(RESEARCH ARTICLE)

Real-life application and appreciation of mathematics of grade eight (8) students

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Abstract

This study was conducted to improve the level of appreciation of grade eight (8) students of Mathematics using real-life application in the lesson. Both qualitative and quantitative data collection techniques were used for collecting data. The qualitative data was collected using structured interviews and checklist observation. While quantitative data was collected using a pre-survey and post-survey. As the researchers analyzed and interpreted the data gathered from the pre-survey and post-survey, the result showed that the level of appreciation for mathematics improved. Also, there is a significant difference between the level of appreciation for mathematics before and after implementing the intervention. However, students seemed to appreciate mathematics when the lesson was taught in a traditional manner, but it could be improved if it were taught and applied in a real-life situation. Therefore, applying and utilizing real-life scenarios in teaching mathematics can improve students' appreciation of the subject.

Keywords: Real-life application; Appreciation of Mathematics; Application; Appreciation

1. Introduction

Most students in the twenty-first century did not value mathematics because they did not see its importance in their lives. This causes them to have difficulty learning the subject area, and their perception of the subject may affect their behavior. Lack of appreciation by the students is also one of the problems encountered by the teachers in mathematics, particularly in public schools, because most of the students tend not to give attention to the subject because they don't know its importance in their daily lives. Until now, this teacher's struggle with their students seems to have persisted.

Mathematics appreciation among students is determined by their perceptions of the value, worth, and significance of mathematics. Also, some of the teachers hear these common expressions: "I really hate mathematics." I've never been good at it. "And when am I ever going to use this again?" How can teachers make students not say lines like these? Teachers should not only teach what is in the book; instead, they should go beyond it to show their students how to appreciate mathematics (Edutopia, 2015).

Based on what the researchers had observed, they found out that some of the teachers taught their lessons using the traditional method, which made the students fail to see the importance of mathematics in the real world and led them to not appreciate the subject. Also, some teachers tend to act as sources of information while the students act as passive learners, which is why most of the students seem not to appreciate mathematics.

The theory that impacts the researchers' study is the experiential learning theory, also known as "learning by doing," that has been proposed by John Dewey. The theory proposes student self-initiative in learning, in which students must discover what they are expected to learn. Relating the theory to the study, the researchers used this to improve the level of students' appreciation for mathematics through real-life application in the lesson in terms of activities and value integration.

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The purpose of this study was to determine the level of appreciation for mathematics among eighth-grade students. The researchers will help the students increase their level of appreciation for mathematics through the use of real-life applications and come up with the following research objectives:

- To determine the level of the grade eight students' appreciation of mathematics from the two classes before the intervention.
- To determine the level of the grade eight students' appreciation of mathematics from the two classes after the intervention?
- To determine if there is a significant difference between the results of the pre-survey and the post-survey implemented in each strategy.
- To determine if there is a significant difference between the level of grade eight students' appreciation of mathematics in the two classes before and after the intervention.

2. Literature Review

Connections in mathematics. Many problems in mathematics education have arisen as a result of a conflict between mathematical theory and its "close connection to the real world" (Willoughby, 1990). Willoughby observed that some teachers believed that mathematics should be taught completely in an abstract way, whereas others discern mathematics as being closely related to the real world, where real-world problems could be extremely useful. These latter teachers agreed that mathematics should be learned, taught, and discussed in connection with real-world situations without even depending on abstract symbols for the students to fully appreciate the power and beauty of mathematics.

Mathematics. refers to the study of motion, number, change, space, and shapes (Devlin, n.d.). From an elementary school volunteer, mathematics acts as the center of everything. A first-grade teacher sees mathematics as everything in which it covers all the extremes. A 12-year-old kid sees mathematics as a universal language that is understood by everyone (Petti, n.d.).

