International Journal of Humanities and Social Sciences
p-ISSN: 1694-2620
e-ISSN: 1694-2639
Vol. 10, No. 4 (2018), pp. 56-62, ©IJHSS

Visual Modelling Approach (VMA) in Learning Fractions

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Abstract
Learners have varied learning styles and intelligence. As observed in different classes, students can easily understand the lesson if visual aid is presented. As, such the researchers explore more on the power of the human eye, what it can, and cannot do by integrating visual modeling approach (VMA) in teaching. Specifically the core purpose of this study is to find out the effects of visual modeling approach (VMA) in solving fraction. Using experimental research design Grade-6 pupils of Tabayla Elementary School was purposively selected as the respondents of the experiment. Data were gathered through pre-test and posttest administered to the respondents. Analysis of data gathered data revealed that the mean score of the pre-test and posttest of both groups has increased in favor to the experimental group showing higher mean gain compared to the control group. Significant difference between the pre-test and posttest scores of each group was noted despite of its no significant difference between the mean-gain scores of the two groups. Thus, it can be concluded that VMA enhanced the respondents abilities in learning fractions more effectively than the traditional method of teaching. It is hereby endorsed, that VMA may be integrated to the traditional approach to yield positive change in the performance of the pupils on solving fractions. **"**It is better to see it once, than to hear it a thousand times".

Keywords: visual modeling approach, visual learning, experimental design, Tabango, Leyte, Philippines.

Introduction

Teachers are responsible for planning instructions, delivery of instructions, and assess learning outcomes of the students. It is believed that the best instructional materials are the teacher himself or herself. However, teaching can be enhanced further by integrating different teaching techniques and instructional materials that are suited to the learning ability of the students. Learning style of each students differ from each other. Research findings of Chatterjee & Ramish (2015) pointed out that commonality of students learning styles is very rare. In this context,

teachers should be resourceful and creative in designing different instructional materials and teaching techniques. Teachers and researchers always discuss factors that affect students' academic performance, and yet there is still no solid conclusion to resolve the issue. One thing common idea among educators and researchers is that proper guidance of parents and teachers could promote students' performance in school. The teaching methods applied in teaching should be provoking students interest, effective, promote creative thinking, and practical skills of the students as a learners (Hackenberg, Creager, Eker, & Lee (2016).

Each learner needs different teaching materials particularly teaching mathematics, which considered as a difficult subject. It is the role of the teacher to expand students' opportunities to learn. The same way in teaching fractions in mathematic subjects, considering that not all learners can learn the same thing at the same time teachers should provide and meet their needs by giving appropriate teaching methods to them (Stewart, V. 2005). According to Xiaofen Zhang, M. A., Clements, K., and Ellerton, N. F. (2015), students can easily understand the concepts of fractions if they were engage with different models of fraction during the teaching-learning process**.** Teaching fractions using contextualization is very effective in such a way that teaching and learning fractions is already a part of daily lives. Moreover, fractions play an important role in mathematics, since they are involved in probabilistic, proportional and algebraic reasoning. However, many learners viewed fractions as one of the most complex mathematical concepts. However, fractions are taught through manipulative approach, students could learn better and appreciate the value of fractions in life (Duzenli-Gokalp, N. & Sharma, M. D. (2010).

NAEP (2005) reported that many researchers and teachers typically described fractions as difficult and challenging because of its complexity. Many scholars also thought that learning fractions is difficult to teacher particularly among young children. However, Hackenberg, Creager, Eker, & Lee (2016) believed that when the teachers teach fractions in differentiated ways learners could easily understand. In addition, Charalambous & Pitta-Pantazi (2007) and Duzenli-Gokalp, N. & Sharma, M. D. (2010) pointed out that to teach fractions effectively, drawing models and hands-on activities is necessary to provide in depth understanding of the learners on the concepts of fractions. The teachers are responsible for establishing high, challenging performance in order to encourage students to engage deeply in what they are learning. The teacher will act as guide by the side of the students by helping the students to linked ideas that promote successful learning environment (Empson, Susan B. and Levi, Linda, 2011)

Castro, Isabel, Coronel, Carmelita, & Gallardo, Luz (2011), reiterating that many teachers failed to teach fractions effectively because they commonly teach fractions through purely computations without proper background and application to the real-world scenario. They just follow what the examples in the textbooks and then failed to apply the concepts in the everyday life experiences of the learners. To teach effectively, teachers must guarantee that learners understand the meanings of fractions before performing operations to provide meaningful value of fractions in life. Research findings of Bednarz, N., & Proulx, J. (2014) and (Barmby, P., Bolden, D., Raine, S., & Thompson, L., 2013) proved that vvisual model could help facilitate the teaching and learning process more effective

Teachers and researchers have struggled to find ways to make fractions more meaningful, relevant and understandable to students. Valdez (2017) Pentagon Model of Instructional Materials emphasized the inclusion of the five components such us, teacher's pedagogical content knowledge (PCK), students learning style and learning types, educational and learning

theories, the school/classroom environment, and the student's emotional in designing any instructional materials to be used in the teaching and learning process.
With the aim of improving mathematics performance particularly in the field of fractions, the researcher was motivated to explore the effect of manipulative or visual model approach as teaching techniques in teaching fractions. They were also ignited to determine whether using a visual model approach (VMA) in solving fractional problems could be more enthusiastic and enjoyable in teaching and in learning mathematics.

