group of 11.35. The t-test result indicates a highly significant difference between the two groups.
3. The experimental group had a significant increase in gain scores of 9.65 compared to the 2.48 increase of control group. The t-test revealed a significant difference with t-value of -12.64141 and p-value of < 0.00001.

Implications of the Study on Teaching Science and Learners Performance

The considerable improvement in performance of the experimental group that used constructivist teaching methodologies emphasizes the need of incorporating these approaches into scientific education. The findings indicate that there is an improved learners' performance. Constructivist teaching practices, such as active involvement, problem-solving, and hands-on activities, collaboration, and concept mapping significantly enhance student engagement and performance, thereby underscoring the importance of good teaching practices in achieving comprehensive learning that aligns to the assertion of Cox (2009).
Also, the study highlights the significance of teaching methods that cater to the diverse learning styles and demands of the learners, emphasizing the role of constructivist strategies in enabling students to develop their own thinking.
In addition, the significant difference in gain scores between control and experimental groups indicates that constructivist teaching practices enhance learners' academic performance in Basic Science, which also confirms the assertion of Cox (2009) that diverse and effective instructional approaches are crucial for improved learning outcomes.
The study highlights the importance of instructors' expertise in using constructivist teaching methods, recommending the inclusion of this approach in Basic Science training due to its proven ability to enhance learning outcomes, enhance comprehension, and enhance retention.

5. CONCLUSION

From the findings of the study, the following conclusions are drawn:

1. The study found that learners who were taught using constructivist teaching strategies showed better performance compared to those in traditional instruction settings.
2. Constructivist strategies are effective in improving the learners performance.
3. Creative and learner-centered instruction, particularly in Basic Science, improve comprehension, retention, critical thinking, and real-world connections.
4. Teachers' training to enhance their skills and knowledge in implementing constructivist teaching strategies is necessary to help them create a dynamic and engaging learning environments.

6. RECOMMENDATIONS

Based on the conclusions drawn, the following recommendations are formulated:

1. The adoption of constructivist teaching strategies must be prioritized.
2. Educational institutions should allocate resources for professional development opportunities for educators to enhance their competencies and understanding of constructivist pedagogy.
3. Promote innovative and learner-centered strategies in education, especially in Basic Science, to enhance learners' comprehension, retention, critical thinking, and real-world connections beyond academic success.
4. Teachers' training programs should incorporate constructivist pedagogy components to foster dynamic and engaging learning environments that promote student achievement.
5. Similar study may be conducted focusing the use of the constructivist strategies in other discipline and in different setting.

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