

Development and Implementation of Lessons Integrating Mathematical Tricks

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Abstract— This study aimed to develop and implement three lesson plans integrating mathematical tricks in teaching Algebraic Expressions with One Variable. The lesson plans were developed first by selecting the topics to be used, identifying standards, formulating learning objectives and making instructional procedures. Then it was followed by the experts' validations and necessary revisions. A variety of mathematical tricks are integrated in the lesson plans, and it is found that it helped the pupils to understand more about the lesson. The overall performance of the respondents about the lesson integrating mathematical tricks revealed that there is a highly significant difference between performances of Grade 6 pupils in the pre and post achievement tests. On the other hand, there is no sufficient evidence to show that there is a significant difference between motivational level of Grade 6 pupils before and after the integration of the mathematical tricks.

Keywords— Algebraic Expressions, Mathematical Tricks.

I. INTRODUCTION

Mathematics is the language we use to describe the world around us because it is one of the bases of all sciences. Math is all about manipulating numbers and finding patterns. Adding, subtracting, multiplying and dividing are the building blocks of basic maths (McOwan, 2015). In school, most of the math we learn was done with pen and paper which makes the learning insufficient. Yet, in many situations, it makes more sense to do math in a tricky way. The best of all, many students have an inner motivation to understand how mathematical tricks work, and that curiosity and excitement can lead them to embrace and apply both new and familiar concepts and skills, including algebra. Moreover, there is a joy and lifelong value in being able to do mathematics in your head (Benjamin, 2011). However, knowing that mathematical secret isn't the same as being able to perform the tricks well. But in order to do that, you need to use your performance skills to create a sense of wonder (McOwan, 2015).

The ability to do rapid mental calculation can help students achieved higher scores on standardized tests and can keep the mind sharp as we age (Benjamin, 2011). According to Wendy Petti (2000), Mathematical Tricks is an activity where it can arouse the students' interest. They are having fun to perform and help students learn and practice various math skills. For teachers, tricks are an excellent way to encourage your students to get more enjoyment out of math. Math tricks can liven up any math class and create a sense of wonder and curiosity about math. Math magic creates new context for algebraic reasoning as students go beyond "What's the answer?" to explore "What's the trick?"

Mathematical tricks are a creative way to help students learn how to manipulate numbers. Many of your students enjoy magic tricks and learning a few tricks with numbers can be both educational and entertaining. Teachers can use mathematical magic tricks in the classroom to make math class more exciting, and students can use them to impress their friends and family. Magic tricks with numbers can make

learning fun and interesting, while still helping students learn basic math skills. (Reeh, 2013)

In this study, the researchers aimed to find out whether the utilization and integration of the mathematical tricks by developing lesson plans will affect the motivation of the students in learning math. Hopefully, the results of the study will enable the learners and the teachers to engage in a more exciting and interesting way of learning and teaching as well as applying math.

II. METHODOLOGY

The quantitative research data was obtained through the students' achievement test and motivation scores. The qualitative research data was obtained from the comments and suggestions of the evaluators, the observation checklists, and journals of the pupils. The subjects of the study were the Grade 6 pupils of Pantao Ragat Central School (PRCS), Pantao Ragat District, Division of Lanao del Norte. The school is located at the center of the Municipality.

Data Gathering Procedure

Some of the mathematical tricks integrated in the lessons were adapted and some were constructed by the researchers to suit the topics. The objectives were emanated from K-12 learning competencies. Instructional procedures were composed of five parts namely: Preparatory activities; Developmental activities; Application; Assessment; and Assignment. Subsequently, the researchers constructed an achievement test. The test covered the lesson about the introduction to algebra. The researchers adapted and modified the lesson plan rubric, observation checklist, and motivational questionnaire except for perception questionnaire which they developed. After the lesson plan revisions, implementation on the Grade 6 pupils began. After the implementation of the lessons integrating mathematical tricks, the researchers administered posttest to assess if pupils have learned and understood the lessons more with the integration of mathematical tricks. Also, the motivational questionnaire was administered to see if there is change to students' motivation

scores. The pupils were also asked for their perceptions of it through journal. Figure 1 shows the summarized steps involved in the development and implementation on lessons integrating Mathematical Tricks.

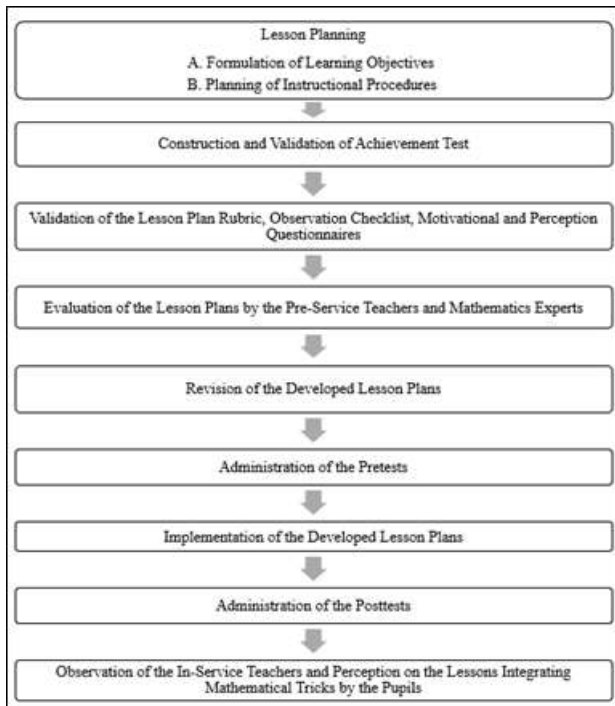


Fig. 1. Flowchart of the Development and Implementation of Lessons Integrating Mathematical Tricks