Statement of the problem

Learners usually find difficulties in learning fractions and tend to ignore its importance. When they are ask about fractions, they usually define fraction as one of the difficult topic in Mathematic subject. With these observations, the researchers as future mathematics teachers were vigorously motivated to explore a teaching technique that could enhance students' interest to learn fractions as effectively and enjoyably. The teaching model designed by the researchers was the integration of Visual Modelling Approach (VMA) in teaching mathematical fractions. The VMA model is assumed to help students overcome their fears when it talks about fraction. VMA model replaced the traditional approach in teaching mathematics such us using workbooks, drills, worksheets and memorization. VMA model offers a learning environment for children to think as they manipulate objects. Amalgamation of thinking and manipulations provides students to develop their thinking skills and abilities that is not quite easy to forget. With assumption that VMA model is a promising technique that effectively, transmit knowledge to the learners specifically teaching mathematical fractions, this study aimed to determine the extent of its effectiveness in improving students' academic performance particularly in mathematics where this model is applied.

Significance of the Study

The said study has a huge contribution to the educators, the school administrator, the parents and to the youth all over the country and internationally. For some who find difficulty in solving fraction but they want to make fraction interested through the use of visual model. This study is useful for the teachers and school administrators for classroom activity and it is also an alternative for the teacher in classroom scenario.

Methods

Research Design

Logically dealing the study, it utilized experimental research design to measure the effectiveness of VMA model in teaching mathematical fractions. The researchers establish and study the different effects of the treatment used in the control and experimental group. Academic performance of the students was measured using pre- test-post-test and compared the effect of the treatment given to each group.

Participants of the Study

Participants of the study were the Grade 6 students of Tabayla Elementary School, Tabayla, Tabango, Leyte. Sampling method were utilized in selecting the participants. Pupils were ranked and numbered according to their previous grades in math and assigned to the control (traditional) and experimental group (VMA treated) using draws lots respectively. All odd-numbered pupils consisted on one group and all the even-numbered pupils consisted also the other group.

Research Instruments

Instruments used in gathering the data includes standardized test in fractions, classroom observations and documentations. The standardized pre-test was done in the same time to the two groups. After the pre-test, the manipulative or visual model method was introduced to the experimental group, while the control group was exposed to the traditional way of teaching fractions. The same test was conducted to the two groups through posttest at the end of the treatment to measure if both groups learned from the different teaching method.

Collecting of Data

Prior to collect data, the researchers observed entry protocol. Letter was given to authorities asking for approval of the conduct of the study at Tabayla Elementary School. After obtaining permissions from authority, the researchers preliminary entry to the research locale was done and the grade 6 students were oriented as well as the subject teacher regarding the objective of the study. To observe intellectual property right, all data gathered were subjected to utmost confidentiality.

Treatment of Data

The gathered data were analyzed statistically using statistical software. To measure the degree of difference and effects of the VMA t-test for independent and dependent samples were utilized. It uses the mean in measuring the performance of two groups under the study. The t-test of independent sample was used to find out the significant difference of the respondents' performance and t-test for dependent samples was used for the significant difference from the pre-test and post-test.

Statistical Findings

Findings are logically presented in accordance to the following research questions:

1. What is the pre-test, posttest scores and mean gain scores of the participants?

Table 1: Pre-Test, Post-Test and Mean Gain Scores of the Experimental and the Traditional Groups

Group	Number of Cases	Pretest Mean Score	Posttest Mean Score	Performance (Mean Gain Score)
Control Group	19	3.7	8.0	4.3
Experimental Group	19	3.68	9.95	6.3

Table 1 shows the scores of the two groups consisting of 19 cases each. Each method shows a remarkable increase from the pre-test to the post-test scores, which signifies improvement. The pre-test mean score of each group is almost the same; it differed only by two-hundredths. The post-test mean score of the participants exposed to two different methods of instruction varied for a couple of margin.

The difference between the pre-test and post-test mean scores of the control group is 4.3, while the experimental group obtained much higher than the control group reaching to 6.3. A test for significance of this difference obtained a computed t-value of six (6), which is greater than the critical t-value (at level of significance, $\alpha = 0.05$) of 2.14. This means that the research

hypothesis which states that the post-test mean scores of the traditional group are higher than their pre-test mean scores is accepted. This means that the instructional materials used by the control group are effective in as much as the treatment used in the experimental group.

