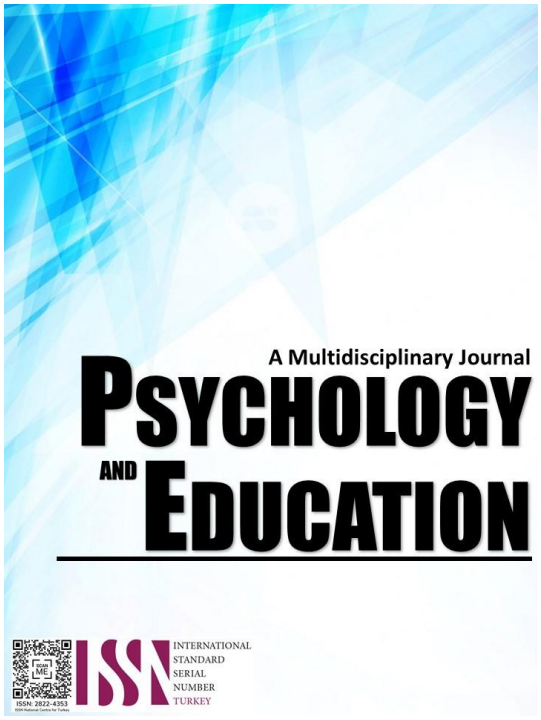
THE CAUSES OF FAILURE IN BASIC MATHEMATICS AT THE COLLEGE STAGE



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Research Article

The Causes of Failure in Basic Mathematics at the College Stage

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Abstract

This study was carried out to determine the factors affecting the failure of students in basic mathematics at the college stage in terms of age, degree course, and family background and identify the causes of failure such as school climate, methods to solve questions, regularity of tests and class population, and other problems faced by the students in learning mathematics. A sample of 128 college students of the Mindanao State University – Tawi-Tawi College of Technology and Oceanography (MSU- TCTO) who were enrolled in basic mathematics subjects in the second semester, academic year 2015-2016 and whose performances were identified as failure or almost failure were selected for the study. This study found that most of the respondents were of above average age, non-math major, and whose parents have not reached college and belonged to low-income families. It also found that school climate was good, lessons were mostly lecture, and only very few drills and exercises, inability to understand lectures, and lack of interaction between the teacher and the students lead to failure. Lack of students' ability in mathematics oftentimes leads to failure. Hence, this study concludes that being of above average age, non- math major, parents' low income and inadequate education, doing so much domestic chores, lengthy syllabus, lack of students' ability and interest towards math, inappropriate number of examples and exercises, and inability to understand lectures are the causes of failure in basic mathematics.

Keywords: *learning, higher education, failure, basic mathematics*

Introduction

Education is the field of study which deals mainly with methods of teaching and learning. Though other may say that education begins at home, the process is formally acknowledged in schools. Education includes knowledge and experiences acquired from infancy to old age. Education is as old as human existence and shall continue to function as long as the human race still lives. According to Pesto Lozzi, "Education is the natural harmonious and progressive development of man's innate power. Education is a process which does all round harmonious development of the individual to modify his behavior, attitude, and thinking."

Mathematics education is very essential in everyone's life. Mathematics is the science of numbers. Every phenomenon which involves numbers, their operations, interrelations, combinations, generalizations, and abstractions, to include the shape, structure, measurement, transformations, change and relationships between these concepts are studied in mathematics. A person's ability to count, calculate, and use different number systems in solving problems in mathematics are expected to be enhanced in school but somehow students fail to comprehend.

Mathematics is one of the languages of human life. According to the famous leader Pandit Jawahar Lal Nehru, "Mathematics is supposed to be a dull subject, but is increasingly recognized that it is of high importance in scientific developments today".

Mathematics is one of the most important subjects which act as a bridge for all knowledge. Every day we encounter mathematics in our every action from the moment we sleep, till the moment we sleep again. Being a mathematics college associate professor, the researcher observed that even everything (like books, computers, solved problems, different types of methodologies, etc.) are provided for the students to learn math, there is still a large number of students who fail in the subject. Because of this reason, the researcher came to an idea of studying the root causes of these failure.

Research Questions

Education is the need of all people. Thus, many programs have been made free for education but still there are continuous drop outs from schools due to many reasons. One of the main reasons of the drop out is the failure in mathematics. Hence, this study strived to answer the following questions:

1. What is the general profile of the respondents in terms of the following:
   1.1. age,
   1.2. gender, and
   1.3. degree course?
2. What is the perception of failure students in basic mathematics at college stage on the following possible causes of failure:
   2.1. Family Background
   2.1.1.Educational level of parents; and
   2.1.2. Parental income.

