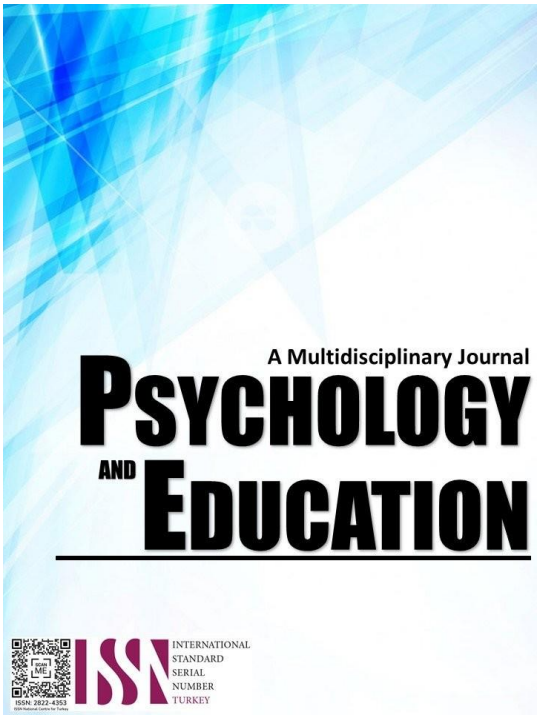
ENVIRONMENTAL APPROACH IN TEACHING FRACTIONS IN THE CONDUCT OF FACE-TO-FACE CLASSES



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Research Article

Environmental Approach in Teaching Fractions in the Conduct of Face-To-Face Classes

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Abstract

Teaching mathematics in the transition period required familiarity with the four fundamental operations: addition, subtraction, division, and multiplication, including fractions. This is necessary for a pupil to comprehend more complex mathematical concepts. The COVID-19 epidemic had a significant impact on the development of these skills. The appropriate use of teaching materials was one of the explanations offered by several studies for why students struggle to understand fractions and fall short of fundamental levels of proficiency in fractions. In order to teach fractions to Grade III students at Ditucalan Elementary School in Iligan City's West II District face-to-face, this study sought to assess the learning benefits of environmental resources. In particular, it aimed to respond to queries regarding substantial differences between the pretest and posttest of the Comparative and Environmental approach groups. A quasi-experimental research design was used for this investigation. This study compared the comparative method and environmental approach using a 40-item teacher-made test as the instrument. The Most Essential Learning Competencies (MELC) formed the basis for five lessons that were taught to third-graders. The statistical methods utilized to compare the results of the pretest and posttest for both the Comparative and Environmental approaches were frequency count and percentage, Independent T-test, and Paired T-test. The following conclusions were drawn from the data: The pretest mean scores of both groups were comparable and did not significantly differ. However, the posttest results showed that there was a significant difference, thus the null hypothesis was rejected. It was concluded that the use of environmental resources had improved the pupils' academic performance. This proved that teaching Fractions using resources from the environment can be adapted as another teaching strategy. Thus, it is hoped that the action plan on environmental resources be realized.

Keywords: *environmental resources, comparative group, fractions, face-to face classes*

Introduction

Teaching Mathematics in the transition stage requires mastery of the four basic fundamental operations. These fundamentals include fractions as well as addition, subtraction, division, and multiplication to help learners understand more complex mathematical ideas. Developing such skills was significantly impacted by the COVID-19 epidemic. To continue providing a secure learning environment for the students, almost all of the institutions chose to use a modular learning delivery mode that includes both print and online sessions. It had a negative impact on the students' level of mastery in mathematics as seen in the pre-assessment test as of the current academic year 2022-2023.

Among the one hundred twelve (112) learners in grade three of Ditucalan Elementary School, only seventeen (17) or 15% got a score that was 75% and above. The School's Mean Percentile Score (MPS) in Mathematics was only 40.2. Teachers were facing learners who were non-readers and lacked mastery skills in numeracy, especially in fractions. Therefore, a teacher must be creative, resourceful, and patient enough to find ways and means to maintain learners' attention and interest. They should understand and master the basic skills in Mathematics. To achieve effective learning and teaching process, there is a need for the use of instructional material or strategy which can facilitate learners in acquiring mathematical competencies.

In a teaching-learning environment, the teacher plays a major role to influence the pupils' way of acquiring knowledge. The teacher selected the subject matter and matched it with a well-designed activity. It was to achieve the desired objectives that gave fulfillment to the teacher and additional learning to the pupils after the desired goal was attained.

