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# The Use of Socio-Constructivist Approach in Improving the Academic Performance of Students in Mathematics

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***Abstract*—** The study investigated the use of a socio-constructivist approach in improving the academic performance of Grade 8 students at New Visayas National High School, New Visayas, San Francisco, Agusan del Sur, during the school year 2022-2023. The quasi-experimental research design was utilized where the 40 students were divided into two groups- the control group and the experimental group. These two groups were the recipients of the intervention: a socio-constructivist approach for the experimental group and a lecture method for the control group. The groups took a pretest, and then the posttest was administered after the interventions. The results showed that there was a significant difference between the pretest and posttest mean scores of the experimental group as well as the control group. Moreover, the study found no significant difference between mean posttest scores of the students' in control group and experimental group. It means that the socio-constructivist approach and lecture method have no significant difference. Hence, it was concluded that the socio-constructivist approach and lecture method are both effective and can help the academic performance of the students in mathematics. As a recommendation, these interventions should be utilized to improve the student's academic performance and also be used in teaching mathematics for the development of higher student achievement.

***Keywords*—** Academic Performance, Socio-constructivist Approach, Teaching Approach, Quasi-experimental Design.

## I. INTRODUCTION

Mathematics teachers utilized inappropriate teaching approaches in the classroom have resulted in unsatisfactory performance and a poor attitude towards mathematics subject for many students. It is imperative for the teachers to use the appropriate teaching approach to achieve the critical thinking and problem-solving in mathematics to the students. Socio-constructivist is one of the teaching approaches that may be used to increase academic success of the students in mathematics and could provide them with opportunities to understand the concepts in mathematics through collaboration or social interaction to their peers or classmates.

In Turkey, the students failed to demonstrate the desired performance in mathematics in both national and international assessments. The result of the assessments concluded that mathematics is considered as difficult and boring by many students. While there may be many reasons why students struggle in mathematics and why many students considered mathematics to be a difficult subject, the teaching approaches used in mathematics are considered effective on these reasons (Akinsola & Olowojaiye, 2008). Due to academic problem, the teachers used different teaching approaches to provide the desired student success in mathematics. Until, the Ministry of National Education implemented the constructivist teaching approach in the curriculum in 2005, in which it took an important step to make teachers apply constructivism in teaching mathematics (Eğitim Reformu Girişimi [ERG], 2005).

According to Graven (2015), learning mathematics is considered a social activity in which students actively construct meaning. This implies that students' progress in acquiring knowledge in mathematics may be influenced by their social environment. Additionally, in a social constructivist learning environment, learners are expected to be involved in learning, for instance, through discussion, arguing, sharing ideas, and cooperatively solving problems in real-world situations. In these educational environments, teachers should plan and organize the learning context available to assist the students' learning activities (Richards, 2005). In mathematics lessons, learners socially construct meaning (Graven 2015); thus, during the lessons, teachers must provide students the opportunity to interact with one another while working in groups to solve mathematical problems. If some members of the group encounter problems with understanding concepts within mathematics, by doing this, learners may be able to help and support each other.

Moreover, Wexler (2017) viewed learning as a social movement. When the students work together with the teacher and their peers, it is considered an opportunity to develop mathematical information. By offering opportunities for social activity, small group

collaborative learning is a crucial route for the students to build a foundation of learning (Huang et al., 2017). Consequently, the social movement of learners in the classroom is important for understanding the progress of their mathematical thinking (Volk, 2017; Schoenfeld, 2009).

Witfelt (2000) emphasized that the qualities of a teacher in a socio-constructivist approach are facilitating students' work, encouraging them, conducting group discussions, employing student experience in lessons, identifying students' skills, and doing constructive student assessment. Kumar (2006) added that in the classroom, teachers encourage students to ask various questions, analyze, interpret, and predict through dialogue among students, and provide attractive stimuli. They also utilize this teaching approach based on students' prior knowledge and level of learning. In addition, they should facilitate students in connecting their previous knowledge with those they have learned and serve as models for them to improve their thinking skills. (Creswell, 2007).