2.2. Related Characteristics
2.2.1.School climate;
2.2.2. Method to solve question;
2.2.3.Class strength; and
2.2.4. Test?

3. What degree they perceived that the problems faced by the students in learning mathematics affects their performance in the subject in terms of the following:
3.1. Unavailability of time for study at home;
3.2. Help in domestic chores;
3.3. No help from parents in homework;
3.4. Unavailability of time for research;
3.5. Unavailability of opportunity for group study.
3.6. Lack of interest in mathematics;
3.7. Lack of appropriate number of exercises;
3.8. Lack of examples related to topic;
3.9. Lack of mental ability towards mathematics;
3.10. Tuition
3.10.1. Heavy syllabus in mathematics;
3.10.2.Teacher unable to complete syllabus;
3.10.3. Unable to understand lecture;
3.10.4. Syllabus unable to attain the scope of the subject;
3.10.5. No syllabus at all;
3.11. Methods of teaching
3.11.1. (Teacher) not answering question during teaching;
3.11.2. (Student) not serious about completing homework;
3.11.3. (Student) dislike the methods of teaching;
3.11.4. Lack of attention by the teacher; and
3.11.5. Lack of use of blackboard?

4. Is there a significant relationship between the performance of the respondents and their family background?

5. Is there a significant relationship between the students' performance and the related characteristics?

Literature Review

Mathematics Failure

Mathematics anxiety is one of the main reasons in students' failure in math. It is anxiety about one's ability to do mathematics independent of skill. Mark H. Ashcraft defines math anxiety as "a feeling of tension, apprehension, or fear that interferes with the math performance".

According to Sian Beilock and her group at the University of Chicago, math anxiety is not simply about being bad at math. After using brain scans, scholars confirmed that the anticipation or the thought of solving math actually causes math anxiety. The brain scans showed that the area of the brain that is triggered when someone has math anxiety overlaps the same area of the brain where bodily harm is registered.

Some students believe that their mathematical achievement is mainly attributable to factors beyond their control, such as luck. These students think that if they scored well on a mathematics assignment, they did so only because the content happened to be easy. These students do not attribute their success to understanding or hard work. Students might also believe that failure is related to either the lack of innate mathematical inability or level of intelligence. They view their achievement as accidental and poor progress as inevitable. (Beck, 2000; Philips & Gully, 1997).

Failure rates are high and deficient learning in mathematics is commonplace at the college levels in almost all schools. According to the Department of Education (DepEd), more than one third of children are failing to make the expected progress in mathematics.

According to Gough one of the causes of students' failure in mathematics is the "mathemaphobia" or fear of mathematics. She said, "It is an axiom of life that to correct problems, whatever their nature, we must first determine the causes of the problems". Mathemaphobia needs no defining. The term is self-definite. The prevalence of the disease, however, does call for a concerted effort to educate the public against its insidious attacks.

Narotra (1980) while observing the achievement in mathematics found that the failure in subject mathematics has a strong correlation with socio-economic status. Security and problem of students found significantly positive correlation between socio-economic status and achievement in the subject.

Bhargava and Marwaha (1982) while evaluating the performance in mathematics found that deprivation in its social, cultural, and economical parameters causes retardation in solving or in performance of the students in mathematics.

Mohammad Miyan (1982) advocated that method of teaching equally affect the achievement of the students in mathematics. He found that: the guided discovery method was most effective in developing originality in the subject. Furthermore, he also observed that the pure discovery method is not so effective in the achievement in the field of mathematics. He stated that low achievement in mathematics varies from defective textbooks to some personality needs. Lastly, he

mentioned that imparting knowledge and blind use of the articles causes problems or failure in mathematics.

Pritam (2002) in his study on survey of cause of failure in mathematics at +2 stage concluded that, "all the students felt that their failure in mathematics is due to tough examinations of article or formulae in the textbook, tough examples are not explained in one or two different ways, not able to use the library facilities, and lack of books in the library. The number of questions for practice is less, heavy syllabus, theoretical and less practical are some of further causes of failure."

Kalhotra (2013) in his study of causes of failure in mathematics at high school stage concluded that, "the failure students were found to be older in age and low in socio-economic status, it seems that their parents being illiterate and poor, are not able to care for the education of their children by sending them to the school of appropriate age."

Methodology

Research Design

This study used the descriptive quantitative design. Data collected from the respondents were carefully analyzed and this study described and determined the causes of failure in basic mathematics at the college stage of MSU-TCTO in terms of age, gender, and course of students, family background, other related characteristics, and problems faced by students in learning mathematics.