The Learning Recovery and Continuity Plan of the Department of Education concentrated on reducing the drawbacks of purely online learning. It deepened the innovations and learning gains driven by COVID-19 while bridging the learning gaps brought about by the disruption generated by COVID-19. Former Deped Secretary Briones added that a key element in helping to create a meaningful country was the caliber of education. She stated that the Basic Education Development Plan's (BEDP) 2030 goals included addressing the root causes of issues with high-quality instruction. These objectives included filling up the gaps, maintaining and improving pertinent programs, and introducing innovations todevelop resilience and include children's and youths' rights into education (Launching of the BEDP, 2022).

Furthermore, the Mathematics Framework for Philippine Basic Education (2021) explained that a deep understanding of mathematics requires a variety of tools for learning. Mathematical tools allowed students to be actively engaged in learning mathematics and deepened their mathematical understanding. These tools included manipulative and hands-on materials. These are effective for developing, clarifying, and applying mathematical concepts. These materials should be carefully integrated into the instructional process.

It was deemed necessary that teachers must swiftly design responses to the emerging educational challenges. It protected young

people's educational opportunities during and following the pandemic. It should be an innovation that will create learning connections through the application of instructional materials from the environment that will somehow develop learners' organization of ideas, symbols, objects, and words (OECD Innovating Education and Educating for Innovation: The Power of Digital Technologies and Skills, 2018).

The researchers observed that the application of instructional materials tends to sustain and attract children's attention and make teaching and learning more interesting. As cited by Bukoye (2019) instructional materials played a very important role in the teaching-learning processes. To mention; the enhancement of the memory level of the students; facilitating the teaching-learning process; the improvement of student rate of accumulation; serving as tools used by the teachers to correct wrong impressions and illustrate things that, learners cannot forget easily. It also assisted in giving a sense of reality to the body of knowledge under discussion; it gave lessons a personal look and encouraged teacher's creativity; and permitted the students and teachers to experience in concrete terms the learning activities that can promote the idea of self-evaluation.

The teacher is responsible for creating an intellectual environment. She also provided learning opportunities that challenged the pupils at all levels of understanding. To improve teaching, teachers must analyze what were the active approaches and experiences they can offer to pupils to enhance learning. Active learning breaks away from the traditional lecture format and changes the method of instruction. Pupils are not considered passive receptacles for the knowledge imparted by instruction. Instead, they took on an active role in their education.

The low academic performance of Grade Three learners in Mathematics opted the researchers to conduct the study. This study determined the academic performance of learners in the Comparative group and the Environmental Approach group in Fractions which were the competencies for the Third grading in the Grade III Mathematics learning area. The study was conducted at Ditucalan Elementary School in the school year 2022-2023.

Since the researchers is presently handling Grade III which was teaching Mathematics subjects and observed that pupils were having difficulty absorbing the lessons in Mathematics, she was determined to use an environmental approach to teaching Mathematics. She also believed that the on-hand experience of the pupils in using those concrete and real objects from the environment can help to minimize the use of time and money in making instructional materials at the same time can elevate pupils' performance.

Research Questions

The main thrust of this study was to determine the use of an environmental approach to teaching Mathematics. Specifically, this study sought to answer the following questions:

1. What are the pretest scores in the comparative and environmental approach groups?
2. Are there significant differences between the pretest scores in the comparative and environmental approach groups?
3. What are the posttest scores in the comparative and environmental approach groups?
4. Are there significant differences in the posttest scores between the comparative and environmental approach groups?
5. What are the increment scores of both the comparative and environmental approach groups?

Methodology

This section describes the procedural or methodological aspects used in collecting, interpreting, analyzing, compiling, and evaluating the data. This includes the research design, research locale, respondents and sampling procedures, research instruments and their validity, data gathering procedures used, and the statistical treatment employed in the study.

Research Design

The method used in this study was the quasi-experimental research design using two groups of learners, the comparative and the environmental approach groups. The teacher-made test was used as the main tool in gathering the data needed. The content of the lesson plan was based on the Most Essential Learning Competencies (MELC), particularly in Mathematics for Grade Three in the third quarter. Both groups of pupils were composed of a heterogeneous grouping of below-average, average, and above-average achievement levels. In this research design, the performance of the learners was subjected to the environmental approach group, the comparative group was compared, and significant differences were assessed.

Respondents

The respondents of the study were seventy (70) Grade Three learners from the two sections during the school year 2022-2023 of Ditucalan Elementary School. The respondents were 62% of the total number of grade three pupils for the said school year. There were thirty-eight and thirty-seven pupils in the 2 sections respectively. However, only 35 pupils in each group were selected using simple random sampling. They were paired based on the individual result of the Pre-assessment test. The researchers then used Toss-Coin Technique to determine which class belonged to the environmental approach group and the comparative group.

