



STUDENTS' PERFORMANCE IN FACTORING QUADRATIC TRINOMIALS THROUGH THE X-BOX METHOD

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Article history:	Abstract:
Received: 10 th April 2022 Accepted: 10 th May 2022 Published: 22 nd June 2022	This study aims to increase the performance of the grade 8 learners in factoring quadratic trinomials using the X-Box method. The participants were the 90 grade 8 learners of Claver National High School categorized into two groups: the control and experimental groups. The study's control group was provided with the school's existing self-learning module, while the researchers-made modules that discussed factoring quadratic trinomials through the X-Box method were distributed to the experimental group. Results showed an increase in the students' performance in the control and experimental groups after providing the learners with different modules in factoring quadratic trinomial. However, the experimental group showed a higher increase in performance than the control group. Thus, learners with researchers-made modules featuring the X-Box method performed better than learners with modules used by the schools for the distance learning modality.

Keywords: X-Box Method, Factoring Quadratic Trinomial, Self-Learning Module, Students Performance.

1. INTRODUCTION

The Mathematics Education for secondary schools in the Philippines, as stipulated in the conceptual framework of the K to 12 Basic Education Curriculum, aims to develop individual skills in knowing and understanding, estimating, computing and solving, visualizing and modelling, representing and communicating, conjecturing, reasoning, proving and decision-making, applying and connecting mathematical concepts and problems. These skills are essential in facing challenges of everyday life brought about by the advancement of Science and Technology. However, some learners have no interest in learning and have poor performance in Mathematics. Some students got easily distracted and could not remain attentive throughout the Math class. Their attention wandered, and they stopped showing or paying any interest. That is why teachers find ways to capture the students' interest during class discussions.

Factoring quadratic trinomial, which requires rewriting $ax^2 + bx + c$ into the form $(mx + n)(px + q)$, is one of the most difficult algebraic challenges for students in the high school Mathematics curriculum. Kieran (2006) pointed out that based on the research investigating "visual salience" in the learning of Algebra, students perform significantly better in recognition tasks involving salient visual rules. Therefore, students failed to develop reasoning in non-visual salient algebraic expression and caused poor performance in quadratic factoring.

Allaire and Bradley (2001) had already demonstrated the possibility of performing quadratic factoring using the x-box method. Furthermore, it is possible to design group activities involving the x-box method to maximize the benefit of collaborative learning. The x-box method can be acted as a visual mediator in quadratic factoring, which means that students in the group can quickly identify the objects (both coefficients and factors) and coordinate their communication by the x-box method.

The teaching of Mathematics, viewed as unappealing to most learners, can be challenged in mixed-ability classrooms and struggle with their interests and experiences (Mavrotheris, 2014). In the first quarter examination, 268 out of 526 learners, or 50.95 % of Grade 8 learners in Claver National High School, did not understand the problem since they got items on factoring quadratic trinomials wrong. Half of the grade 8 curriculum population got low mastery in factoring quadratic trinomials as the competency in the number of items based on the item analysis report. It was found that learners' lack of attention due to a large number of learners in each classroom, learners' home environment, teachers' time management and the school's insufficient learning materials for Mathematics affected the learners' performances. Those learners were promoted to secondary school or the next level without mastering basic knowledge and needed skills; thus, they have difficulties learning new mathematics concepts.

Further, the Mathematics teachers of Claver National High School were always encouraged by their school head to create an intervention activity or any fun-learning activity that would improve learners' mathematical skills and

confidence. Thus, the current study was conducted to increase the students' performance in factoring quadratic trinomials through the x–box method.

2. MATERIALS AND METHODS

2.1 Research Design

This study used a quasi-experimental design. Quasi-experimental methods are research designs that aim to identify the impact of a particular intervention program by comparing treated units (experimental group) to control units (controlled group) (White, H., & Sabarwal, S., 2014).

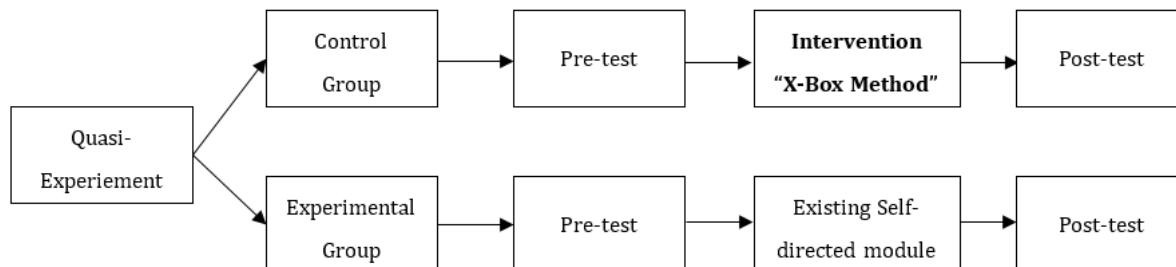


Figure 1. A diagram of a two-group pretest-posttest design

2.2 Sampling Design

The study participants involved ninety (90) Grade 8 students from Claver National High School who did not get the correct answer on item number four in the first quarter examinations. They were sorted into two equal groups using a trough sampling technique: Group A as the control group and Group B as the experimental group.