III. RESULTS AND DISCUSSIONS

Mathematical Tricks

Table 1 presents a sample of mathematical tricks used in the implementation of the lessons. Magic 2 and Mind Reader were the mathematical tricks included in the implementation in Lesson Plan 1, where the lesson is the introduction of the algebra and what it's all about.

TABLE 1. Mathematical Tricks Utilized in Teaching Algebraic Expressions with One Variable

MATHEMATICAL TRICKS	
Lesson Plan 1	
Magic 2	
1. Let the pupils think of a <u>number</u>	x
2. Then add 2 to the <u>number</u>	$x + 2$
3. Add 4	$(x + 2) + 4 = x + 6$
4. Subtract the number you thought of	$(x + 6) - x = 6$
5. Subtract 4	$6 - 4 = 2$
*You must be left with 2	2
Mind Reader	
1. Think of any number from 1 - 9	x
2. Multiply it by 2	$x(2)$
3. Add 2	$2x + 2$
4. Add 4	$(2x + 2) + 4 = 2x + 6$
5. Subtract 6	$(2x + 6) - 6 = 2x$
6. Tell me the number you've got	$2x$
*Trick: Divide the number by 2	$2x / 2 = x$

For a grade-6 pupil, dealing with the basic operations at a time considering that there is variable included is no joke,

especially algebra is new and very unfamiliar to them. Hence, the researchers included a lesson (shown in Table 2) which incorporates the four basic operations as a challenge part.

TABLE 2. Mathematical Tricks Utilized in Teaching Algebraic Expressions with One Variable

Lesson Plan 3	
Favor - 8*	
1. Choose any <u>number</u>	x
2. Add 1	$x + 1$
3. Double it	$2(x + 1) = 2x + 2$
4. Increase it by 6	$(2x + 2) + 6 = 2x + 8$
5. Divide it by 2	$(2x + 8) / 2 = x + 4$
6. Add 4	$(x + 4) + 4 = x + 8$
7. Take away the number you chose	$(x + 8) - x = 8$
*You should be left with 8	8
Number Guessing	
1. Think of a number	x
2. Multiply it by 2	$2(x) = 2x$
3. Add the number you thought of	$(2x) + x = 3x$
4. Divide it by 2	$3x / 2$
5. Subtract the number you thought of	$(3x / 2) - x = 1/2 x$
*Trick: Multiply the result by 2	$(1/2 x)(2) = x$

Lesson Plan Evaluation

For the evaluation of the lesson plans by the mathematics experts and pre-service teachers, the overall remarks are rated as "exemplary" in all terms. Some feedback/ comments of the mathematics experts are the following:

"Added guide questions and include questions that will develop higher order thinking skills of the students."

"Interesting to students. Let the students create their own math tricks."

"Good presentation of the problem. Students are guided properly."

Respondents' Performance in the Achievement Test

Table 3 shows the result of the pretest and posttest of grade 6 respondents in the achievement test. The pretest mean score is 6.68 and the posttest mean score is 9.84. This implies that there is an improvement in pupils' performances from pretest to posttest. This means that there is a highly significant difference between performances of grade 6 pupils in the pre and post achievement test. Furthermore, pupils gained conceptual understanding on the algebraic expressions and equations. This can also be supported by the pupils' journals.

TABLE 3. Comparison of Pretest and Posttest Performances of Grade 6 Pupils in the Achievement Test

Grade 6 Pupils	Pretest	Posttest
Mean	6.68	9.84
Mean Difference	3.16	
Mean Standard Deviation	3.39	
t-test	5.20	
p-value	0.0000134*	

Respondents' Motivation to Learn Mathematics

The motivation towards mathematics scores of the respondents before and after the integration of mathematical tricks on lessons is presented in Table 4. Before the implementation, 9% of the pupils were undecided while the rest agreed that their motivation to learn mathematics is positive one. After the implementation of lessons, majority of the pupils were positively motivated to learn mathematics

integrating mathematical tricks on lessons. However, it can be said that no changes in pupils' motivation towards mathematics was noted. This means that there is no sufficient evidence to show that there is significant difference between the motivational level of grade 6 pupils before and after integration of mathematical tricks on lessons.