Number of Respondents in the Comparative and Environmental Approach Groups Group	*Male*	*Female*	*Total*

	F	*%*	*F*	*%*	
Comparative (Section Kind)	20	33%	15	29%	35
Environmental Approach (Section Honest)	20	33%	15	29%	35
Total	40	33%	30	29%	70

Table 1. *Number of Respondents in the Comparative and Environmental Approach Groups*

Instruments

The research instrument that was used in gathering the data for this research study was the researchers-made test based on the listed K-12 most essential learning competencies in Mathematics. This tool was patterned from the activities in the mathematics modules and books. There were forty-item multiple- choice test items about fractions that were equaled and greater than one. Also, reading and writing fractions, representing fractions using regions, sets, and the number line, comparing and arranging fractions, and visualizing equivalent fractions were included. Each item was analyzed to determine the reliability coefficient, the index of difficulty, and the index of discrimination.

Procedure

The researchers were the one who personally conducted the study including the retrieval of the seventy (70) copies questionnaires. In gathering the information needed, the researchers asked permission from the Schools Division Superintendent to conduct the study. As soon as permission was granted, the researchers approached her principal for courtesy regarding the conduct of the study. The researchers also approached some master teachers for their insights on the contribution of the environmental approach as the medium for teaching fractions. As class observers, they suggested strategies to conduct and deploy accurately the questionnaires. Before the development of the questionnaire, the researchers identified the topics covered in the study. Testing objectives for each topic area were determined based on Bloom's taxonomy of thinking skills. The researchers then determined the points devoted to each topic based on the number of days those topics were taught. Forty multiple-choice questions were selected to test learning objectives. Then polishing was done to make sure that the important topics were covered and the number of items for the test was sufficient for the time allotted for the test.

The researchers-made test, which was used for the pretest-posttest, was patterned from the Math modules and books used by the Grade III pupils. The pretest had the same content as the posttest but with a different sequence in the numbering of items. The researchers made a sixty-item test. It was reproduced and was piloted to the twenty (20) Grade III pupils of the neighboring school, Maria Cristina Falls Elementary School. The result was item analyzed and either retained, revised, or discarded based on the result of the item analysis. Based on the results of the item analysis, thirty-one (31) questions were retained, twenty-five (25) questions were revised and four (4) questions were rejected. Only forty items were chosen to be part of the final questionnaire and were shown to the District Math Coordinator and the researcher's adviser for content validation.

After the approval of the thesis adviser, the researchers administered the pretest to both groups of Grade III pupils. Results were recorded, tabulated, and kept for further use. Following the lesson plans made, the two methods were implemented in the class of the two groups of respondents. The comparative teaching was done to the traditional group at 9:30- 10:20 in the morning and the environmental approach group at 2:00- 2:50 in the afternoon. This was done for two weeks. The chalk and talk were done in teaching the comparative group but in the environmental approach group lessons were made outside the classroom. Resources from the environment such as twigs, stones, and leaves were used as instructional materials. These were carefully chosen to fully facilitate learning among pupils in the environmental approach group.

Data Analysis

The following statistical techniques were used to analyze the data. The data were tabulated and interpreted to acquire the actual information needed. The following were the statistical tools to be used in the treatment and analysis of data; For problem 1, Frequency count and Percentage were used to determine the pretest scores in the Comparative and Environmental approach group. For problem 2, Independent T-test was used to determine the significant differences between the pretest scores in the Comparative and Environmental Approach Groups. For problem 3, Frequency count and Percentage were utilized in determining the posttest scores in the Comparative and Environmental approach groups. For problem 4, Independent T-test was used to determine the significant differences between the posttest scores in the Comparative and Environmental Approach Groups. For problems 5 & 6, Paired T-test was used to determine the significant differences between the pretest and posttest scores in the Comparative and Environmental Approach Groups.

Results and Discussion

Problem 1: What are the pretest scores in the Comparative and Environmental approach groups?

The pretest scores were the result of the assessment given to the two groups, Comparative and Environmental Approach before they have undergone the treatment. The pretest questionnaire was given one week before the conduct of the treatment.

