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## Does instruction of “Integers” subject with cartoons effect students’ mathematics anxiety?

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### Abstract:

The purpose of this research is to investigate the existence of “The Effect of Instruction of Integers Subject with Cartoons on Students’ Mathematics Anxiety”. Research consists of a semi-experimental study which was performed on 61 students during 2007-2008. These students were in their 7<sup>th</sup> year of primary education in the city of Bolu. An experiment and a control group were used in the research. While acquisition of “Integers” was handled with traditional methods in control group, it was handled with the use of cartoons in the experiment group. The data acquired with “The Mathematics Anxiety Rating Scale”, which is used before and after the research, was evaluated with statistical analysis method. According to the acquired data, results showed that instructions accompanied with cartoons lessened students' mathematics anxiety than traditional instructional methods.

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### 1. Introduction

Students get the opportunity to observe and take an example by the events in their active learning environments. Thus, as the student observes, he gains cognitive manners as well as affective manners. If the aim is to teach something to students, learning should be taken in to consideration not as just a mental process but also with its social and emotional aspects.

The researches done indicates that quarter of the differences between learning of individuals are caused by affective learning (Bloom, 1998). Anxiety stands on a key position among these learnings. Anxiety can be defined as the stress that paves the way for success (Selye, 1974). As for mathematics anxiety; it was initially defined by Dreger and Aiken (1957) as the syndrome of emotional reactions towards the fields of mathematics and arithmetic. Richardson and Suinn explains mathematics anxiety as the feeling of anxiety and stress occurring while solving arithmetical problems and using numbers in everyday or academical life (1972). Moreover, according to Tobias and Weissbrod, mathematics anxiety is the panic, feeling of unassistedness, paralization and mental disorders when they wish to solve an arithmetical problem (1980). As for its general definition; mathematics anxiety is a situation which shows itself with emotional stress and anxiety when the individual is faced with cases such as solving arithmetical

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problems or doing operations with numbers in either his school or everyday life. This anxiety state can cause amnesia and lose of self confidence (1993).

Mathematics is a feared subject which students has preconceptions about. Taking these in to consideration, it is important to arrange learning environments and activities which aim to relieve the anxiety of the student. This should be done by the use of cartoons, that could appeal more sense organs, drawing the attention of the student and help him to remember the knowledge, giving student the opportunity of questioning and appealing not only the cognitive but also the affective fields. Therefore, it might be possible to use the positive effects of illustrations for determination of the notion paralogisms, development of mathematical thought process, createion of a brainstorm and a debate environments and bringing out the education outside of classroom (Moralı and Uğurel, 2006). Because cartoons have the potential of humor that is suitable for the objective, demonstrate, disproof, support, ease the anxiety and preoccupy people (Torok et.al. 1999). Thus, well chosen cartoons would contribute to the student's mental development and his critical thinking ability before anything. Cartoon defined as *a funny and thought provoking drawing that handles any event about people or society and indicate it with exaggeration*, can be used in mathematics education with regard to it being able to help with visualization of mathematical thought (Tall, 1991). In other words, some of the comments on the use of more visualization in education programs state that it should not only be emphasized on only student's understanding of mathematics but also more creative ways to use mathematics and mathematical thought should be encouraged (Cunningham, 1991). Because of this reason, since cartoons would be a help in visualization, it might be easier to materialize this objective. A visual utility such as cartoon could ease the work of the instructor on the blackboard because since cartoon appeals eyes it motivates and creates an opportunity for debate (Özer, 2005). Consequently mathematical subjects could be purified of the complexity and abstractness. Because it appeals visual sense it could ensure the permanency of the knowledge and eliminate the forgetting caused by learning by heart.

It is stated that the use of cartoons is not limited with aiding visualization in written lecture materials and that they are tools having remarkable effects on learning and instructing in terms of their psychological effects where humor is effectively used (Uğurel and Moralı, 2006). Therefore, mathematics instruction aided with cartoons is thought to be important for its properties of degrading mathematical subjects to concrete from abstract, making students think while they are having fun and easing their anxieties by appealing their affective fields.

