

THE REASONS BEHIND STUDENT'S DISINTEREST IN MATH AS A MAJOR AT QATAR UNIVERSITY A COMPARATIVE CASE STUDY

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Abstract

Most universities in the world contain colleges of science as the college of basic sciences. Mathematics is one of the main specializations in these colleges, mathematics departments offer many courses for their students, beside different courses serving other colleges. It has been noticed that the number of students who specialize in mathematics in many universities within the Gulf including Qatar University and the world in general is reducing. This phenomenon led the authors to stop and try to investigate for factors that cause this reduction. Are they the students, schools' teachers, universities' instructors, the family, or other factors?. In an earlier case study about this phenomenon, students opinion at Qatar University were taken through a questionnaire distributed among them. In this paper, instructors from Qatar university were asked about their opinion through a questionnaire which contained 19 questions and was distributed among them. The research aimed to focus on instructors as one of the reasons behind students' disinterest to specialize in Mathematics. It is found that there are social reasons like the family and the lack of work fields for Math graduates. Also, financial reasons like low salaries for Math graduates. In addition, cultural reasons like the society view of a math teacher to be less than other majors, and many other reasons.

Keywords: Reasons; Disinterest; Major; Mathematics; Stratified Simple Random Sample, Z-Test.

1. INTRODUCTION

There is growing evidence of the importance of students attitudes and beliefs about mathematics for their achievement in and successful applications of the subject. Research studies have shown that students in higher education who are not Math majors often have negative images, beliefs and attitudes towards mathematics.

Low achievement or repeated failure in Math often leads to negative attitudes and lowered confidence, resulting in reduced effort or even Math avoidance, leading to further failure. Positive achievement and success in Math often leads to enhanced attitudes and raised confidence, resulting in increased effort and persistence, and further success.

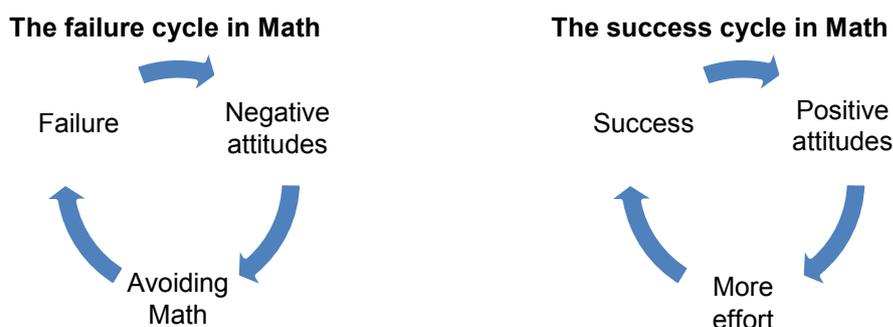


Fig. 1: Failure and Success Cycles in Math

In the past, mathematics was perceived as “a fixed, static body of knowledge” filled with memorizing facts and practicing procedures. What is good mathematics teaching? This question has been debated for some time with no universal agreement in finding an answer. In 1986, Hersh stated that, “one’s conception of what mathematics is affects one’s conception of how it should be presented. When a teacher has a conceptual understanding of mathematics, the classroom instruction is affected in a positive manner.

Methods of teaching and offering Mathematics in the classroom tend to disconnect mathematics with other subjects and the real world. The students learn the techniques, but fail to learn the concepts behind them. We have taught our students mathematics, but not with understanding. Fennema and Romberg wrote, “traditional school mathematics has failed to provide students with any sense of the importance of the discipline’s historical or cultural importance, nor any sense of its usefulness. Is it any wonder that many students dislike mathematics and fail to learn it?”

The National Council of Teachers of Mathematics (NCTM) has remained rooted in the belief that standards are essential in the improvement of our mathematics education system. These three documents include Curriculum and Evaluation Standards for School Mathematics, Professional Standards for Teaching Mathematics, and Assessment Standards for School Mathematics.