Table 2. *Pretest Scores of the Comparative and Environmental Approach Groups*

CMSS	*Description*	*Comparative Group*		*Environmental Approach Group*	
		F	*%*	*F*	*%*
90% -100%	Outstanding	0	0	0	0
85%-89%	Very Satisfactory	0	0	0	0
80%- 84%	Satisfactory	0	0	0	0
75%-79%	Fairly Satisfactory	0	0	0	0
60%-74%	Did not Meet Expectations	35	100%	35	100%
	Total	35	100%	35	100%

Note: Comparative Group: Pretest Mean (SD) = 19.49 (3.64) Environmental Approach Group: Pretest Mean (SD)= 18.37 (3.26)

Table 2 presents that most of the respondents had pretest scores of 74% and below or did not meet expectations in the performance category. This meant that respondents in the two groups had insufficient knowledge of basic concepts in fractions. This data further implied that all respondents were in the same intellectual capacities at the start of the experiment. It was also emphasized by Duschinsky (2022) that at the starting point, individuals fill up the blank slate of the mind with knowledge. They acquired ideas through experiences.

Problem 2: Are there significant differences between the pretest scores in the Comparative and Environmental Approach Groups?

The table below is a comparison of the pretest scores of the two groups before the start of the treatment. This result is necessary to determine whether the two groups are comparable in terms of the respondents' prerequisite knowledge of fractions.

Table 3. *Differences in the Pretest Scores Between the Comparative and Environmental Approach Groups*

Group	*Mean Difference*			*t-value*	*P-value*	*Remark*
	Mean	*SD*	*Mean Difference*			
Comparative Group	19.49	3.64	1.11	1.35	0.18	Not significant 0.18
Environmental Approach Group	18.37	3.26				

Note: Analysis is based on Independent T-test SD- standard Deviation ns- not significant at 0.05 level

Table 3 presents the comparison of paired differences on the pretest scores of the Comparative and Environmental approach groups. This Table revealed that the p-value of 0.18 exceeded the 0.05 level of significance (2-tailed) which meant that the null hypothesis 1 was accepted. It also revealed that there were no significant differences in the mean pretest scores of the pupils in the Comparative and Environmental approach groups. These differences implied that at the beginning of the experiment, the two groups had comparable mean score differences in their pretest performance. Furthermore, it was an indication of good comparison since the two groups showed insignificant performances before the intervention as cited by Cantor et al. (2018), the development of the brain was an experience-dependent process that activated neural pathways that permitted new kinds of thinking and performance.

Problem 3. What are the posttest scores in the Comparative and Environmental approach groups?

The comparative group was given a traditional way of teaching and the Environmental approach group was exposed outside the classroom and used environmental resources as instructional material. After two weeks, the results were recorded. This result was then recorded, and analyzed.

Table 4. *Posttest Scores in the Comparative and Environmental Approach Groups*

CMSS	Description	Comparative Group		Environmental Approach Group	
		F	%	F	%
90% -100%	Outstanding	0	0	5	14%
85%-89%	Very Satisfactory	1	3%	5	14%
80%- 84%	Satisfactory	2	6%	0	0
75%-79%	Fairly Satisfactory	4	11%	6	18%
60%-74%	Did not Meet Expectations	28	80%	19	54%
Total		35	100%	35	100%

Note: Comparative Group: Posttest Mean (SD) = 24.26 (4.91) Environmental Approach Group: Posttest Mean (SD)= 27.09 (5.34)

Table 4 displays the results of the posttest scores of the Comparative and Environmental Approach Groups. The data showed that the respondents' posttest scores in both Comparative and Environmental Approach Groups increased by 20% and 46% respectively to Fairly Satisfactory, Satisfactory, and Very Satisfactory. It was evident that the use of resources from the environment as instructional material in teaching provides activity to pupils to create their knowledge through experiences as supported by Hoxie (2022).

Problem 4: Were there significant differences in the posttest scores between the Comparative and Environmental Approach Groups?

The table below is a comparison of the posttest scores of the two groups, the Comparative and Environmental approach groups. The result determines the differences between the two groups after using the traditional and environmental approaches in teaching fractions.

Table 5. *Differences in the Posttest Scores of the Comparative and Environmental Approach Groups*

Group	*Posttest Score*		*Mean Difference*	*t- value*	*P-value*	*Remark*
	Mean	*SD*				
Comparative	24.26	4.92	-2.83	-2.29	0.025	Significant
Environmental Approach Group	27.09	5.34				

Note: Analysis is based on Independent T-test SD-standard deviation, ns-not significant at .05 level

Table 5 presents the comparison of paired differences in the posttest scores of the respondents in the comparative and environmental approach groups. This table showed a p-value of 0.025 which was lower than the 0.05 level of significance. It meant that null hypothesis 2 was rejected and revealed that there were significant differences in the mean posttest scores of the pupils in the comparative and the environmental approach groups.This result further implied that the performance of the subjects in the environmental approach Group achieved better than the subjects in the comparative group. This performance showed that the environmental approach contributed to the fulfillment of the subjects. Therefore, resources from the environment increased and deepened pupils' skills, knowledge, and understanding from concrete to what was more abstract. This result was supported by Gerdes et al. (2018) that having materials in the classroom made of natural materials (Wood, living plants, natural lighting, and windows) had an impact on the learning atmosphere. To promote optimal development of the whole child, children needed a variety of materials available to them daily that provided both challenge and success.

