



A STUDY OF GENDER DIFFERENCES IN ACHIEVEMENT IN MATHEMATICS

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ABSTRACT

Mathematics is one of the effective subjects in educational performance and prospective occupation. Gender differences in different academic disciplines, on the other hand, have been recently considered as the fitting foci of several research. This paper is empirically addressed gender differences in achievement in mathematics. To this end, 400 students (168 girls and 232 boy) were randomly sampled from Tehran, Iran high school. It is also to be mentioned that researcher used the math' scores of final exam as a tool for evaluating achievement in mathematics. Data was analyzed through employing t-test. The results of the study manifested that there was a significant difference in the scores for boys (Mean= 14.58, SD= 3.46) and girls, (Mean=16.08, SD=3.22); $t(373.95) = -4.45$, $p = .000$ (two-tailed). Investigation of this kind leads to a better insight toward gender differences in several academic disciplines.

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Introduction

Mathematics is one of the core and effective subjects in individual's educational performance and future job. It is the center of attention due to its inherent beauty as well as its various applications. One of the fields in studying this issue is the analysis of parameters related to the achievement of students in mathematics. This field has caused several extensive researches based on the importance of mathematics and the weakness of the majority of students in this subject. The International Association for the Evaluation of Educational Achievement (IEA) assesses the mathematical performance of students in a number of countries through an exam called the Trends in International Mathematics and Science Study (TIMSS). This research emphasizes Iranian students with low proficiency in mathematics with respect to the findings of TIMSS. This weakness can be noticed in three stages of education. Achievement in mathematics is defined as learners' success in educational affairs which can be evaluated based on examinations. The evaluation of mathematical progress means the assessment of the learners' performance and the comparison of the results with predetermined goals in order to decide whether teachers' educational activities and students' learning activities have yielded favorable results and the desirable success rate [1]

On the other hand, it is worth noting that a large number of researches have been conducted on the genders of students and their roles in different variables, some of which indicating no connection [2] and some revealing a connection between gender and the studied variables [3]. A few studies have considered investigating the improvement of the achievement in mathematics among Iranian students in relation to their gender.

The main purpose of this paper, therefore, is to examine significant difference between the achievements in mathematics among male and female high school students. Above all, the definition of achievement in mathematics in this research is success in educational affairs which can be evaluated through examinations, especially for those who score "A" in mathematics examinations.

1.1. Research Question

Is there any significant difference between the achievements in mathematics among male and female of high school students?

1.2. Research Hypothesis

Based on the question outlined, it can be hypothesized that:

There is significant difference between the achievements in mathematics among male and female of high school students.

1.3. Scope of the Study

The scope of this research is confined to the 11th grade of high school in Tehran as the capital of Iran. The researcher screen the respondents, who are between 16 and 17 years old. The data collected through four questionnaires being distributed from the first of January to the end of March of 2014.

2. Literature Review

2.1. Overview of education system in Iran

The education system In Iran education is a necessity for children in ages 6-14(Grades 1–8). Public education is free. The education system is divided in 5 different levels: pre-school, elementary school, lower secondary education, higher secondary education and higher education. The study programmer lasted 4 years and comprised the ninth through twelfth grades for the 14 to 17 age group. Most education is provided in Farsi (Persian). The academic year is divided into 2 semesters and runs from September to June.

2.2. Progress in Mathematics

Functional test can be used to measure progress in mathematics. Functional tests deal with the skills, proficiency in the use of procedures and administrative practices, and production skills. For example, laboratory skills, science, mathematics and problem-solving skills, the literature courses deal with communication skills. The functional tests have various aspects that divided them into four categories, which are presented as the following:

- ✚ Written Test: Written test or paper-pencil cognitive domains are more appropriate for measuring the efficiency of learning goals.
- ✚ Identification test: In these tests, the learner will be asked to identify a tool or instrument and to describe its instruction.
- ✚ Simulation: In the simulation or test performance in simulated situations, the learner will be asked to take a position as artificial or imaginary, which is essential in real situations.
- ✚ Sample work: In a sample work the learner will be required to do things that truly represent the measured [1]

Thus, the mathematical problem-solving skills are operational and measured in written test.

2.3. Problem solving skills

The problem in relation to its effect on learning. In his belief, the problem is the assignment that A) the students are interested in it and will try to resolve it and B) the students do not have a simple and easy solution to solve it. The problem is not an issue as long as the learner is not interested to solve it. Four stages for the problem-solving as following [4].