In recent years, different lines of investigation have been developed, coinciding with analyzing the causes of the decreasing interest of students towards the study of mathematics. So the importance of this study comes from the fact that mathematics is related to many other specializations in the university, and this will give us the chance to find opinions of the instructors at the university who also can be considered as parents to the students. We conducted the questionnaire only in Qatar University because it is the unique governmental university in Qatar, which needs a reduced budget, and because we couldn’t perform it in other universities in the gulf (at the same time, due to budget restrictions). We chose the specialization of mathematics, because many universities, such as Qatar University, have halted the admission of students in Mathematics.

The organization of this paper is as follows: In Section 1.1, the purpose of the study is presented, population and sample are presented in Section 1.2. In Section 2, study hypotheses are presented, analysis of the study and the results are given in Section 3. In Section 4, a summary of the conclusions and recommendations are presented. Finally, Acknowledgment is introduced in Section 5.

1.1. The Purpose of the Study

The purposes of this study are:

- To point out some reasons that make students disinterested to specialize in Mathematics.
- To introduce some suggested solutions to reduce this phenomenon.
- To compare between the instructors' opinions and the students' opinions about some common questions.

1.2. The Population and the Sample

Qatar University has six colleges and two programs. Since all instructors at the university have the experience and liability to give their opinions as instructors and as fathers or mothers, the population of the study was all instructors at Qatar University for the academic year 2008/2009. The Number of instructors at Qatar University for the academic year 2008/2009 is (637) divided into eight colleges and programs as shown in the following table:

Table 1. Population Information on the College and Number of Instructors:

No	The College	Number of Instructors
1	College of Arts & Sciences	252
2	College of Business & Economics	29
3	College of Education	28
4	College of Engineering	106
5	College of Law	15
6	College of Sharia	32
7	Foundation Program	165
8	Pharmacy Program	10
	Total	637

Since the population is divided into colleges with different weights, the suitable sample to be used in this study is the stratified Simple Random Sample (SSRS) with the following percentages, the sample size for this study is (135) instructors.

Table 2. Survey Information on the College and Number of Instructors:

No	The College	Number of Instructors
1	College of Arts & Sciences	53
2	College of Business & Economics	6
3	College of Education	6
4	College of Engineering	23
5	College of Law	3
6	College of Sharia	7
7	Foundation Program	35
8	Pharmacy Program	2
	Total	135

2. STUDY HYPOTHESES

- There exist social reasons which make students reluctant to specialize in mathematics like the few or limited fields of work for a math graduate, if not limited to the teaching of Math, and the role of family in the student's disinterest in math as a major.
- There exist financial reasons that make students reluctant to specialize in mathematics like the low salaries of math graduates, and the raise of tuition fees for math at the university.
- There exist cultural reasons that make students reluctant to specialize in mathematics like the society view of the math teacher as less than that of doctors or other scientific majors; and the description of math jobs is not clear.
- There exist no difference between the instructors' opinions and the students' opinions.

3. ANALYSIS OF THE STUDY AND THE RESULTS

3.1. Testing The First Three Hypotheses Of The Study:

To test the study hypotheses, one sample z-test with a level of significant ($\alpha = 0.05$) is used, the null hypothesis $H_0 : \mu = 3$, and the alternative hypothesis $H_0 : \mu \neq 3$. By comparing the $p - value$ and the significant level α

If $p - value < \alpha$ then we reject H_0 , otherwise we don't reject H_0 .

The key of the answers in the questionnaire is as follows:

Strongly Agree = 5, Agree = 4, No opinion = 3, Disagree = 2, strongly Disagree = 1

Tests are summarized in the following table

Table 3. Tests of the study hypotheses:

The hypothesis H_0	Mean	p-value	The result
There are social reasons like the few fields of work for Math graduates; and the family has a vital role in the student's disinterest	3.237	0.021	Reject H_0 The instructors agree with this hypothesis.
There are cultural reasons like the society view of the math teacher as less than that of the doctors or other scientific majors; and the description of math jobs is not clear.	3.822	0.014	Reject H_0 The instructors agree with this hypothesis.
There are financial reasons like the low salaries of math graduates, the raise of tuition fees of math at the university.	3.368	0.017	Reject H_0 The instructors agree with this hypothesis.