Participants

The respondents of this study were the students of the Mindanao State University – Tawi-Tawi College of Technology and Oceanography (MSU-TCTO), taking basic mathematics courses such as: MATH 1 (Introduction to College Mathematics), MATH 2 (College Algebra), MATH 3 (Fundamentals of Mathematics), MATH 15 (College Trigonometry), and MATH 31 (Elementary Statistics), during the second semester of the academic year 2015-2016, whose performances were identified by their corresponding instructors as *failure* or *almost failure*.

Instruments of the Study

The researcher adopted a questionnaire used by Kalhotra, Satish Kumar in his paper entitled "A Study of Causes of Failure in Mathematics at High School Stage" approved by the panel of experts with a little modification and conducted a survey on the students of MSU-TCTO enrolled in basic mathematics second semester academic year 2015-2016 to identify the causes of failure in mathematics at the college stage. The research instrument included the letters of request to the dean of the College of Arts and Sciences thru the chairman of the Mathematics and Sciences Department of MSU-TCTO, letter to the respondents, and the specially designed questionnaire. All the pertinent details were recorded on the questionnaire seeking information on the aspects included in the study.

Procedure

The researcher secured permission from the dean of the College of Arts and Sciences thru the chairman of the Mathematics and Sciences Department of the MSU-TCTO to allow the respondents to participate in data gathering of this research. The researcher conducted the procedure as indicated on the theoretical framework as follows.

Results

This section includes the tabular presentation, analysis, and interpretation of the data gathered from the respondents. It includes percentages distribution and the mean formula to know the general profile of the respondents and the Multiple Logistic Regression Analysis to test the significant relationships. This part presents tables on the general profile of the respondents, their perceptions on socio-economic status, related characteristics, and other problems faced by failure students in math. This also presents tables on significant relationships between identified variables. These were utilized to identify causes of failure in basic mathematics at the college stage.

Respondents' General Profile: Age, Gender, Degree Course

This part presents tables on the general profile of the respondents.

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Research Article

Table 1. *Respondents' general profiles: age, gender,degree course*

Respondents' Profile	*Responses*	*Percentage (%)*
Age		
16	2	1.56
17	24	18.75
18	37	28.91
19	30	23.44
20 and above	35	27.34
Gender		
Male	56	43.75
Female	72	56.25
Degree Course		
AB English	3	2.34
AB History	3	2.34
AB Political Science	2	1.56
AB Shariah	1	0.78
BEED ECED	1	0.78
BEED Generalist	40	31.25
BS Environmental Science	6	4.69
BS Fisheries Technology	15	11.72
BS Information Technology	4	3.13
BS Mathematics	4	3.13
BS Statistics	1	0.78
BS Teaching Arabic	1	0.78
BSED English	2	1.56
BSED General Science	8	6.25
Diploma Secretarial Science	1	0.78
General Education	36	28.13

Basic mathematics subjects are commonly offered in the freshmen year in college. The academic year 2015-2016 is the period before the implementation of the K to 12 programs of the Department of Education (DepEd). The average age of students in first tertiary year then is 16 to 17 years old. Table 1 reveals that, most of the respondents are aged 18 or above with a total of 102 (79.7%) of the respondents. Moreover, most of the respondents are female (56.25%), and only very few (7.04%) came from math major courses (BS Information Technology, BS Mathematics, and BS Statistics). Thus, failure students are of above average age, mostly female, and came from non-math major courses.

Family Background

This part presents table on educational level of parents and joint annual parental income.

Table 2 reveals that in terms of educational level, most parents have finished only secondary education with 60.16 *Cumm(%)* and 62.5 *Cumm(%)* for father and mother, respectively. This means that most of them have not reached college level and thus unable to help their children with their college basic math homework. Moreover, it is shown that the joint parental income is below 50,000 Ph Peso per annum (71.88%), which means that the respondents belong to low-oncome families.

Table 2. *Family Background*

Educational Level of Parents	*Responses Father*	*(%)*	*Cumm. (%)*	*Responses Mother*	*(%)*	*Cumm. (%)*
Illiterate (Western Education)	5	3.91	3.91	6	4.69	4.69
Elementary Level	16	12.5	16.41	16	12.5	17.19
Elementary Graduate	18	14.06	30.47	15	11.72	28.91
High School Level	21	16.41	46.88	25	19/53	48.44
High School Graduate	17	13.28	60.16	18	14.06	62.5
College Level	21	16.41	76.57	16	12.5	75
College Graduate	26	20.31	96.88	27	21.09	96.09
Earned Masteral Units	1	0.78	97.66	2	1.56	97.65
Masteral Degree	2	1.56	99.22	1	0.78	98.43
Earned Doctoral Units	0	0.0	99.22	1	0.78	99.21
Doctoral Degree	0	0.0	99.22	1	0.78	100
Post Graduate	1	0.78	100	0	0.0	100