Omwirhiren (2015) discussed that one of the methods of social constructivism teaching is the discussion teaching method. This teaching method is defined as a method that uses guided interaction to highlight a specific subject matter with the goal of facilitating the students' learning. Jegede (2010) mentioned that though this method takes time, it improves learning by giving students room to develop their communication skills and mental skills such as reflective thinking, critical thinking, and evaluating diverse opinions. Moreover, in this method, the teacher serves as a facilitator for the exchange of ideas between students and teachers about a chosen topic. This can be done in the form of a whole-class discussion or a small-group discussion. Each student is free to express their opinions on a particular issue or topic while the teacher facilitates the discussion. This teaching method increases students' interest, promotes learning retention, stimulates the exchange of ideas, and makes learners active participants in the lesson.

In the Philippines, the problems on academic performance in mathematics is true. Department of Education considers performance in Mathematics as a significant problem in Education (Novriani & Surya, 2017). Because of the formulas and rules involved in a mathematics lesson, the students perceive mathematics subjects negatively. They felt tense and anxious when answering mathematical problems, which affects them to have poor performance. Additionally, more students also admitted that they had not learned from the method of the actual teaching of their teachers in a mathematics subject. The choosing of the appropriate teaching approaches leads to attaining success in performance in Mathematics. Moreover, in order the students to succeed academically and develop critical thinking in answering Mathematics, the appropriate teaching approaches should be used. It also helps to have high performance in Mathematics (Ersoy, 2016).

In New Visayas National High School, the researcher who has spent years in teaching Mathematics has observed that students have lack of motivation and poor mathematical attitudes due to poor teaching approach used by the teachers in the classroom.

Students with a poor attitude towards mathematics may receive low grades in their quarterly grades. Teachers may improve the academic performance of their students when they use effective teaching methods or approaches to convey information.

Also, the appropriate teaching approaches could decrease the poor attitude towards mathematics. In this context, this led the researcher to conduct the study to investigate if using socio-constructivist is an effective teaching approach in improving the academic performance of the students and if this teaching approach can develop the students' learning in mathematics by giving them an opportunity to discuss ideas and explore the concepts by their own understanding.

***Statement of the Problem***

The study aimed to examine how socio-constructivist approach improves the academic performance of Grade 8 students of New Visayas National High School. New Visayas, San Francisco Agusan del Sur, School Year 2022-2023.

Specifically, this study sought to answer the following questions:

1. Is there a significant difference between the pretest and posttest mean scores of the control group?
2. Is there a significant difference between the pretest and posttest mean scores of the experimental group?
3. Is there a significant difference between mean posttest scores of the students' in control group and experimental group?

***Null Hypothesis***

In order to establish evidence to answer the specific questions presented in this chapter, the following hypotheses were tested:

*Ho₁*: There is no significant difference between the pretest and posttest mean scores of the control group.

*Ho₂*: There is no significant difference between the pretest and posttest mean scores of the experimental group.

*Ho₃*: There is no significant difference between mean posttest scores of the students' in control group and experimental group.

***Scope and Delimitation of the Study***

This study was delimited to determine the academic performance of the Grade 8 learners of New Visayas National High School in their Mathematics class using the socio-constructivist approach. Since there were 40 students in Grade 8 for the School Year 2022-2023, they were divided to create 20 students to control group and also 20 students to experimental group. Moreover, the study was limited in the pretest and posttest scores of the students in comparison of their achievements' before and after the intervention using socio-constructivist approach for the experimental group and lecture method for the control group. There were three selected topics in mathematics that imparted on the students. It was discussed for one month from the duration of the research.

## II. METHODS

***A. Research Design***

The data for the study was gathered using a quasi-experimental research design. This research design divides the respondents into two groups: the experimental group and the control group. The intervention of using a socio-constructivist approach was introduced for the experimental group, while the lecture method was used for the control group. The data was collected using a pretest and posttest. Both groups were given a pretest at the beginning, and a posttest was administered after the topics had been discussed.