Traditional Mathematics. It is commonly defined as being focused on the teacher, which is the main source of information. In this kind of teaching strategy, the students act as passive participants in their own learning, wherein they only listen to what their teacher discusses and gain knowledge from it. This is the most common application of this strategy as a mathematics teaching strategy, in which students practice remembering and applying the correct rule as outlined in the lesson. However, as stated in the NCTM, the relationship between the concepts should be taught to make them integrate with one another in the current mathematics reform.

"Mathematics should be taught in connection with other disciplines to develop understanding of the natural phenomena that are changing around us" (Young, 1906). NCTM Standards (1989, 2000) emphasized the need for mathematics to be taught through the use of real-world problems and within the mathematics domain.

Mathematics must be learned within and outside of domains, as well as by integrating it with other disciplines, in real-world mathematics. Through these, students will realize and understand the power and beauty of mathematics in the real world.

These definitions may differ from one another, but one thing they have in common is how they see mathematics as an important subject in our everyday lives. As for teachers, it is very important to have a clear understanding of mathematics to help students know and appreciate mathematics.

3. Methodology

Intervention. The NCTM standards emphasized that students can easily remember mathematics lessons when they are applied to real-life situations or scenarios rather than when they are learned through a paper-and-pencil approach.

Researchers used "real-life application" in lessons as an intervention to see how it would affect the students' appreciation of mathematics when the lesson was applied in a real-life situation and to test whether the students would see the value and importance of mathematics in their lives. By using real-life applications in mathematics lessons, it would help the students easily understand and remember mathematics. It would also make the interaction between the teacher and the students in a discussion more fun and meaningful. Students will realize and understand the power and

beauty of mathematics if it is integrated into a real-life situation. Real-life application also involves value integration in the lesson so that the students can see the importance of it in their everyday lives and appreciate mathematics as well.

Instruments. The researchers prepared instruments and had them validated by the validators. It was then presented to the principal of Ramon Avanceña High School, located at J. Nepomuceno Street, Barangay 386, Quiapo, Manila, with the approval of the Division Superintendent. The respondents were two classes in grade eight (8), which have fifty (50) students each. The traditional method was used in one class, while the intervention with real-life application was used in the other. Both classes were taught the same lesson.

Qualitative and quantitative data were used in collecting the data. On the first day of data collection, the researchers gave a pre-survey questionnaire to the students, which consisted of eleven (11) questions, and an interview to the teacher, which consisted of two (2) questions. Then the researchers prepared their lesson plan for three (3) consecutive days. On the second, third, and fourth days, the researchers administered two classes. One of the researchers taught one class using the traditional method while applying real-life examples to the other class. During the lesson, the researcher provides practice exercises to the class taught using the traditional method while providing a series of real-life applications of the lesson in terms of classroom activities to the other class. The other researchers and some teachers of the said school participated in the checklist observation and recorded the actual classroom teaching through video clipping while observing the class. On the fifth day of data collection, the researchers gave a post-survey questionnaire to the same students and a structured interview to the teacher, which consisted of five questions.

4. Results and discussion

Findings from this study were presented, analyzed, and interpreted. Statistical Package for the Social Science (SPSS) was used to analyze the data, and the results, as evaluated by the researchers, were reported in tables and text.

The researcher uses a 4-point Likert scale questionnaire which is considered as an interval scale. The mean is very important in analyzing the data after gathering. From 1 to 1.75 it means highly unappreciated. From 1.76 to 2.50, it means unappreciated. From 2.51 to 3.25, it means appreciated. And from 3.26 to 4, it means highly appreciated.

