



The Effect of Utilizing Storytelling Strategy in Teaching Mathematics on Grade Four Students' Achievement and Motivation towards Learning Mathematics

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1. Introduction

Learning can be enjoyable if teachers use appealing methods of teaching [4]. Research shows that there is a high correlation between the student's level of motivation and their achievements. The literature also shows that the ability to motivate students is a very important teacher characteristic [13]. It was argued that the use of storytelling methods in teaching is very effective for motivating students' desire to learn [3]. Before the wide spread of new technology, narration was the only way to transfer heritage, customs, traditions, beliefs, and history from generation to generation. Egan argues that told stories direct the listeners' emotions toward its content [5]. Zazkis & Liljedahl see that the stories are interesting and can present ways to think and act as the stories' heroes can do [14]. The literature asserts that stories create a favorable environment for learning, and reduces students' tensions and improves students' memory for what they learn [1], [3], [12].

Many educators show interest in utilizing stories to transmit mathematical concepts. Standards for school mathematics, as suggested by the National Council of Teachers of Mathematics considered communication as an essential component of learning mathematics. This means using language in the form of writing and speaking in order to communicate their mathematics ideas [11]. As a result, it is important to practice the art of communication in different ways. Storytelling in teaching mathematics can help in understanding complex thoughts and ideas, because it encourages students to focus and think harder [14].

2. Aims

This study aims to investigate the effect of using storytelling approach in teaching Mathematics on fourth grade students' achievement and motivation for learning Mathematics, through answering the following two main questions:

- What is the effect of using storytelling strategy in teaching mathematics on fourth grade students' achievement in mathematics?

To answer this question, the following hypothesis will be tested:

there are no statistically significant differences ($\alpha \leq 0,05$) in students' achievement that can be attributed to the teaching method.

- What is the effect of using storytelling strategy in teaching mathematics on fourth grade students' motivation to learn mathematics?

To answer this question the following hypothesis will be tested:

There are no statistically significant differences ($\alpha \leq 0,05$) in students' motivation toward learning mathematics that can be attributed to the teaching method.

3. Method

3.1 Instruments

Three instruments were developed; a mathematics test intended to measure students' achievement on relevant concepts of fractions, a questionnaire for measuring students' motivation towards learning mathematics, and which benefitted from relevant literature [8], and a unit on fractions which was re-written in storytelling form, each story in the unit included a concept on fractions that corresponds to one lesson from the fractions unit in the book.

3.2 Participants

Two fourth grade classes from the same school were randomly assigned to control and experimental groups. The study sample consists of 68 students, 34 in each group. Prior motivation questionnaire and achievement mathematics tests were applied for both groups. Data that collected and analyzed using independent sample t-test indicated that the two groups were equivalent.

3.3 Methodology

In conducting the study, a quasi-experimental design approach was followed. The control group was taught the fractions unit in a traditional way, while the experimental group studied the same unit with the storytelling strategy that was developed by the researcher. After completion of the fractions unit, both the motivation questionnaire and the mathematics test were administered to both groups. Data were analyzed using independent sample t-test to examine the hypotheses of the study.



3.4 Statistical Analysis

The statistical package SPSS was employed to analyze the data. Cronbach alpha was used to examine internal consistency for the motivational instrument, while the Pearson's correlation coefficient formula was used to compute the reliability of the test. Independent sample t-test was used to examine the equivalence of the two study groups, and to test the two hypotheses in order to answer the two main questions. Cohen's d. equation was used to calculate the effect size of the storytelling strategy on both students' motivation and achievement toward learning mathematics.

4. Results and discussion

The means and standard deviations of students' scores on the mathematics achievement test were computed, and then independent sample t- test was performed. The results are shown in table 1 below:

Table 1: t-test results for difference between mean scores of both experimental and control groups on the mathematics achievement test

Teaching method	Mean	S	T	F	Sig(2-taild)
traditional method	13.29	6.37	-2.6	4.39	*0.011
Storytelling method	18.05	8.39			

* Statistically significant at the level of $\alpha \leq 0,05$

The effect size was calculated, and was found to be 0.75 which is considered large. These findings shows that using storytelling method in teaching mathematics increased the students' ability to understand fraction concepts, and increased their ability to solve mathematics problems, thus increased their mathematics achievement. This result might be attributed to the stories' ability in helping the students' imagination.