1. **Understanding the problem:** First, a word problem must be understood, is also necessary that students can unknown a major part of the problem such as the data, the requirement and the exception and carefully consider the main components of different ways.
2. **Designing a map:** the main work to solve a problem is thinking about the map and plan to solve it. This idea may be resulted gradually or suddenly.
3. **Planning a map:** planning a map is simple, what we need is patience and fortitude. Prior knowledge of the mental habits of good thinking and focusing on the goal at this stage is effective.
4. **Look back and reconsider:** Even very good student, then found the answer to the question, close their books that informative forget an important step. They strengthen their understanding through re-looking; rebuilding all the test results and strengthening problem-solving.

2.4. Gender Differences and their Impact on the Achievement in Mathematics

In this section, the gender differences in terms of the research variables are discussed. The researchers that used the advantages of advanced methods of statistical research can help us to take a clearer view of these variables. As the average difference tests show that gender differences exist among mathematic performance variables, mathematic self-concept and mathematic self-efficacy. However, the results of techniques, such as path analysis results indicated that the differences are moderated by some variables, such as in self-efficacy. This means that the only significant path to self-efficacy was gender. Researches also show that the performance differences between the genders appear when there are similar variables in the model [5].

Gender differences in math achievement over the past two decades are a major topic of research, and this research has faced conflicting results. One of the goals of this study is to study more closely the relationship between gender and math self-efficacy. Many studies show that boys are superior to girls in achievement in mathematics. One reason for these differences is boys' self-efficacy is higher than girls [6] mathematical self-efficacy expectations of male students are stronger than female students. And in their conducted study, boys get better grades in self-efficacy. Compared with girls, boys achieve more in math assessment and have a better attitude toward mathematics and were more confident of their abilities in mathematics. [7, 5] Contrasting these results, another scholar [2] showed that gender and students' levels have an important effect on mathematical performance and self-efficacy of students, teachers, schools, and academic. Thus, the female students and teachers in mathematics performance scores are better than males; these results are contrary to previous researches. Despite these findings that suggest the preference for boys in math performance variables, some studies, likewise, suggest that the distinction between the genders in achievement in mathematics, girl's scores were better.

Most studies [8] showed a preference for boys over girls' confidence in learning mathematics, and even when girls have a better argument based on their performance, this difference remains. Others [7] assessed gender differences in attribution, self-efficacy and achievement in mathematics on a sample of 62 students. The findings suggest that the gender differences in achievement in mathematics variable the boys have significant differences, and in self-efficacy variables there was no significant difference between boys and girls. In a similar study [9], titled gender differences in the self-concept English / mathematic and language development in Mathematic/ mathematic adults were using path analysis showed that both variables had significant differences in mathematical self-concept and achievement in mathematics between the two genders. Another study [10] showed that there is not a significant difference between boys and girls on self-efficacy and achievement in mathematics. He announced that the direct effect of gender on self-concept of mathematics and improvement is not significant. He also stated that these findings are consistent with the findings of researchers, [11, 6], but the researchers found the results

are inconsistent with the findings [12] reflected the decline of the gender gap between boys and girls in the mathematical self-concept of variable and the difference between the genders in achievement in mathematics variable was the last question [2]. The findings show that there is no significant difference between boys and girls in achievement in mathematics. Among the factors that can be used as internal barriers that may impede the progress of girls in mathematics clever can be argued is:

- A) Avoiding mathematics because it does not take into account women's field.
- B) Lack of math as necessary to attain the objectives of the employment and training of girls.

One of the influencing factors in gender differences and mathematical self-efficacy and mathematical self-concept is cultural differences and the families and teachers, and their higher attention to the boys to solve mathematical problems, and the belief that a man is paying mathematic based on a traditional belief among them. In some cultures, families and teachers believe in improving mathematics and boys have some difficult problems to develop their technology and production and the boys must do the hard work. On the other hand, the presence of social activities of girls, employment and factory production changing traditional beliefs that lead some researchers have obtained conflicting results. Therefore, the conflicting results were obtained from self-efficacy studies of boys and girls. This study intends to investigate this issue more accurately and does more to get more facts about gender differences in mathematics. Regarding the conflicting records related to the gender and variables of the final model, this study is conducted in two groups of boys and girls [3].

In another study, [13] showed that there is not a significant difference between boys and girls in self-efficacy and achievement in mathematics. About students' gender and their role in the studied variables, many studies have been done, some of which showed no relationship [1, 5, 7] and some suggested relationships between gender and studied variables [8, 9, 3].

