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The Investigation of Usage-Proficiency of Length, Area, Volume Units of 8th Grade Students According to Some Variables

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Abstract In this paper, usage proficiencies of length, area, volume units of 8th grade students were investigated according to the variables of gender, attitude toward mathematics, attitude toward science, academical successes for mathematics and science. Data for this study was collected via scale of attitude toward mathematics, scale of attitude toward science, and the test for usage-proficiency of length, area, volume units developed by the authors. The sample of this study was the students of 8th grade from any primary school in Eskisehir-Turkey. After the evaluation of this data, it was observed that the usage-proficiency of length, area, volume units was changed according to gender. It was found that there is a positive relation among the usage-proficiency of units and attitude toward science, academical successes for mathematics, and science.

Introduction

I want to start with a maxim of St. Augustine Lamet: "My God, I measure continuously, but I don't know what I measure" This maxim is an confession that is ignorant of what the measurement is. Most people, don't know what the meaning of measurement, which we meet everywhere and at any moment in daily life, is (Şimşek,1997).Measurement is a process in which how many selected units there are in any measured quantity are expressed. In measuring process, it is needed to a unit which has international aggrement and is well-defined (Wildi, 1996), (Bueche et al, 1995), (Bueche, 1975). While any result of measurement is written, appropriate unit in result, must be expressed. One of the mistakes which the students made frequently in exams is to express the result of the problem only by a number, i.e.,not to write appropriate unit, after the number. There are three causes of expression of problem result not to be written units by the students:

i) to avoid from the mistakes of selecting wrong unit.
ii) not to be aware of thought of why the unit must be written on result of the problem.
iii) to forget to write because of exam-anxiety.

Thus, after the exams, following question has been asked by the students to the science teachers:
"I forgot to write the unit on the result of the problem or I found wrong result because of unit selecting mistake. How do you evaluate this wrong result? Could you give me full note from this problem?" (Orhun and Orhun, 2002).
One of the subject of primary school mathematics is " Measurement via Standart Units: Measures of Length, Mass, Volume, Area".It is aimed to gain the students the following skills through this subject:

i) to know the measuring units of length, weight, volume, area widespreadly used and the relationships among them.
ii) to express magnitudes of quantities via measuring units.
iii) to calculate the lengths of the perimeters and surface areas of various geometrical figures via measuring units.
iv) to calculate the surface areas and the volumes of various geometrical objects via measuring units
v) to obtain the true results, applying the gained knowledge to some problems met in daily life, i.e., to calculate the price of any good, and to calculate the speed of any automobile, to compare the magnitudes of two or more quantities etc. (Busbridge, 1997).

These aims, which were not arrived throught the years of primary school, play important role to appear very seriously problems of the students in future. After they conceived the process of obtaining mathematical equation of object taught, the students of engineering and science, who hadn't gained the skill of using right units before entrance of university could made dense mistakes of selection of units on the stage of application of this knowledge to any problem (Orhun and Orhun, 2002).
Some of the causes affected the formation of this serious problem could be gender, attitude towards mathematics, attitude towards science, academical success for mathematics and science of the students. Recent studies in mathematics education asserted that the factor of gender, generally, hadn't played any role on making mistakes on mathematical problems.On the study made by Orhun N. and Orhun Ö., it was asserted that there wasn't any meaningful difference on relation between attitude towards mathematics and attitude towards science for the 9th grade students in Eskişehir-Turkey (Shepardson and Pizzini, 1994), (Hendley et al,1995), (Orhun and Orhun, 2001).It couldn't be found any study in the literatur of mathematics education, examined by us, about the effects of these variables on usage of measuring units.

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Problem

What is the relationship between mathematics attitudes, science attitudes, academical successes for mathematics and science and usage of length, area, volume units?

Sample of the Study

The sample of this study was the 8th grade students from any primary school in Eskişehir-Turkey.The total number of students is 97 (girls : 54, boys : 43).

Measuring Instruments

In the present study, the following measuring instruments were used:

1. Attitude Towards Mathematics Scale (ATM).
2. Attitude Towards Science Scale (ATS).
3. Problems for usage-proficiency of Length, Area, Volume Units (ULAV).
4. Level of success in Mathematics (LSM).
5. The grade of mathematics taken from transcript of student in academic year of 2002-2003.
6. Level of success in Science (LSS) :

The grade of science taken from transcript of student in academic year of 2002-2003.