According to Shadish, Cook, and Campbell (2002), a quasi-experimental research design is defined as "a study in which an intervention is introduced to observe its effects". The researcher manipulates the independent variable to criticize its effect on the dependent variable. Another characteristic of experimental designs is that they involve two groups of subjects. One group acts as the experimental group, which receives the intervention, and the other group acts as the control group or as the comparison group, which does not receive the intervention (Fraenkel et al., 2012).

***B. Research Subjects***

The subjects of this study were the Grade 8 students of New Visayas National High School who enrolled in the school year 2022-2023. There were 40 students in this grade level. They were divided into two heterogeneous groups. The subjects were selected using simple random sampling, where the students' names were written on a sheet of paper and drawn until the first 20 subjects were taken and assigned to the experimental group. The remaining names were assigned to the control group. The researcher used this sampling technique to let all 40 students answer the pretest and posttest questionnaires.

***C. Research Instrument***

The research instrument was a researcher-made test with 40 multiple-choice questions from the following topics: graph a system of linear equations, system of linear equations in two variables by (a) elimination, (b) substitution, (c) graphing, and solve problems involving systems of linear equations in two variables.

The researcher prepared a lesson plan for every teaching method. These methods are the think-pair-share method, the jigsaw method, and the group work method. These teaching methods are considered as a socio-constructivist approach. The table of Specifications (TOS) was also prepared so that the items of the test could be distributed to the different competencies. The test was a multiple-choice examination with four choices for each item, and the questions were arranged as easy at 25%, average at 50%, and difficult at 25% based on the competencies.

The said test instrument was composed of 40 questions and was referred to a panel of experts to determine its validity and elicit their suggestions for the improvement of the tests. It was pilot tested on subjects who were not included in the study. Using the appropriate statistical method, the reliability test and item analysis were also examined.

***D. Validation of the Research Instruments***

The research instrument was presented to the researcher's validators and research adviser for comments and suggestions. The instrument was tested with a group of 20 students for pilot testing. and they were divided into upper and lower score groups, which

were then assessed for indices of difficulty, discrimination, and options. The item analysis, reliability test, and validity test were also checked using the appropriate statistical formula. The pilot testing of the research instrument would help the researcher implement the study effectively. The reliability index of the instrument was 0.69. Thus, the instrument was considered reliable before its administration to the subjects to the study.

## III. RESULTS ANS DISCUSSION

### *Significance Difference Between the Pretest and Posttest Mean Scores of the Control Group*

***Table 1.*** *Comparison of the Achievement of the Students in the Control Group*

| | Mean | P-value | Decision |
|---|---|---|---|
| **Pretest** | 14.00 | 0.000 | Reject Ho |
| **Posttest** | 30.15 | | |

The table reveals the comparison of the achievements of the students in the control group. The p-value is 0.000, which means that it is less than the significance level (0.05), and the null hypothesis should be rejected. Thus, there was a significant difference between the pretest and posttest mean scores of the control group when using the lecture method.

Furthermore, in comparison of the achievements of the students in the control group, it implies that the null hypothesis was rejected, and it proves there was a significant difference between the achievements of the students. It means that using the lecture method resulted in a significant improvement in the students' learning in mathematics.

Kaur (2011) stated that the lecture method is easier for the teacher to apply because it just "tells" students about the subject. He added that, compared to most other teaching methods, the lecture method is easier to learn. The lecture will be successful if it attracts the students' full attention, is delivered excitingly and systematically, and provides students with opportunities. At the end of the lecture, it is necessary to provide assignments to students, the final assessment, and put forward conclusions.

Moreover, Novita (2014) added that the lecture method can make teaching easier for the teacher because it allows them to directly monitor and control the learning conditions for their students. Using this method gives the teacher wide access to the constraints and limitations that students encounter during learning. Additionally, since the lecture method is solely teacher-centered, the teacher may simply control and guide the class.