3.2. Percentages of Instructor's Responses To Some Questions

The following table shows the percentages of instructor's responses to some questions in the questionnaire:

Table 4. The proportions of the instructor's answers for some questions:

The question	Strongly Agree	Agree	No opinion	Disagree	Strongly Disagree
Math departments are greatly responsible for the lack of organized visits to the governmental, educational and private institutions to demonstrate the Math graduate's abilities other than teaching.	22.2%	35.6%	32.6%	7.4%	2.2%
the opening of new branches in Math department like Financial Math and others which are highly wanted in the job market will increase the desire among students to study Math as a Major.	36.3%	43.0%	14.1%	5.2%	1.4%
The coordination between Qatar University and the job market in offering new jobs other than teaching will increase the push for studying math as a major.	32.6%	52.6%	11.1%	3.7%	0.0%
The merge of the Math department with the departments of Physics and Statistics reduced the importance of Math as a major.	14.1%	29.6%	38.5%	15.6%	2.2%
Teaching Math in a traditional way at pre-university schools reduces the students' desire.	31.9	42.2	17.0%	8.2%	0.7%
The insufficient role of mass media in shedding light on Math potential in the job market.	19.3%	56.3%	20.7%	3.1%	0.6%
Math is not generally connected to the actual life which leads to such disinterest.	26.7%	37.8%	11.1%	14.8%	9.6%
Math is taught in English at the universities a matter that leads to inappropriate understanding of the subjects of Math and declines the desire to major in it.	5.2%	20.0%	25.9%	31.1%	17.8%
The teacher of Math has a great role in creating a desire for Math as a major.	41.5%	47.4%	8.1%	3.0%	0.0%

3.3. Comparison between The Instructor's And Student's Opinions:

To compare between two groups (instructors and students) for common questions, authors used independent z-test with a level of significant ($\alpha = 0.05$), the null hypothesis $H_0 : \mu_1 = \mu_2$, and the alternative hypothesis $H_0 : \mu_1 \neq \mu_2$. Where μ_1 is for instructors and μ_2 is for students; and equal variances are assumed.

By comparing the *p-value* and the significant level α

If $p - value < \alpha$ then we reject H_0 , otherwise we don't reject H_0 .

Table 5. Tests of the study hypotheses (some comparisons between t:teacher, s:student)

The question	N	Mean	Standard deviation	p-value	The result
The fields of work for Math graduates are few if not limited to the teaching of Math.					
Q1t Q1s	$N_1 = 135$ $N_2 = 125$	$\bar{X}_1 = 3.27$ $\bar{X}_2 = 3.64$	$S_1 = 1.21$ $S_2 = 1.23$	0.032	Reject H_0
The society view of the math teacher and teachers in general is less than that of doctors and engineers, or any other scientific majors.					
Q3t Q6s	$N_1 = 135$ $N_2 = 125$	$\bar{X}_1 = 3.68$ $\bar{X}_2 = 3.90$	$S_1 = 1.19$ $S_2 = 1.20$	0.007	Reject H_0

Reducing tuition fees of Math at the university will lead to an increase in the number of students majoring in Math.					
Q9t Q9s	$N_1 = 135$ $N_2 = 125$	$\bar{X}_1 = 3.07$ $\bar{X}_2 = 3.66$	$S_1 = 1.06$ $S_2 = 0.98$	0.019	Reject H_0
The teacher of Math has a great role in creating a desire for Math as a major.					
Q16t Q7s	$N_1 = 135$ $N_2 = 125$	$\bar{X}_1 = 4.28$ $\bar{X}_2 = 4.55$	$S_1 = 0.74$ $S_2 = 0.85$	0.021	Reject H_0
Teaching Math in a traditional way at pre-university schools reduces the students' desire.					
Q12t Q5s	$N_1 = 135$ $N_2 = 125$	$\bar{X}_1 = 3.96$ $\bar{X}_2 = 3.40$	$S_1 = 0.94$ $S_2 = 1.46$	0.013	Reject H_0

Table 6. Who is responsible for student's disinterest in the study of Math?