Seven stories were used in this experiment; each story contains one fraction concept, and corresponds to one lesson in the fraction unit from the fourth grade math text book. Each story contains math offered in a question type which must be solve in order to know the end of the story. During the storytelling session the stories attracted the students' attention, the students seemed integrated and influenced by the events of each story, which might have helped them in imagining the situation while trying to resolve the problem.

One story was about a king who likes mathematics and yearly used to give one prisoner the chance to get out of prison if he was the first to solve a math problem. In the story the king brought a box filled with 36 piece of gold, and asked the prisoners to choose from three given fractions the one that makes the largest quantity of the gold pieces, and the first prisoner to find the answer will get out of prison.

While telling the story the students were sympathetic to one prisoner, they all wanted him to get out of prison, he was the first to give an answer, but to be sure that he was able to choose the right answer the students have to try to solve the problem. They were given time to work on the problem, and no rules or formulas were given to them, and they were free to choose the method in solving it.

The students used different methods to solve the question, some answered it orally by calculate it mentally without using paper or pen, some used algorithms, and many used various graphic representations to reach the proper solution. the students' desire to know the correct answer which will enable the hero to get out of prison made them try different ways to find the solution on their own, and enabled many of them to find the proper solution.

The students were dealing with the math in each story in order to resolve its question to find the end of the story, for that the math in the story became meaningful to them. This thing let them learn mathematics without intent, they compared, converted, subtracted and added fractions. They did it before it was given to them. So they were able to use and understand the fraction concepts that mentioned in their unit before it was given to them. Imagination might have helped them in arranging their ideas in a way that could help them in resolving the questions. In addition imagination might have helped them to live the story events which make it easier for them to understand the mathematics involved in each story. Egan's theory explained this result in that the mind organizes better in a storytelling form [6].

This result is consistent with findings from other relevant studies like [7], [13] in that encouraging a student to solve problems in his/her own way is necessary and increases interaction within the class and improves children's desire to learn. The results are also consistent with [2], [9], [12], [13] in that the story provided the appropriate environment for Imagining in mathematics classes, which consequently helped the students to understand mathematics in a better way.



In answering the second question, means and standard deviations for students' responses on the motivation instrument were computed, the independent sample t- test was conducted, and the results are shown in table 2 below:

Table 2: t-test results for difference between mean scores of both experimental and control groups on the motivation for learning mathematics

Teaching method	Mean	S	T	F	Sig(2-tailed)
traditional method	2.35	0.31	-2.38	2.38	0.020*
Storytelling method	2.55	0.37			

* Statistically significant at the level of $\alpha \leq 0,05$

Note that the highest value that can be obtained is 3

The effect size was calculated, and was found to be 0.65 which is considered large. This result clearly indicates that children who studied mathematics through storytelling were significantly more motivated. This might be explained by the fact that stories are enjoyable and are capable of breaking class routines. Many children expressed their joy and satisfaction with the storytelling approach. Interest in stories was expressed in their daily waiting for new stories, and from their desire to solve the problem in each story.

This result is in agreement with other previous studies [2], [3], [13] in that the use of stories in teaching is interesting, it decreases boredom and increases students' motivation to learn, it eliminates barriers, restrictions and reduces the tension between the students and their teacher, making them feel comfortable, calm and closer to their teacher. The stories provided a communication between the teachers and their students, and among the students themselves, and this is consistent with the communication standard that was suggested by [11] where it sees that the child needs to use his language and make dialogue in mathematics. So listening to the story and having dialogue with the teacher and peers about the story events, and then participate in the activity to resolve the problem in the story, each in his/her own way may enhance this standard [7].

The finding of this study shows that using storytelling in teaching mathematics increases students' ability to understand fraction concepts, and increases their ability to solve mathematics problems, thus increases their math achievement. Also the results confirm that the storytelling increases students' motivation toward learning mathematics.