Joint Annual Parental Income (Ph Peso)	*Responses*	*(%)*	*Cumm (%)*
Below 50,000	92	71.88	71.88
50.000 to below 100,000	26	20.31	92.19
100,000 to below 150,000	6	4.69	96.88
150,000 to below 200,000	1	0.78	97.66
200,000 and above	3	2.34	100

Related Characteristics

This part presents table on related characteristics such as school climate, method to solve question, class strength, and test schedule.

Table 3 reveals that the school climate was good (65.63%), method to solve question was slightly oral and more on written (53.12%, combined percentage), class was slightly crowded (43.75%), and that the test was conducted weekly (45.31%).

Table 3. *Related Characteristics*

Related Characteristic	*Responses*	*Percentage (%)*
School Climate		
Very Good	23	17.97
Good	84	65.63
Fair	16	12.5
Poor	4	3.13
Very Poor	1	0.78
Method To Solve Questions		
Written	34	26.56
Slightly Oral and More on Written	34	26.56
Oral	10	7.81
Slightly Written and More on Oral	10	7.81
Both Written and Oral	40	31.25
Class Strength		
Not Crowded	39	30.47
Slightly Crowded	56	43.75
Moderately Crowded	20	15.63
Crowded	12	9.38
Over Crowded	0	0.0
No Answer	1	0.78
Test Schedule		
Daily	16	12.5
Weekly	58	45.31
Monthly	27	21.09
At The End of the Chapter	23	17.97
Any Other (Specified every meeting)	4	3.13

Problems Faced by the Students in Learning Mathematics

This part presents the tabular representation of the problems faced by the students in learning math. To measure the degree of the causes affecting the failure in basic mathematics among college students, the weighted mean formula was used. Table 4 shows that respondents *always* do help in working with house chores that may lead to failure in math because students are not given enough time to review lessons at home. Moreover, lack of mental ability towards mathematics *often* causes a failure. Furthermore, unavailability of time for study at home, parents unable to help with homework, unable to understand lecture, do research and group study *sometimes* cause failure. Lack of interest in the subject, lack of appropriate number of exercises, examples, heavy syllabus in math, and teacher not answering the questions from the students *sometimes* lead to failure.

Table 4. *Problems faced by the students in learning math*

Indicator	*Mean*	*Interpretation*
Unavailability of Time for Study at Home	2.70	Sometimes
Help for Parents in Domestic Chores	1.60	Always
No help from parents in homework	3.27	Sometimes
Unavailability of time for research	3.03	Sometimes
Unavailability of opportunity for group study	3.13	Sometimes
Lack of interest in mathematics	3.14	Sometimes
Lack of appropriate number of exercises	3.18	Sometimes
Lack of examples related to topic	3.13	Sometimes
Lack of mental ability towards mathematics	2.34	Often
Tuition		
Heavy syllabus in mathematics	2.88	Sometimes
Teacher unable to complete syllabus	3.54	Seldom
Unable to understand lecture	3.37	Sometimes
Syllabus unable to attain the scope of the subject	3.51	Seldom
No syllabus at all	4.02	Seldom
Methods of teaching		
(Teacher) not answering question during teaching	3.37	Sometimes
(Student) not serious about completing homework	3.69	Seldom
(Student) dislike the methods of teaching	3.83	Seldom
Lack of attention by the teacher	3.44	Seldom
Lack of use of blackboard	3.67	Seldom

Finally, *seldom* for teacher to have no syllabus or unable to complete syllabus, to show less attention to students or less use of blackboard, and also *seldom* for students to not be serious about completing homework and to dislike the method of teaching.

Test of Significance

Regarding the significant relationships between the performances of the students with their family background and so as with other related characteristics, the Multiple Logistic Regression Analysis is being applied. The results are shown in Table 5 and Table 6.