As in contradictory researches, in mathematical self-concept models on the gender differences, based on Pajares & Miller's findings (2003), boys' preference is higher than girls in mathematical self-concept. On the other hand, other researcher [10, 13] indicated that the girls' mathematical self-concept is the same as boys and in some cases is higher. This study is going to show more facts and further experiments in this regard.

3. Method

This paper which is a quantitative survey, addressed the significant difference between the achievements in mathematics among male and female of high school students

3.1. Research Design

In this research, the quantitative approach was applied as research method. In this paper, which is a survey one, the researcher utilized T-test to examine the existence of the significant difference between the achievements in mathematics among male and female of high school students.

3.2. Population and Research Sampling

This research study was done in Tehran, the capital of Iran. The sample was chosen from Iranian high school boys and girls students who study at grade 11 in schools of Department of Education District 2 Tehran, Iran. Consistent with statistics of Ministry of Education of Iran, the number of students in the grade 11 in mathematics are 5599, 3105 boys and 2494 girl which they were studying at 2011-12. The data on the number of students have been obtained in collaboration with the Ministry of Education.

3.3.1. Participants

Total number of participants were 400 students (232 boys and 168 girls) who were selected and examined based on stratified random sampling from the high school students in Tehran.

3.4. Data Gathering Procedures

A list of schools in Tehran was obtained from Iranian Education Ministry. Since the purpose of this research is predicting the students' achievement in mathematics, their average score in math, geometry and algebra were taken from the high school for 2012–2013 educational years.

3.5. Research Instrument

3.5.1. Demographic Questionnaire

The first questionnaire include the demographic information of the participants, for example gender, age and their total result and mathematics in the mid-year and past year examination in December 2012.

3.5.2. The Tools to Recognize the Mathematical Progress

In keeping with the recommendations of Bandura (1997), aimed at evaluating the academic performance of the students we should consider the actual performance of them. Real presentation may appear when the assignments are important and they have high motivation to do it. Usually the final exam is very important for students and, the researcher used the math' score of final exam as a tool for evaluating achievement in mathematics.

3.6. Data Analysis

To analyse the demographic data, the researcher applied descriptive statistical analysis (frequency and percentiles) on the sample groups to obtain a clear understanding of the population. T-test was also applied to study the difference between variables of interest.

4. Findings

4.1. Demographic Findings

The findings show 58 (232) percent of participation were boys and 42 (168) percent were Girls. Also 14 percent of the respondents belongs to the age group of 16. Also 70.5 percent of the respondents were under 17 years old. 11 percent of participants belongs to the age of 18. While 4 percent were under 19 years old. In addition. 30 percent of students were from the educational area 2. 13.5 percent of students were from educational area 4. Also 35 percent of students were from educational area 6. Finally, 22 percent of students were from educational area 19. In addition the results indicating the data were normally distributed and there were not significant problems in the data set for sample group of Iranian students.

4.2. Testing Hypothesis

There is significant difference between the achievements in mathematics among two genders of high school students.

To determine the level of differences between achievements in mathematics among boys and girls of high school students the t-test was used for comparison of two groups. The results are presented in table 4.1.

Levene's test is conducted to evaluate the homogeneity of variation in the results. It tests the null hypothesis that "there is no significant difference between the two population variances". Levene's test identifies which t-values that SPSS produce is the correct values for researchers to use. If significance for the Levene's test is <0.05 then equal variances not assumed is used. This means null hypothesis was rejected. Thus the researcher should use the second line in the table, referring to equal variances not assumed and if the p-value is more than 0.05, then use the first row which labeled equal variances assumed.

According to the results of mathematics achievements in table 4.1, the p-value for the Levene's test for equality of variance is .024, since this value is less than alpha=0.05, and since the Levene's test is significant, it means the variances are not equal, therefore, the researcher used the t-test result given in the second row "Equal variances not assumed."

An independent- samples t- test was performed, comparing mathematics achievements scores in two gender. The findings showed, there was a significant difference in scores for boys (Mean= 14.58, SD= 3.46) and girls, (Mean=16.08, SD=3.22); $t(373.95) = -4.45, p = .000$ (two- tailed). If the value in the sig. (2 tailed) column is equal or less than 0.05, there is a significant difference in the mean scores on the dependent variable for each of the two groups. In this result $p = .000$ and it showed significant difference between mathematics achievements of Iranian students boys and girls. By considering attention to the results of this research, it could be said that consideration differences between boys and girls in mathematics have beneficial effects on efficacy of educational programs.