Attitude towards mathematics scale was developed by Aşkar . This scale consists of 20 likert-type items (Aşkar, 1986). Attitude towards science scale was developed by Aiken .This scale consists of 20 items (Aiken,1979).The problems for usage-proficiency of length, area, volume units (ULAV) developed by the authors. The problems (ULAV) were created to conform with the curriculum for 8th grade. Problems were selected from physical / geometrical problems.The topics areas covered by the problems were calculation of velocity, distance, area, volume and comparision of various quantities. The information about physical / geometrical problems, i. e. formulas, definitions about problems was given to the students. Thus, the students could make only mistakes on usage of units.

Findings

The Two-Sample T-test and CI was used to investigate the relation between the usage-proficiency of length, area, volume units and ATS, LSS, ATM, LSM,G (gender).

In the light of findings obtained by statistical testing of each variables, the following conclusions can be stated.

Table I. Relation Between ATS-ULAV of students

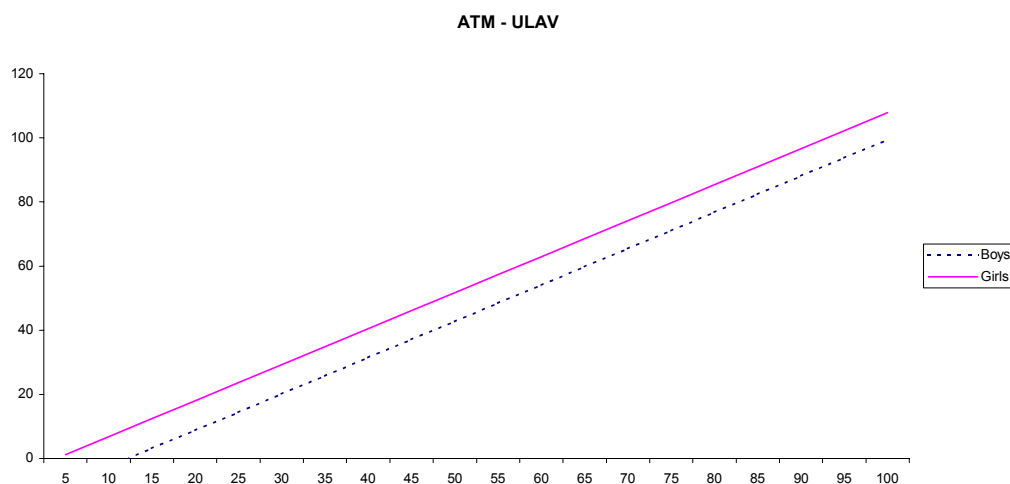| Gender	Variables	r	t	p
Girls N: 54	ATS-ULAV	0.137	- 5,23	0,000
Boys N: 43	ATS-ULAV	0.200	- 6,49	0,000

As shown in Table I there is a significant relationship between chosen variables for girls and boys at level 5%.As expected, there is a positive relation between these two variables

Then, boys have higher correlation than girls.

Table II. Relation Between ATM-ULAV of students

Gender	Variables	r	t	p
Girls N: 54	ATM-ULAV	0.572	- 0,24	0,814
Boys N: 43	ATM-ULAV	0.317	0,54	0,592

As shown in Table II there isn't a significant relationship between chosen variables for girls and boys at level 5%.

ATM - ULAV

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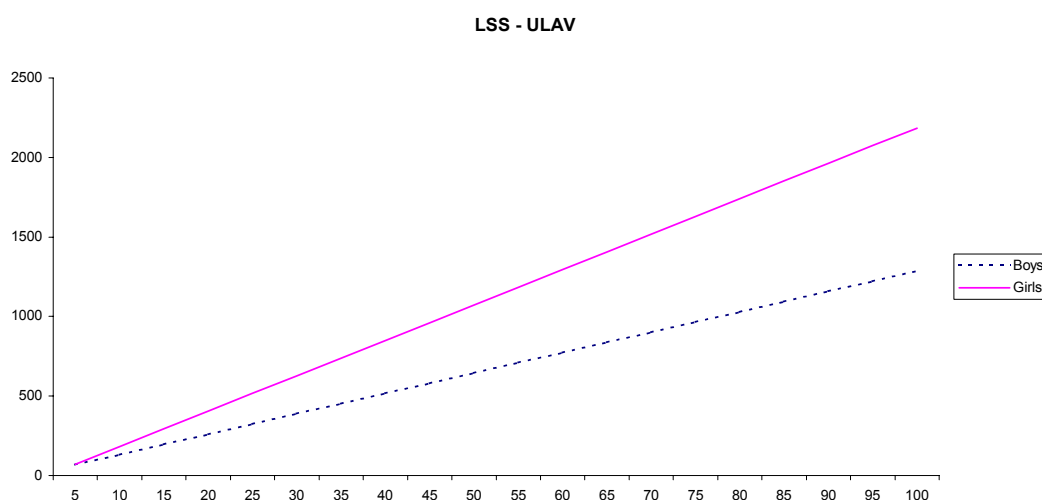The regression line between ATM-ULAV for boys and girls respectively,

$$y = 1,1 \ x - 13,9 \qquad \text{and} \qquad y = 1,1 \ x - 4,4$$

Then, the correlation coefficients of boys and girls are same.