### *Significance Difference Between the Pretest and Posttest Mean Scores of the Experimental Group*

***Table 2.*** *Comparison of the Performance of the Students in the Experimental Group*

| | Mean | P-value | Decision |
|---|---|---|---|
| **Pretest** | 14.50 | 0.000 | Reject Ho |
| **Posttest** | 30.45 | | |

The table shows the comparison of the performance of the students belonging to the experimental group. The mean indicates that the pretest got 14.50 and the posttest got 30.45. As a result, the P-Value is 0.000 less than the level of significance (0.05), indicating that the null hypothesis was rejected and there was a significant difference between the pretest and posttest mean scores of the experimental group when using the socio-constructivist approach.

The comparison of the achievement of the students in the experimental group resulted in a significant improvement. The learners who are taught through a socio-constructivist approach have shown good performance in mathematics. Furthermore, the results showed evidence that this approach leads to meaningful learning when the learners are engaged in social activities such as group collaboration or pair discussion.

According to Naude and Meier (2019), a socio-constructivist approach to teaching and learning fosters

learner collaboration, interaction, and idea exchange within mathematics classrooms, which can improve learning opportunities for students. Additionally, socio-constructivist learning outcomes could be attained through teamwork, group discussions, or any other instructional interaction. Students interact with their peers to gain the knowledge and experience needed for a successful life (Kapur 2018).

Moreover, the socio-constructivist approach maintains that students can create or construct their knowledge more effectively when it is embedded in a social setting. He added that interaction between the teacher and the students as well as among the students themselves should be encouraged in order for them to create a deeper understanding of new mathematical concepts (Stiff 2001).

***Significance Difference Between the Posttest Performance of the students in Control group and Experimental group***

***Table 3.*** *Comparison of the Performance of the Students between the Control and Experimental Group*

| Group | Mean | P-value | Decision |
|---|---|---|---|
| **Control** | 30.15 | 0.816 | Accept Ho |
| **Experimental** | 30.45 | | |

The table reveals the level of performance of the students after the interventions of the two groups. The mean indicates that the control group got 30.15 and the experimental group got 30.45. The P-Value is 0.816, which is greater than the level of significance (0.05). Therefore, the null hypothesis was accepted, and there was no significant difference between the performance of the students in the control and experimental groups as reflected on their posttest scores.

The result implies that the socio-constructivist approach and lecture method have no significant difference. The teachers can use the lecture method and the socio-constructivist approach in the classroom setting since these interventions are both effective. Furthermore, based on the posttest results of this study, the appropriate teaching approaches to use in teaching mathematics are the socio-constructivist approach and the lecture methods.

Galia (2016) conducted a study that found that the lecture method and the constructivist-based approach were both effective for teaching mathematics. However, in this experimental study, the mean score of the pretest performance for both groups was only "fair, while the experimental group and control group's posttest performance significantly improved to a "Very Good" level for the former.

## CONCLUSION

The competency level of the students in the experimental group after the intervention using a socio-constructivist approach was significantly different. Therefore, it can be concluded that the use of socio-constructivist as a teaching approach was effective in teaching mathematics. Furthermore, since this study found that the use of a socio-constructivist approach was effective, it could be applied in the classroom to improve the academic performance of students in mathematics.

Moreover, the academic performance of the students improved using the Lecture method and the socio-constructivist approach. The results showed that both were effective in teaching Mathematics.

## RECOMMENDATIONS

The following recommendations were offered by the researcher based on the conclusion of the study.

1. Teachers should encourage to use of a socio-constructivist approach in teaching mathematics since it improves learners' performance. The teachers need to provide students with the opportunity to share ideas in their groups when they solve problems in mathematics.
2. Students should involve in social activity as they solve mathematical problems, which lead them to the improvement of learning opportunities in mathematics subject.
3. The School Administrators should encourage and support the mathematics teachers using socio-constructivist approach.
4. The use of socio-constructivist as teaching approach is recommended for future researchers to implement for it has relevant effect to the performance level of the students.

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