TABLE 4. Comparison of Motivational Scores of Grade 6 Pupils Before and After Implementation of Lessons

Grade 6 Pupils	Before	After
Mean	3.75	3.79
Mean Difference	0.04	
Mean Standard Deviation	0.31	
t-test	- 0.86	
p-value	0.3971*	

Respondents' Observable Behaviors during the Implementation of Lessons Integrating Mathematical Tricks

The behaviors of the pupils were being observed by in-service teachers using the observation checklist (Fig. 2). The teachers had observed that the pupils were motivated to listen attentively to the performances and that the mathematical tricks had captured their attention.

OBSERVATION CHECKLIST of Observed Student Behaviors in the Mathematics Classroom (Lahoylahoy, 2003)			
Class Observed: _____		Date: _____	
Topic: _____			
Observer: _____			
Instructions: Check the appropriate column provided for observed or not observable students' behaviors. Write your comments whenever possible.			
Students Behaviors	Observed	No Opportunity to Observed	Comments
A. Reaction/ Attitude towards the lesson			
1. Is motivated to listen attentively to the teacher.			
2. Ask the teacher to clarify/ correct contradictions/ inconsistencies.			
3. Mathematical Tricks and have captured his attention.			
4. Participate in the discussion enthusiastically.			
5. Participate actively in class activities.			
6. Shows confidence in the activity.			
B. Other observable behavior during the class (Kindly explain briefly)			

Fig. 2. Observation Checklist of Observed Student Behaviors in the Mathematics Classroom (Lahoylahoy, 2003)

The comments of the in-service teachers regarding the student's behaviors during the implementation of lessons are the following:

- "They were motivated through the activities given." I1
- "They ask clarification in the word problems given." I1
- "The pupils are amazed with the tricks presented." I1
- "Well participated enthusiastically." I2
- "Yes, the activities presented were new to the learners." I1
- "The teacher let the pupil explain his/ her answer in the activity." I1
- "Some of the pupils were amazed for the tricks given by the teacher. And they were curious how they achieved for the same answers." I2

Perception of the Respondents towards the Integration of Mathematical Tricks in a Mathematics Class

To assess the perception of the respondents towards the integration of mathematical tricks on lessons in teaching mathematics class, the researchers required the pupils to do journal writing on "how well they receive the new teaching of mathematics" and "how well they like the mathematical tricks presented to them". The following were asked in the journal: (1) Describe your experience about the lesson; and (2) Do you like the mathematical tricks presented? Explain. Responses of the pupils for each question were not limited to the topics discussed. Their responses to the questions provided are grouped as follows:

1. The respondents appreciate the teacher's capability.
 - "Noong dumating kayo mas natuto na ako sa math, akala ko hindi na ako matututo sa math. Salamat sa inyong dalawa (I thought I won't be able to learn math anymore, but I learn something from it ever since you teach us here. Thanks for the both of you)." F3
 - "Noong una ayaw ko nang math tricks kasi scramble ang brain ko kaya parang ayaw ko ... Dumating kayo, itinuro nyo yan, salamat kasi naintindihan ko na. Salamat po (At first, I don't like mathematical tricks because it blows my mind. But after teaching us, I think I understand. Thank you)." F20
2. The respondents were amazed by the nature of mathematical tricks.
 - "... yung math tricks ay ang galing dahil parang magic (Mathematical tricks were amazing, they were like magic)." M2
 - "Ang saya kapag nagtuturo siya ng math tricks, ang enjoy at nabibigla kami kapag malalaman niya ang sagot naming (We enjoyed the mathematical tricks and got surprised when she knew the answer)." F1
3. The respondents enjoyed solving mathematical tricks.
 - "Nakita ko kung papaano pala at masaya ako dahil marunong na ako sa math at natuto na akong mag-answer!!! (I see how it works and I'm glad because now I know how to answer math!)." F6
 - "Oo nagustuhan ko . . . gusto ko yung imagination na ipipikit yong mga mata, para sa akin ito ay challenge at nag-eejoy talaga ko sa bawat challenge ng math trick (I like the imagination part of the mathematical tricks. For me, it is a challenge and I enjoyed every bit of it)." F18
4. The respondents appreciate the application of mathematical tricks in real-life situation.
 - " At dahil sa itinuro ninyo, mas nagustuhan ko ang math subject at mas napalawak ang aking kaalaman sa math. Thank you very very much! (I think I like math subject better now because of what you taught me, you widened my learning in mathematics. Thank you very much!)." F19
 - "Ang naging experience ko sa lessons ay para sa akin makakatulong ito para sa aking isip (I think that the lessons help improve my thinking)." F18

IV. CONCLUSIONS AND RECOMMENDATIONS

Incorporating mathematical tricks into lessons significantly improved students' understanding of Algebra, highlighting

their effectiveness as a teaching tool. However, despite students enjoying the tricks, there was no significant change in their motivation levels before and after the lessons. This suggests that while mathematical tricks enhance learning, they may not necessarily boost motivation. The researchers recommend integrating mathematical tricks into Grade 6 classrooms and further refining lesson plans based on feedback and evaluations. Since students enjoyed these tricks, it is advised that teachers incorporate them into Algebra lessons to vary teaching methods. Future lesson plan developers should ensure the tricks are engaging to capture students' attention.

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