Problem 5. Are there significant differences in the pretest and posttest scores of both the Comparative and Environmental approach groups?

The gain scores focus on the difference between measurements taken at the Comparative and Environmental approach groups. The result determines the effectiveness of the environmental resources compared to the traditional way.

Table 6. *Paired Differences on the Pretest and Posttest Scores of the Comparative and Environmental Approach Groups*

Paired Variables	Pretest		Posttest		Paired Mean Difference	t- value	P- value	Remark
	Mean	SD	Mean	SD				
Comparative Group	19.5	3.6	24.3	4.9	-4.77	- 8.75	000	Significant
Environmental Approach Group	8.1	3.6	27.2	5.3	-9.06	- 8.05	000	Significant

Note: Analysis is based on Paired T-test SD- standard deviation ***-significant at 0.05 level*

Table 6 presents the performances of the respondents under the comparative and environmental approach groups in the pretest and posttest. Both groups indicate an improvement in the scores as seen in the mean. This implied that the performances of the respondents in the posttest seemed better than that in the pretest. As shown in the table, the level of significance (2-tailed) using paired sample test was 000 which was lesser than the accepted value of 0.05, this meant that the null hypothesis 3 was rejected. This implied that pupils had learned the lesson on fractions using the traditional method of teaching. Similarly in the environmental approach group, the level of significance (2-tailed) using paired sample test was 000 which was again lesser than the accepted value, null hypothesis 3 was to be rejected. This further implied that using an environmental approach to teaching was effective in enhancing the pupils' learning and improving their academic performance. Teachers can use multiple strategies to create a stimulating and responsive environment for children in their primary years. These strategies can lead to children's overall social, emotional, physical, and cognitive development (Gerdes et al., 2018).

Conclusion

Based on the findings drawn, the study concludes: There were no significant differences between the pretest scores of pupils in the Comparative and Environmental Approach Groups. The majority of the pupils' pretest scores in both groups belonged to the "did not meet expectation" category. These implied that the pupils had less idea about the basic concepts in fractions. This further showed that pupils had no idea about the lesson at the start.

There were significant differences in the mean posttest scores of the pupils between the Comparative and Environmental approach groups. The majority of the pupils in the Comparative and Environmental approach groups remained to have a higher percentage in Did not meet expectation category. However, almost half of the respondents in the Environmental approach group increased their performance to the satisfactory, fairly satisfactory, and very satisfactory categories. Pupils in the environmental approach group learned

better than those in the comparative group through experiences and hands-on activity. It could be concluded that the use of resources for the environment motivated pupils to learn basic concepts in fractions and increase academic performance.

There were significant differences in the pretest and posttest scores of pupils in the Comparative and Environmental Approach Groups. Most pupils in the Comparative group belonged to the "Did not meet expectation" category in the pretest and some were promoted to Satisfactory, Fairly Satisfactory, and Very Satisfactory in the posttest. In the Environmental approach group. Most of the pupils also were in the "Did not meet expectation" category and promoted to the Satisfactory, Fairly Satisfactory category in the posttest. Therefore, the use of resources from the environment in the lesson greatly contributed to the learning performance of the pupils.

Experiential learning or the learning-by-doing by Dewey (1938), stated that the more experiential leanings were involved, that encouraged pupils to play a central role in creating their knowledge, the more and the better the learning would be. This theory proved this study because with the use of resources from the environment pupils learned meaningfully when they were actively involved rather than listening passively to the teacher. Instead of only reading or listening to others, hands-on education gave students the freedom and responsibility to learn via experience.

The Law of Readiness Theory by Thorndike (1913), stated that in general when a child was not ready to learn, he cannot force to learn beyond his level in academic areas such as reading, arithmetic, or even social activities. Because the learner was ultimately responsible for what he had learned from the teacher, this theory supported this study. Learning experiences through connecting with the environment enabled the student to construct his understanding of the subject matter and, when he is ready to acquire critical thinking skills. Additionally, this made learning more engaging, interesting, and easy.

The Multiple Intelligences Theory of Howard Gardner (1999) stated that from recent cognitive research, pupils possessed different kinds of minds. Therefore, learning, remembering, performing, and understanding in different ways were manifested. This hypothesis was supported by the study because environmental resources were practical tools for enhancing students' learning, particularly for those who learned better using visual-spatial representations. People who exhibited talents in other intelligence should receive the same attention as everyone else.

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