Table 5. *Multiple Logistic Regression Results of the Relationship between the Family Background and the Performance of the Respondents*

Variable	*B*	*S.E. (B)*	*P-value*	*Interpretation*
Father Educational Level				
Illiterate	-0.026	2.168	0.990	Not Significant
Elem Level	-0.657	1.757	0.708	Not Significant
Elem Grad	0.889	1.743	0.610	Not Significant
High School Level	-0.553	1.740	0.750	Not Significant
High School Grad	-0.344	1.743	0.844	Not Significant
College Level	0.345	1.680	0.837	Not Significant
College Grad	-0.311	1.687	0.854	Not Significant
Advanced (ref. category)				
Mother Educational Level				
Illiterate	-2.105	*1.646*	0.201	Not Significant
Elem Level	-1.529	1.231	0.214	Not Significant
Elem Grad	-0.547	1.216	0.653	Not Significant
High School Level	-1.118	1.153	0.332	Not Significant
High School Grad	-0.931	1.168	0.425	Not Significant
College Level	-2.894	1.299	0.026*	Significant
College Grad	-0.807	1.087	0.458	Not Significant
Advanced (ref. category)				
Parents' Annual Income				
below-50,000	-0.216	0.794	0.786	Not Significant
50,000-99,999	-0.723	0.908	0.426	Not Significant
above 100,000 (ref. category)				

Multiple Logistic Regression Analysis (Table 5) shows that there is no significant relationship between the students' performances and their family background except only for the education level of the mother (College Level).

Table 6. *Multiple Logistic Regression Results of the Relationship between the Related Characteristics and the Performance of the Respondents*

Variable	*B*	*S.E. (B)*	*P-value*	*Interpretation*
School Climate				
Very Good	-0.821	1.092	0.452	Not Significant
Good	-0.251	1.017	0.805	Not Significant
Fair	-1.883	1.258	0.134	Not Significant
Poor (ref. category)				
Methods to solve questions				
Written	-0.909	0.554	0.101	Not Significant
Slightly oral and more on written	-0.257	0.513	0.616	Not Significant
Oral	-0.110	0.780	0.888	Not Significant
Slightly written and more on oral	-0.116	0.802	0.885	Not Significant
Both written and oral (ref. category)				
Test				
Daily	-1.110	0.817	0.174	Not Significant
Weekly	-0.064	0.503	0.899	Not Significant
Monthly	0.143	0.600	0.811	Not Significant
At the end of the chapter/any other (ref. category)				

Multiple Logistic Regression Analysis (Table 6) shows that there is no significant relationship between the students' performances and other related characteristics.

Discussion

The poor results in mathematics reflect a general panorama of poor academic performance. Thus, this research's main goal is to identify the causes of failure in basic mathematics at the college stage. This study made use of percentages distribution to know the general profile of the respondents and the Multiple Logistic Regression Analysis to test the significant relationships between the performance in mathematics of the respondents and their family background and between the students' performance and the students' related characteristics. To measure the degree of the causes affecting the failure in basic mathematics among college students, the weighted mean formula was used.

This paper reveals that, most of the respondents are aged 18 or above with a total of 102 (79.7%) of the respondents, most of the respondents are female (56.25%), and only very few (7.04%) came from math major courses (BS Information Technology, BS Mathematics, and BS Statistics). Additionally, it also reveals that in terms of educational level, most parents have finished only secondary education with 60.16 *Cumm(%)* and 62.5 *Cumm(%)* for father and mother, respectively. This means that most of them have not reached college level and thus unable to help their children with their college basic math homework. It was also shown that the joint parental income is below 50,000 Ph Peso per annum (71.88%), which means the respondents belong to low-income families. This study also reveals that the school climate was good (65.63%), method to solve question was slightly oral and more on written (53.12%, combined percentage), class was slightly crowded (43.75%), and that the test was conducted weekly (45.31%).

Furthermore, this paper shows that respondents *always* do help in working with house chores that may lead to failure in math because students are not given enough time to review lessons at home. Lack of mental ability towards mathematics *often* causes a failure. In addition, unavailability of time for study at home, parents unable to help with homework, unable to understand lecture, do research and group study *sometimes* cause failure. Lack of interest in the subject, lack of appropriate number of exercises and examples, heavy syllabus in math, and teacher not answering the questions from the students *sometimes* lead to failure. Lastly, *seldom* for teachers to have no syllabus or unable to complete syllabus, to show less attention to students or less use of blackboard, and also *seldom* for students to not be serious about completing homework and to dislike the method of teaching.

For the test of significance, this paper reveals that there were no significant relationships between the performances of the students with their family background, except only for the educational level of the mother (college level), and with other related

characteristics.

Conclusion

Based on the results presented, majority of the failure students have the following characteristics: above average age, non-math major, lack of mental ability towards mathematics, parents are illiterate or have inadequate education, parents are unable to help in children's homework, belonging to low-income families, and spending so much time doing house chores which would not give them enough time for review, do research and group study. Additionally, unable to understand lecture, lack of interest in the subject, lack of appropriate number of exercises and examples, heavy syllabus in math, and teacher not answering the questions raised by the students may *sometimes* cause failure.

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