Table III. Relation Between LSS-ULAV of students

Gender	Variables	r	t	p
Girls N: 54	LSS-ULAV	0.738	6,64	0,000
Boys N: 43	LSS-ULAV	0.536	-8,51	0,000

As shown in Table III there is a significant relationship between chosen variables for girls and boys at level 5%.

LSS - ULAV

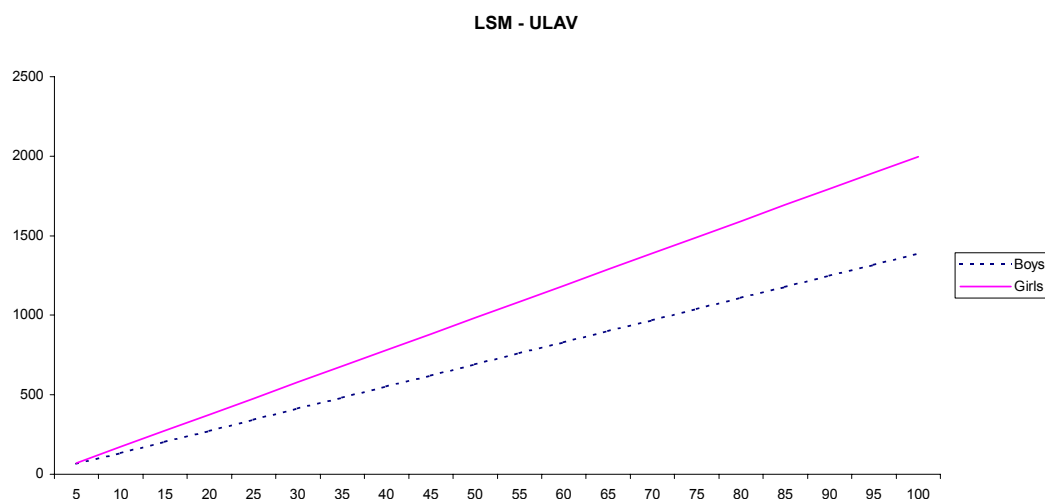The regression line between LSS-ULAV for boys and girls respectively,

$$y = 12,8 \ x - 2,7 \qquad \text{and} \qquad y = 22,2 \ x - 0,41$$

There is positive correlation between two variables. Girls have higher correlation than boys.

Table IV. Relation Between LSM-ULAV of students

Gender	Variables	r	t	p
Girls N: 54	LSM-ULAV	0.742	- 6,66	0,000
Boys N: 43	LSM-ULAV	0.500	-8,46	0,000

As shown in Table IV there is a significant relationship between chosen variables for girls and boys at level 5%. There is positive correlation between two variables.

LSM - ULAV

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The regression line between LSM-ULAV for boys and girls respectively,

$$y = 13,9\ x - 5,5 \qquad y = 20,2\ x - 29,8$$

Then, girls have higher correlation than boys.

Table V: Relation between all Variables – ULAV of students

Gender	Variables	r	t	p
Girls N:54	ATS, ATM, LSS, LSM,-ULV	0,120	- 7,74	0,000
Boys N:43	ATS, ATM, LSS, LSM,-ULV	0,072	- 8,45	0,000
All students N :97	ATS, ATM, LSS, LSM,-ULV	0,094	- 11,49	0,000

The general model is significant according to all variables.

Results and Suggestions

According the findings of this research, there is positive relation between ATS and ULAV of the 8[th]grade students. There is meaningful on relation between ATS and ULAV of girls and boys students. Besides, there isn't positive relation between ATM and ULAV of the 8[th]grade students.According to gender, there isn't any meaningful difference on same relation.There are positive relations between LSM and ULAV, and between LSS and ULAV. According to gender, these relations don't change.

Teaching of usage of length, area, volume units in primary school is very important. If the students couldn't learn the usage of these units, the unusability of units causes very seriously learning problems in career-education. For this reason,primary school teachers must pay attention to teach the usage of units more attentive. Because, any subject must be taught at right time.

First of all, the students must perceive the concepts of measurerement and units. There is an important rule for conversion of units: The magnitude of any quantity specified by bigger units gets smaller and vice versa.This rule must be taught especially.Students must solve many problems concerned with conversion of units. Thus, the students accustomed to use the units of length, area, volume.

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