## 2. Method

Semi-experimental pattern with pretest-posttest control group is used in this research. In the pretest-posttest control group semi-experimental pattern model, there is an additional group that is not exposed to independent variable along with the experiment group exposed to independent variable. This pattern consists of an experiment and a control group but the participants are not decided randomly. Unless there is a significant difference between the groups' pretest scores, the equivalence of the groups could be mentioned relatively. In order to test the hypothesis', changing scores between pretest and post test are compared to detect a significant difference (Bulduk, 2003 . Christensen, 2004). Research was performed on 61 seventh grade students who study in two different classes of a primary school in the city of Bolu during 2007-2008 year of study. Experiment and control groups are formed from two classes which have close mathematics anxiety which is determined according to pre-anxiety scale. Experiment group consists of 30 students and control group consists of 31 students.

### 2.1. Tools

*Mathematics Anxiety Scale* developed by Emine Erol (Erktin) in 1989 which has its reliability determined to be  $\alpha=0.78$ , was used. As for this research, the reliability coefficients of pre-anxiety and post-anxiety are determined as 0.868 and 0.890 respectively. Mathematics anxiety scale consists of 45 positive and negative clauses contains mathematics fear questioning whether students like the mathematics lesson and activities concerning this lesson or not. Anxiety scale is developed as a four degree likert-style scale. Clauses in the anxiety scale were coded as Never(1), Sometimes(2), Frequently (3), Always(4) points. Moreover, clauses numbered 4, 10, 13, 20, 27, 32, 40, and 43 are positive clauses and the pointage is done conversely.

## 2.2. Data Acquisition and Analysis

Before starting the research, integers subfield of number learning field in the new mathematics program is examined. Taking students' learning troubles about the integers subject in their 6<sup>th</sup> grade in to consideration, 6<sup>th</sup> and 7<sup>th</sup> grade integers sub-learning field acquisitions are merged. Afterwards, different stories were formed for each acquisition and cartoons were drawn which are turned in to worksheets with the use of computer programs. Experts were asked for their opinions about cartoons being appropriate in terms of pedagogy and whether they are appropriate for desired acquisitions in the notinal perspective or not. While, cartoons were drawn accroding to acquisitions, attention was paid to each acquisition were described clearly. Different stories and characters suitable for these stories were used in all of the cartoon activities. Characters were places in situations such that every student might face in his daily life. Furthermore, a couple of problems from course book were charicaturized. After a general problem situation was stated, cartoon would be given place to and dialogs between characters were placed in attention drawing boxes. As for towards the ending of the activity, small cartoons were used. Students also do not need to write on notebooks since small spaces were allocated on the papers for students to study on.

After preliminaries, "Mathematics Anxiety Rating Scale" was performed on four seventh grade classes of the school. Among these classes two classes that has no difference regarding mathhematics anxiety in terms of statistics were determined. After this determination, one of these classes was chosen to be experiment group and another one was chosen to be control group. In the control group classes were instructed with traditional method, whereas in experiment group classes were instructed with the aid of cartoons. During the research, in addition to presenting the worksheets to class with the use of projection, the papers were copied and handed out to students. Moreover, by distrubuting the students in to homogeneous groups, it was provided for students to debate and exchange ideas. After handing out the worksheets including cartoons, a period of time was allocated for students to answer the problem state which is the main theme of every paper. Dialogs were shared with class by determining different groups with every sheet. Afterwards, answers were taken from all groups one by one. The existance of different answers provided a debate environment between groups. A different worksheetwas passed on after the questions were answered in the last section. After 6 weeks of research, "Mathematics Anxiety Rating Scale" was performed on experiement and control groups.

## 2.3. Evaluation and Interpretation of Data

The analysis of datas acquired during the research is done with statistical analysis method. One Sample Kolmogorov-Smirnov test is performed before starting analysis to determine whether the datas acquired are appropriate for normal distribution or not. During analysis of pre-anxiety and post-anxiety scales Paired Sample T-Test is used to compare the points of students in the same group and Independent Sample T-Test is used to compare the points of students in different groups. Significance levels of acquired datas during research is evalutead taking  $p < 0.05$  in to consideration.