Table 1 Level of Appreciation of Grade Eight (8) students of Mathematics BEFORE the Intervention of Class 1 and Class 2

Indicators	Mean of class 1	Description	Mean of class 2	Description
I remember what I have learned in Mathematics.	3.28	Highly Appreciated	3.12	Appreciated
I always prioritize Mathematics subject when doing my assignments.	3.47	Highly Appreciated	3.25	Appreciated
I enjoy actively participating in our daily discussion.	3.65	Highly Appreciated	3.56	Highly Appreciated
In my everyday life, I give more time in studying Mathematics.	3.10	Appreciated	2.68	Appreciated
I am grateful to my teacher because they make Mathematics easier to understand.	3.76	Highly Appreciated	3.37	Highly Appreciated
I feel so happy whenever I solve Mathematics problems.	3.52	Highly Appreciated	3.15	Appreciated
I always do some advance reading about our lesson in Mathematics.	2.79	Appreciated	2.56	Appreciated
I recognize and acknowledge the positive values that I gain in Mathematics activity.	3.38	Highly Appreciated	3	Appreciated
I appreciate the level of my achievement in learning Mathematics.	3.53	Highly Appreciated	3.18	Appreciated

I feel thankful whenever I am able to apply Mathematics in my daily activities.	3.46	Highly Appreciated	3.31	Highly Appreciated
I make sure that I have reviewed my lesson before taking test in Mathematics.	3.53	Highly Appreciated	3.15	Appreciated
	3.40	Highly Appreciated	3.12	Appreciated

The data that were presented in Table 1 revealed the result of the pre-survey administered to Class 1 and Class 2. Based on the mean result of the pre-survey under class 1, it showed that they attained an overall mean of 3.40 with a level of appreciation of "highly appreciated." The data also shows that they attained the highest mean of 3.76 (refer to question number 5) with a level of appreciation of "highly appreciated," wherein students are grateful to their teachers because they make mathematics easier to understand. Meanwhile, data show that they achieved a lowest mean of 2.79 (refer to question 7), with students indicating that they "appreciated" making an advance reading of their mathematics lesson.

Table 1 also revealed that the mean result of the pre-survey under Class 2 showed that they attained an overall mean of 3.12 with a level of appreciation of "Highly Appreciated." According to the data, they achieved the highest mean of 3.56 (refer to question number 3) with a level of appreciation of "highly appreciated," indicating that students actively enjoy participating in their classroom discussions. Meanwhile, the data revealed that they had the lowest mean of 2.56 (refer to number 7), indicating that students valued reading their mathematics lesson ahead of time.

Table 2 Level of Appreciation of Grade Eight (8) students of Mathematics AFTER the Intervention of Class 1 and Class 2

Indicators	Mean of class 1	Description	Mean of class 2	Description
I remember what I have learned in Mathematics.	3.12	Appreciated	3.37	Highly Appreciated
I always prioritize Mathematics subject when doing my assignments.	3.20	Appreciated	3.50	Highly Appreciated
I enjoy actively participating in our daily discussion.	3.51	Highly Appreciated	3.53	Highly Appreciated
In my everyday life, I give more time in studying Mathematics.	2.94	Appreciated	3.5	Highly Appreciated
I am grateful to my teacher because they make Mathematics easier to understand.	3.28	Highly Appreciated	3.56	Highly Appreciated
I feel so happy whenever I solve Mathematics problems.	3.35	Highly Appreciated	3.53	Highly Appreciated
I always do some advance reading about our lesson in Mathematics.	2.71	Appreciated	3.34	Highly Appreciated
I recognize and acknowledge the positive values that I gain in Mathematics activity.	3.25	Appreciated	3.50	Highly Appreciated
I appreciate the level of my achievement in learning Mathematics.	3.41	Highly Appreciated	3.71	Highly Appreciated
I feel thankful whenever I am able to apply Mathematics in my daily activities.	3.43	Highly Appreciated	3.62	Highly Appreciated
I make sure that I have reviewed my lesson before taking test in Mathematics.	3.20	Appreciated	3.43	Highly Appreciated
	3.22	Appreciated	3.51	Highly Appreciated

The data in Table 2 revealed the findings of the post-survey administered to classes 1 and 2. Based on the mean result of the post-survey under Class 1, it showed that they attained an overall mean of 3.22 with a level of appreciation of "appreciated." The data also shows that they achieved the highest mean of 3.51 (refer to question 3) with a level of appreciation of "highly appreciated," indicating that students are actively enjoying and participating in the classroom discussion. Meanwhile, the data revealed that they had the lowest mean of 2.71 (refer to question 7), indicating that students had a level of appreciation of "appreciated" in making advance reading of their mathematics lesson.