Similarly, from Table 1, the difference between the pre-test and post-test mean scores of the experimental group is 6.3 and the computed t-value for this difference is 7.5. Again, this is greater than the critical t-value (at α =0.05) of 2.14. Hence, the null hypothesis stated that the post-test mean scores of the experimental group are significantly higher than their pre-test mean scores is accepted.

With respect to the performance/ mean gain of the two groups, there is a difference of 2, in favor of the experimental group. The difference of the two groups does mean that the experimental group had achieved more than the control group.

2. What is the relationship of the experimental and control group pre-test scores?

Table 2: t- test Score of the Pretest Scores of the Experimental and the Traditional Groups

Pre-Test Mean Scores		Critical t-value	Computed t-value	Interpretation at α =0.05
Experimental Group	Control Group			
3.68	3.7	1.688	-0.004	Not Significant

Table 2 highlights the homogeneity of the two groups in terms of their performance in the pre-test. The interpretation of the means of the two group is not significant, meaning each group which were the participant of the study were identical in terms of their performance in fractions.

3. Is there a significant difference between the mean gain scores of the experimental and control group?

Table 3: t-Test Score of the Mean Gain Scores of the Experimental and Experimental Groups

Group	Number of Cases	Mean Gain Scores	Critical t-value	Computed t-value	Interpretation at α =0.05
Traditional	19	4.3	2.03	0.034	Not Significant
Experimental	19	6.3			

Table 3 shows the differences of the mean gain scores of the two groups. The experimental group has a couple of points higher than the traditional group. This may mean that manipulative or visual model instruction was quite effective than the traditional instruction. But there is a need to verify this by finding if there was a significant difference in the mean gain scores of the two groups. A t-test for independent samples at a level of significance, α =0.05, was done and obtained a t-value of 0.034. This is lower than the critical t-value of 2.03, so, the null hypothesis is accepted and thus, the mean gain score of the traditional group is not significantly higher than that of the experimental group. Hence, both traditional and experimental methods of instruction are equally effective.

Discussion

Based on the statistical findings, researchers found out that the pretest average scores of the two groups were 3.7 and 3.68, respectively. The posttest average scores of the two groups were 8.0 and 9.95, respectively. Analysis in the average score of the pretest and posttest of the two groups, it found out that each group improved their scores during posttest. However, the mean gain scores of the two groups were 4.3 and 6.3 respectively shows no significant difference between the pretest and posttest scores of the two groups. The two groups increased in their performances and this was because of the methods of instructions used in the two groups. Using the t-test for independent samples at 0.05 levels of significance, the computed t-value was 0.034, which was less than the critical t-value of 2.03. This entails that there is no significant difference between the gained scores of the two groups. From the above findings, the researchers deduced that the increase in the mean scores of both the traditional and the experimental groups is due to the respective methods used by each group and thus, it can be concluded that both the traditional and the visual model instruction are effective in solving fractions. Davis, E. A., Petish, D., & Smithey, J. (2007) stressed out that teachers should always face teaching as a challenge and should response to that challenge to ensure that the delivery of instructions is efficient and effective as possible.

However, despite of the no significant difference between the mean gains scores of the control group and experimental group a difference of 2 points mean gain in favor of the experimental group is not worth neglecting. The two (2) points can still signify that the VMA is effective tools in teaching fractions over the traditional method. The limited change of scores and mean gain between groups particularly in the experimental group might attributed by the very limited number of participants in the study and maybe by some external factors beyond control by the researchers such us leakage of information from one group to the other considering they were taught in different time. Furthermore, the limited effect of VMA model in teaching maybe due to the limited pedagogical content knowledge of the teachers considering that not all teachers in mathematics are a specialized in mathematics. Mismatched of teaching assignment were commonly noticed particularly in elementary education. Valdez, Lomoljo, Dumrang, and Didatar (2015) research findings revealed that experimental group who exposed to hands-on and manipulative teaching methods performed better than the control group exposed to traditional teaching methods. Their results also showed that the misconceptions of the learners were corrected when they were exposed to hand-on activities and their learning process was very interactive.

Conclusion and Recommendation

Based on the findings of this study, the researchers concluded that despite of the no significant difference of the students' performance to both groups, VMA model can be still more effective than the traditional method of teaching. The no significant difference may be due to some other factors such as the preparedness of the teachers and the learners, the knowledge of the teachers in using VMA model and the learning environment. Thus, the researchers recommend that further study using VMA models is encourage particularly by increasing the number of participants and by selecting math teachers that are math specialized. According to Valdez (2017) teachers must be responsive and creative enough in designing different pedagogy in teaching that is explorative and interactive to the learners. As, such recommendation has been made that teachers particularly those who are not math specialized teaching math subjects must undergo further study and other form of professional growth to enhance their pedagogy and content knowledge in math.

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