Who is responsible for students' disinterest in the study of Math at the university?						
	The student	The family	University instructor	School teacher	All of them	No one
Instructors	11.1%	3.7%	4.4%	16.3%	45.2%	19.3%
Students	17.6%	6.4%	0.8%	22.4%	42.4%	10.4%

4. CONCLUSIONS AND RECOMMENDATIONS

Authors have arrived at the following conclusions:

1. There exist social reasons which make students reluctant to specialize in mathematics like the few fields of work for math graduates, if not limited to teaching of Math, and the role of the family in the student's disinterest in math as a major.
2. There exist financial reasons which make students reluctant to specialize in mathematics like the low salaries of math graduates, and the raise of tuition fees of math at the university.
3. There exist cultural reasons which make students reluctant to specialize in mathematics like the society view of the math teacher as less than that of doctors or other scientific majors; and the description of math jobs is not clear.
4. 80% of instructors agree that opening new branches in the math department like financial math and others which are highly wanted in the job market, will increase the desire among students to study math as a major.
5. 85% of instructors agree that the coordination between Qatar University and the job market in offering new jobs other than teaching, will increase the push for studying math as a major.
6. 74% of instructors say that teaching math in a traditional way at pre-university schools reduces the students' desire.
7. 76% of instructors agree with the question which says that there is no sufficient role for mass media in shedding light on math potential for the job market.
8. 65% of instructors agree that math is not connected to the actual life which leads to such disinterest.
9. 89% of instructors strongly agree that the teacher of math has a great role in increasing the desire for math as a major.
10. When we made a comparison between the opinions of instructors and the opinions of students, we found that both agree about all the common questions in the two questionnaires.
11. Both instructors and students agree that the cause for students' disinterest in the study of math at the university, is the family and the school teachers.

The following recommendations are introduced:

1. The social reasons which make students reluctant to specialize in mathematics should be reduced by doing the following:
 - a. Changing the view of society about the math teacher, and explaining the importance of Math in our life as teachers, and also in jobs other than teaching.
 - b. Activate the role of mass media by giving lectures, seminars, and programs on TV to explain the importance of math in our life.

- c. Clearing the description of math jobs other than teaching, and that math graduates can work in jobs other than teaching.
2. The financial reasons which make students disinterested in studying math as a major should be solved and reduced by discussing, if it is possible, the following:
 - a. Studying the possibility of reducing tuition fees for math specialization at the university.
 - b. Studying the needs of the labor-market for Math graduates in jobs other than teaching; and arranging regular visits to some governmental organizations to discuss the importance of Math in our life.
 - c. Studying the possibility of giving the students who specialize in Mathematics, financial incentives like monthly salaries to encourage them study this specialization.
 - d. Studying the possibility of raising Math graduates' salaries (which are low).
3. Activate the role of the universities in two methods:
 - a. By opening new branches in the Math department which are highly wanted in the job market.
 - b. By coordination between the universities and the job market in offering new jobs other than teaching.
 - c. Doing frequent meetings with the students and encouraging them to specialize in Math, especially with those who like Math.
4. The school, the university, mass media, and the family, as representatives of the society, and work as a team should work together to create new generation of students who understand the importance of the new stage and is able to follow up the development of the world; and this will not be possible without a specialization like Mathematics.
5. Activate the role of the teachers by doing several intensive workshops and seminars to interchange the experiences, and to help the schools teachers improve their abilities to use the new technology methods in teaching Math.
6. There are some countries which face the same problem; we recommend making use of their experiences and how they treated and solved the problem.

5. ACKNOWLEDGEMENT

This publication was made possible by support of Qatar University. Its contents are solely the responsibility of the authors, and do not necessarily represent the official views of Qatar University.

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