2.3 The Procedure of the study

This study has three stages. The first stage involved gathering and grouping participants and administering a pre-test. Second, they must carry out the intervention activity in their classes for five days. Group A received a school-provided self-learning module on factoring quadratic trinomials, while group B received a researcher-made self-learning module on factoring quadratic trinomials using the X-Box method with worksheets and practice activities. Finally, a post-test and interview were conducted.

2.4 Data Analysis

The study utilized the mean and standard deviation to identify the participants' performances in factoring quadratic trinomials. Moreover, a t-test was used to identify the significant difference between the pre-test and post-test results of the participants in factoring quadratic trinomials, respectively.

3. RESULTS AND ANALYSIS

In this section, all the data collected through pre-test and post-test were analyzed and presented. These are the results, analysis and interpretation based on the problems of the study.

Table 1. Distribution of Achievement Scores

Group	Population	PRETEST			POST-TEST		
		Mean	SD	Qualitative Description	Mean	SD	Qualitative Description
Control Group	45	9.04	1.88	Average	11.40	1.59	Above Average
Experimental Group	45	8.87	2.40	Average	12.53	1.80	Above Average
Legend:		0.00 – 5:33	Below Average				
		5.34 – 10.67	Average				
		10.68 – 15.00	Above Average				

Table 1 shows the performance level of the learners in factoring quadratic trinomials before and after the intervention. The mean and standard deviation of the pre-test and post-test described the performance level. As indicated, the learners' mean scores in the control group before the intervention was 9.04 with a standard deviation of 1.88. However, the experimental group had 8.87 with a standard deviation of 2.40. Tabular values exposed that the control and experimental groups had a slight difference (mean difference of 0.17) in pre-test scores with greater variability in the experimental group.

Further, Table 1 revealed the increase in the learners' post-test mean scores when exposed to two different modules. After the intervention, mean scores in the control and experimental groups were 11.40 with a standard deviation of 1.587 and 12.53 with a standard deviation of 1.804, respectively. Scores obtained among the two groups showed above-average performance, with the experimental group exhibiting the highest mean score and standard deviation. The two groups increased from average to above average.

Based on the values in Table 1, the experimental group demonstrated greater improvement than the control group because the average gain score of the experimental group, which was 3.66 (12.53 – 8.87), is greater than the control group, which was 2.36 (11.40 – 9.04). Thus, the X-Box method improved the performance level of the students in factoring quadratic trinomial.

Table 2. Paired t-test on the achievement of test scores between control and experimental group

		Paired Differences						t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference					
					Lower	Upper				
Experiment	Pretest-Posttest	-3.67	1.40	.208	-4.09	-3.25	-17.59	44	.000	
Control	Pretest-Posttest	-2.36	1.87	.279	-2.92	-1.79	-8.44	44	.000	

It can be gleaned in Table 2 that the performances of the learners from control and experimental groups during and after the intervention are statistically significant at $p \leq 0.05$ by the paired t-test. It can be concluded that the learners had significantly higher scores when learners were provided with modules used by the school for distance learning modality and researcher-made modules which include the X-box method on the lesson factoring quadratic trinomials.

Although they are both significant, it was clear from Table 1 that the group with the greater improvement is the experimental group based on the mean difference in the post-test than the control group. Hence, providing any modules in this new normal education set-up did not stop learners from learning new concepts to improve their performances, especially in factoring quadratic trinomials.

4. DISCUSSIONS AND CONCLUSION

The pre-test scores of learners in different groups were average only due to some factors. One of the factors was their retention skill in the basic concept of factoring monomials or binomials and special products. The control and experimental groups had a small mean difference in their pre-test and post-test scores. Thus, the modules distributed to all grade 8 learners used in the control group and the researcher-made modules that discussed factoring quadratic trinomials through the X-Box method intended for the experimental group had the same effect on their performances. However, there was an increase in mean scores in the control and experimental group after providing the learners with different modules in factoring quadratic trinomials. So, the modules used in different groups have improved learners' performances in factoring quadratic trinomials. Also, the increase in mean scores in the experimental group was higher than the increase in mean scores in the control group. Thus, learners with a researcher-made module featuring the X-Box method performed better than learners with modules used by the school for the distance learning modality.

Furthermore, there is a significant difference between the participants' performances in the control and experimental groups before and after the intervention. This concludes that the X-Box method is effective in factoring quadratic trinomials. It helps to capture the interest of learners in learning factoring techniques.

According to this study, using the "X-box method" in teaching factoring quadratic trinomials is highly recommended for teachers. Future researchers could also use video or online discussions to investigate the effectiveness of the X-box method in teaching factoring quadratic trinomials.

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