## 3. Results

According to One Sample Kolmogorov-Smirnov test, control group pre and post-anxiety scale p values are observed to be .774 and .616 respectively. As for experiment group pre and post-anxiety scale p values are .495 and .717 respectively. Taking the results in to consideration it is observed that the p values are greater than 0.05. As things stand, T-test is decided to be appropriate for exercise since the datas acquired are determined to be acceptable in terms of normal distribution. As a result of the decision of datas being acceptable in terms of normal distrubution, following results are reached.

Table 1: T-Test Results Concerning Experiment and Control Group Students' Pre-Anxiety Scale Points

Groups	N	$\bar{X}$	S	sd	t	p
Experiment	30	76.13	13.90	59	.273	.786
Control	31	75.19	12.99			

When pre-anxiety scale results are taken in to consideration, it is observed that point average of experiment group students is 76.13 while point average of control group students is 75.19. Independent Sample T-Test that is performed in order to detect the existance of a significant difference between pre-anxiety scale points of experiment and control groups. The p value obtained from this test is  $p=0.786$ . Since the obtained p value is greater than 0.05, it is decided that there is no significant difference between experiment and control groups.

**Table 2: T-Test Results Concerning Experiment and Control Group Students' Post-Anxiety Scale Points**

Groups	N	$\bar{X}$	S	sd	t	p
Experiment	30	68.80	11.75	59	-3.238	.002
Control	31	79.90	14.79			

When post-anxiety scale points are examined, the result reached was that the experiment group students' average was 68.80 and the control group students' average was 79.90. Independent Sample T-Test that is performed in order to detect the existance of a significant difference between pre-anxiety scale points of experiment and control groups. The p value obtained from this test is  $p=0.002$ . Since the obtained p value is smaller than 0.05, it is decided that there is a significant difference between two groups after the practice. When the averages of both groups are examined, it is seen that this significance is in favour of the experiment group in which the integers subject was instructed with the aid of cartoons.

While the control group students' pre-anxiety scale point average was calculated as 75.19, their post-anxiety scale point average was obtained as 79.90. Independent Sample T-Test is applied on the points of this scales and p point was obtained as 0.068. Since the p value obtained is greater than 0.05, it is seen that there is no significant difference between pre and post-anxiety points of control group. When the averages are examined, it can be commented that instruction of integers subject by traditional methods increases students' mathematics anxiety even if it is just a bit. Experiment group students' pre-anxiety average is 76.13 and post-anxiety average is 68.80. Independent Sample T-Test is applied on pre and post-anxiety scale points and the p value was obtained as 0.004. Since the p value obtained is smaller than 0.05, the result reached was that there is a significant difference between experiment group students' pre and post-anxiety scale points. When the averages are examined, it can be commented that instruction of integers subject with the aid of cartoons affected experiment group students positively and decreased their mathematics anxiety.

#### 4. Discussion and Suggestions

Researches done on the anxiety towards mathematics from different aspects and on students of different levels, determined that there is a general belief on students having worry and anxiety towards mathematics lessons not only in Turkey but also around the world (Albayrak, 2000). When the literature particularly about the cartoon method's effect on anxiety is examined, it can be seen that the research done supports the works of Yoong (2001), Greenwald ve Nestler (2004), Rule ve Auge (2005), Özalp (2006), Çiğdemtekin (2007) and Üstün (2007).

Due to the fact that cartoons subjects human and life, every lesson and every subject is a tool that can be made use of by it. Taking this in to consideration, education with aid of cartoons could be this period's starting step for education improvement (Efe, 2005). It is considered that it is effective for permanent learning, when instructing subjects, due to being an education activity not only appealing to visual sense and require mental effort, but also appealing to affective field (Uslu, 2007). Because of these reasons, the place, importance and role of cartoons should not be forgotten specially in easing the mathematics anxiety and providing success. Mathematics textbooks should satisfy the students visually and should be decorated with pictures, cartoons or other illustrations which would entertain them and attract their attention. Contents of cartoons should be enriched and besides appealing just eyes, they should appeal other senses by being transformed in to animation format. It should not be ignored that the preferred teaching methods have a big role in mathematics being the most disliked class, despite the fact that it being in a close relation with life being able to be more entertaining. So, different teaching methods should be developed in order to overcome this prejudice. Materials should be desinged that would not only improve students' cognitive sides but also their affective sides.

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