Table 2 also revealed that the mean result of the pre-survey under Class 2 showed that they attained an overall mean of 3.51 with a level of appreciation of "highly appreciated." The data also shows that they attained the highest mean of 3.71 (refer to question number 9) with a level of appreciation of "appreciated," wherein students appreciated their level of achievement in learning mathematics. Meanwhile, the data revealed that they had the lowest mean score of 3.34 (refer to question #4), where students had a level of appreciation of "appreciated" in making an advance reading of their mathematics lesson.

Table 3 Test of Significant Difference of the Pre-Survey and Post-Survey of each class

Variable	Mean		df	P-Value	Conclusion
	1	**2**			
Class 1	3.40	3.22	38	0.01288	Significant
Class 2	3.12	3.51	31	0.00000	Significant

The data presented in Table 3 revealed the significance of the pre- and post-surveys administered to both classes. Under class 1, the mean of the pre-survey is 3.40, and the mean of the post-survey is 3.22. With the degree of freedom of 38 and by computing the p-value with a 0.05 level of significance, the result of the comparison of the pre-survey and post-survey of class 1 is 0.001288 and reveals a significant difference. While under class 2, the mean of the pre-survey is 3.12, and the mean of the post-survey is 3.51. With the degree of freedom of 31 and by computing the p-value with a 0.05 level of significance, the result of the comparison of the pre-survey and post-survey of class 2 shows 0.00000 and reveals a significant difference. Both classes 1 and 2 indicate that the level of their appreciation before and after the intervention had a significant difference.

Table 4 Significant differences between the level of appreciation of the two classes

Variable	Mean		df	P-Value	Conclusion
	1	**2**			
1	3.40	3.12	57	0.00094	Significant
2	3.22	3.51	68	0.00092	Significant

The data presented in Table 4 reveals the result of the comparison of the pre-survey of class 1 and class 2 and the result of the comparison of the post-survey of class 1 and class 2. The result of the mean of class 1 in the pre-survey is 3.40, while class 2 is 3.12. With a degree of freedom of 57 and a p-value at the level of significance of 0.00094, 0.005 reveals a significant difference. It indicates that class 1 had a greater appreciation for mathematics compared to class 2 before the intervention.

In comparison, based on the post-surveys of classes 1 and 2, class 1 has a mean of 3.22 and class 2 has a mean of 3.51. We get 0.00092 with the degree of freedom 68 and the p-value at the level of significance 0.05, revealing a significant difference. It indicates that after implementing the intervention, class 2 had a greater appreciation for mathematics compared to class 1.

Making connections between mathematics and everyday life would help the students appreciate its worth and importance. It would also make the interaction between the teacher and the students more fun and meaningful. Michael Roper (1994) stated that in the real world, mathematics is viewed as a useful tool that can be used in everyday life. It is also emphasized through the NCTM standards because students easily remember mathematics lessons that are applied in the real world rather than the things they learned through the "paper and pencil" approach.

NCTM (1989) also emphasizes that the popular thread throughout the K–12 curriculum is to develop the best use of real-world problem situations to help students understand and appreciate more the use of mathematics in their everyday lives. Also, Lobato (1993) stated that in order to help students appreciate and discover the usefulness of mathematics and understand how topics are applied, it is better if mathematics can be connected to real-world situations.