Table Error! No text of specified style in document..1: Results of t-test for comparison the scores of mathematics achievements among boys and girls

Group Statistics					Levene's Test for Equality of Variance		t-test for Equality of Means		
Variable	Group	n	Mean	Std. Deviation	F	Sig.	T	Df	Sig (2-tailed)
mathematics achievements	Boys	232	14.5887	3.46143	5.123	.024	-.402	398	.000
	Girls	168	16.0883	3.22195			-.452	373.958	.000

4. Discussion and Conclusion

There is significant difference between the achievements in mathematics among two genders of high school students.

To determine the level of differences between achievements in mathematics among boys and girls of high school students the t-test was used for comparison of two groups. There was a significant difference in scores for boys (Mean= 14.58, SD= 3.46) and girls, (Mean=16.08, SD=3.22); $t(373.95) = -4.45, p = .000$ (two-tailed). If the value in the sig. (2 tailed) column is equal or less than 0.05, there is a significant difference in the mean scores on the dependent variable for each of the two groups. In this result $p = .000$ and it showed significant difference between mathematics achievements of Iranian students boys and girls. This finding was in line with studies [5, 6, 13, 7] which showed that girls got high score in self-concept than boys. This is because girls get more effect from people who are important in their life. Girls get more encouragements from their teachers. Also the girls are more social than boys and the others have more influence on them than boys. So their self-concept are more touched from the environment of class. The results showed that the effect of math self-concept on math achievement test was stronger among boys than girls.

By attention to the results of this research, it could be said that consideration differences between boys and girls in mathematics have beneficial effects on efficacy of educational programs. It is also planning to practical training in the concepts of pure mathematics, the sciences and the various applications of mathematics in real life seems necessary.

This research could be useful to students, regarding mathematics in curriculum. It could make them aware of mathematics and in addition, the perception of mathematics as a result of human interests and needs. If students use the result of this research and if the aspects of mathematics program are combined in learning mathematics, learning can be simplified.

References

1. Pajares, F. & Schunk, D. (2001). The development of academic self-efficacy., Development of achievement motivation. United States.
2. Pahlavan Sadegh A. (2005), The review of the relationship between the variables of family, socio-economic status, individual variables with mathematical achievement based on TIMSS Data (2003), MA thesis, Tarbiat Moalem University.
3. Bandura, A, 1994. Self- Efficacy. In V.S. Ramachaudran, encyclopedia of human Behavior, Vol.4, PP.71-78
4. Pajares, F. & Schunk, D. H. (2002). The development of academic self-efficacy, In A. Wigfield & J. Eccles (Eds). Development of achievement motivation (pp.15-31). San Diago: Academic press.
5. Pajares, F., & Miller, M. (2003). Role of self-efficacy & self-concept beliefs in mathematical problem solving: A path analysis. Journal of Educational Psychology, 86 (2), 193-203.
6. Hackett, G., Betz, N. E., Casas, J. M., & Rocha-Singh, I. A. (1992). Gender, ethnicity, and social cognitive factors predicting the academic achievement of students in engineering. Journal of counseling psychology, 39(4), 527.
7. Hackett, G. & Betz, N. E. (1989). An exploration of the mathematics self-efficacy / mathematics performance calibration, Journal for Research in Mathematics Education, 20, 261-273.

8. Martin, B. A., pro-, U. o. O. i. a. a., Kwai-Choi Lee, C., & se-, U. o. A. i. a. (2004). The influence of ad model ethnicity and self-referencing on attitudes: Evidence from New Zealand. *Journal of Advertising*, 33(4), 27-37.
9. Hackett, G. & Betz, N. E. (1989). An exploration of the mathematics self-efficacy / mathematics performance calibration, *Journal for Research in Mathematics Education*, 20, 261-273.
10. Wilkins, j.M .(2004). Mathematics and science self- concept: An International Investigation .*journal of Experimental Education*, 72. 331- 346.
11. Rogers, C. R. (1951). *Client-centered therapy: Its current practice, implications and theory*: Houghton Mifflin Boston.
12. Parvin, L, E, John A.B (2002), *Psychology of personality (Theory & Research)*, Trans by Kadivar Parvin, and Javadi, Mohammad Jafar, Tehran: Abiz Press
13. Nasr Isfahani, Zahra (2003), *The role of mathematical self efficacy, self concept, and anxiety, and the perceived usefulness in educational achievement among high school first graders at Tehran City*, MA thesis, faculty of psychology and educational sciences, Tehran Tarbiat Moalem University.