5. Recommendations

Based on these findings, this study recommends the use of storytelling by teachers; and by education policy makers, especially those involved in curriculum development and teacher training programs to take this issue into account. The study recommends including the strategy of storytelling in designing and preparing curricula and training programs. It is recommended that further research on employing storytelling in teaching of grade levels other than fourth grade ,and topics other than, be carried out.

References

- [1] Balakrishnan, C. (2008). *Teaching Secondary School Mathematics Through Storytelling*, from: <http://www.bing.com/search?srch=106&FORM=AS6&q=TEACHING+SECOND+ARY+SC+HOOL+MATHEMATICS> online on 11/3/2010
- [2] Casey, B., Erkut, S., Ceder, I.& Young,J.M.(2008).*Use of a storytelling context to improve girls and boys geometry skills in kindergarten*, online from: http://www.sciencedirect.com/science?_ob=ArticleListURL&_method=list&_ArticleListID=1230563287&_sort=r&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=3a036865b9878449b6decbe2bb7bdcae0 on 11/3/2010
- [3] Diaw, P.W. (2009). *The Influence of Storytelling As Prewriting Activity (In The Writing Process) On Narrative Writing In The No Child Left Behind Learning Environment* , online from: <http://proquest.umi.com/pqdweb?index=18&did=1850726171&SrchMode=1&sid=4&Fmt=6&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1268306771&clientId=131697> on 11/3/2010
- [4] DiPerna J.C. (2008).*Academic Enablers: Assessment and Intervention Considerations*, online from : http://www.pearsonassessments.com/NR/rdonlyres/DCDB0A7E-9A50-4DF3-A475_EB2FEC1A30F5/0/AcademicEnablers.pdf on 21/11/2010
- [5] Egan, k. (2001). *The cognitive tools of children's imagination*, Online from: <http://www.iERG.net/assets/documents/ideas/cog-tool-childrenL.pdf> on 12-12-2010
- [6] Egan, K. (2005). *An Imaginative Approach to Teaching*. Online from http://www.amazon.com/gp/reader/078797157X/ref=sib_dp_pt#reader-link on 26-12-2010
- [7] Goral, M. B. & Gnadinger, C. M. (2006). *Using storytelling to teach mathematics concepts*. Online from: <http://eric.ed.gov/ERICWebPortal/contentdelivery/servlet/ERICServlet?acno=EJ793906>, on March, 22, 2010
- [8] Guay, F., Herbert, W., Marsh, W.H. & Dowson, M. (2005). *Assessing Academic Motivation among Elementary School Children: The Elementary*



- School Motivation Scale (ESMS), online from : <http://www.aare.edu.au/05pap/gua05378.pdf> on Dec ./22/2010
- [9] Hauscarriague, A. (2008). *Teaching Mathematics Through Stories In High School and Community College*, online from <http://proquest.umi.com/pqdweb?index=18&did=1850726171&SrchMode=1&sid=4&Fmt=6&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1268306771&clientId=131697> on 11/3 /2010
- [10] Linder,S. & Smart, J. (2008). *An Investigation of Motivational Constructs in Mathematics for Students Across Elementary Grades*, online from: <http://www.mathoutofthebox.org/Executivesummarystudentmotivation.pdf> on Dec.12.2010
- [11] National Council of Teachers of Mathematics (NCTM) (2000). *Principles and Standards for School Mathematics*. Reston, VA: NCTM.
- [12] Shirley,J.M.(2008). *Storyteller, Story- Teacher: A Portrait of Three Teachers' Use of Story in Elementary Classes*, online from: http://etd.gsu.edu/theses/available/etd_07262005-161522/unrestricted/shirley_james_m_200508_phd.pdf, on 15-3-2010
- [13] Wilke, J. (2006). *Using Imagination in the Math Classroom*, online from: <http://www.coe.hawaii.edu/documents/pubs/2006-12-pdf#page=16> on 5/3/2010
- [14] Zazkis,R. & Liljedahl,P. (2009). *Teaching mathematics as storytelling* , online from: <http://www.sensepublishers.com/catalog/files/9789087907358PR.pdf> on 19/12/2010