Professional Standards for Teaching Mathematics also recommend that teachers engage students in a series of tasks that involve connections between concepts in mathematics and procedures. "Teachers needed to connect mathematics in real-world situations because students needed a deep understanding of the real world and its mathematical domains," (Shealy, 1993). The statement is justified because students applied their discoveries to solve mathematical problems in a practical manner, taking into account all possibilities. So, the students were too programmed by the routine-type word problem, which is why they did not extend their way of thinking in solving it.

5. Conclusion

This research study aims to provide solutions for increasing eighth grade students' appreciation for mathematics. This study conducted an intervention in two classes where the same lesson was taught. One class was taught using the traditional method, while the other was taught by applying real-life applications or scenarios. It was noted that before the intervention, class 1 had the level of appreciation of "appreciated," while class 2 also had a level of appreciation of "appreciated." The mean result of the pre-survey for class 1 was 3.40, while class 2 had a mean result of 3.12. It indicates that though they differ in the mean result of their pre-survey, they have the same level of appreciation for mathematics.

After the intervention, class 1 had a level of appreciation of "appreciated," while class 2 had a level of appreciation of "highly appreciated." The mean result of the post-survey for class 1 was 3.22, while class 2 had a mean of 3.51. It signifies that the mean result of the pre-survey decreased in the post-survey of class 1, but the level of appreciation for mathematics in class 1 remained the same before and after implementing the intervention. It also signifies that the mean result of the pre-survey of class 2 improved in their post-survey, as well as the level of appreciation for mathematics. It indicates that after the intervention, class 2 had a greater improvement in the level of appreciation for mathematics compared to class 1. Although some students still see the importance of mathematics in real-world situations, the researchers recommend the consistent use of real-world applications in teaching mathematics to students in order for them to improve their level of appreciation for mathematics and to see the importance of it in their daily lives.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare no funding of interest.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

[1]   Anota, R.M. (1981). Affect-oriented mathematics lessons: Their effects on students' attitudes toward and achievement in mathematics (Unpublished master's thesis). University of the Philippines, Diliman Quezon City.

[2]   Bevil, A. P. (2003). The effect of real-world mathematical applications on gifted and nongifted students' achievement and classroom learning environment. University of Houston.

[3]   Cox, J. (n.d.). What is appreciation? Investopedia. http://www.investopedia.com/terms/a/appreciation.asp

[4]   Cox, J. (2014). How to Motivate Students to Love Reading. Teach Hub. https://www.teachhub.com/teaching-strategies/2014/07/how-to-motivate-students-to-love-reading/

[5] Fagley, N. S. (2018). Appreciation (including gratitude) and affective well-being: Appreciation predicts positive and negative affect above the big five personality factors and demographics. Sage Open, 8(4), 2158244018818621.

[6] Guanzon, P.M. (2000). Effects of values integration in teaching mathematics on achievement, values, and attitude of freshmen in Novaliches high school (Unpublished doctoral dissertation). Technological University of the Philippines.

[7] Lobato, J. E. (1993). Making connections with estimation. Arithmetic Teacher, 89, 347-351.

[8] Miller, K. (2009). Real world math: Views from the researcher, teacher and student.

[9] National Council of Teachers of Mathematics (NCTM). (1989). Curriculum and evaluation standards for school mathematics. Reston, VA: Author.

[10] National Council of Teachers of Mathematics (NCTM). (1991). Professional standards for teaching mathematics. Reston, VA: Author.

[11] National Council of Teachers of Mathematics (NCTM). (2000). Principles and standards for School Mathematics. Reston, VA: Author.

[12] Roper, T. (1994). Integrating mathematics into the wider curriculum. In A. Orton & G. Wain (Eds.), Issues in teaching mathematics (pp. 174-191). London: Cassell.

[13] Shealy, B. E. (1993, August). Reflective modeling in teacher education. Paper presented at the International Conference on Teaching Mathematical Modeling and Applications, Newark, DE.

[14] Willoughby, S. S. (1990). Mathematics for a changing world. Alexandria, VA: Association for Supervision and Curriculum Development.