



# Real-World Problems faced by Engineering students of Mathematics: A Study on Select colleges of Telangana.

by

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## Abstract

Mathematics is a prime constituent for engineering students. The main goal of mathematics learning for engineering students is the ability to apply a wide range of mathematical techniques and skills in their engineering and professional work. The students' performance in the examinations of 1st year engineering mathematics is often poor. Generally, students have difficulties in basic mathematics content. Those difficulties may be assumed as one of the causes of abandonment and the existence of failures. This research utilises combined primary and secondary sources of data. The basic data is collected via a questionnaire sent to engineering students.

Achievement in mathematics depends on several factors.

The aim of the research is to study the problems of mathematics among engineering students in Telangana. Statistical tools and procedures including such factor analysis were used to analyze the gathered data.

## Introduction

The acquisition of mathematics had been one of the greatest challenges and concerns of educators, particularly for engineering students. Mathematics encompasses numerous abilities and concepts. The cultivation of problem-solving skills is one of mathematics' most important functions. Mathematics is frequently viewed as an area of study that students find difficult to comprehend; consequently, many universities face the problem of students dropping out due to math. In engineering colleges, mathematics is a required first-semester course for first-year engineering students. If students fail to do well in the initial term, they will be burdened for the remainder of the academic year, as they will be required to continue the failed course(s) in addition to keeping up with other subjects. Not only should engineering education emphasize the development of one's professional competences – expertise, professional skills, and reflection – but also cognitive competence, problem-solving ability, and interpersonal skills such as self-competence, cooperation, and communication. The Engineering Mathematics subject has the greatest failure rate in Telangana. The character of individual research subjects determines the quality of engineering education. The study of mathematics influences the growth of the skills required of engineers.

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Keywords: Mathematics, Problems, Factor Analysis, SPSS

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### Literature Review

According to Anda Zeidmane and Tatjana Rubina (2017), "Causes of Mistakes in Math by Students studying engineering at the Latvian University of Agriculture" The purpose of this research is to investigate the causes of mathematics failure among engineering students. The analysis of mathematical test results and survey data form the basis of the study. The survey collected information and views regarding 1) the syllabus, 2) the instruction process, and 3) the students: their lack of basic knowledge, challenges with comprehending, learning routines, attitudes toward the learning process, home history, and emotional and personality traits. The examination of the survey results revealed that the fundamental issue at the University of Agriculture in Latvia is not only not enough students' prior experience in mathematics, but also their mindset toward learning, psychological reaction to the first failure, and reluctance to exert effort to complete additional assignments or attend tutorials.

"Difficulties Received by Pupils in the Learning and Use of Math Terminology: A Analytical Literature Review," by Ednah Chebet Mulwa (2015). Utilizing document analysis, the study's objective was accomplished. Reviewing documents was necessary for data analysis. This study revealed that students have difficulty employing mathematical phrases and their associated concepts. It was also suggested how these terms could be taught to create more meaning for the students.

Hamidreza Kashefia, Zaleha Ismaili, and Yudariah Mohamad Yusof (2012) in their study titled "Engineering Mathematics Obstacles as well as Improvement: A Comparison of Students' and Lecturers' Perspectives via Creative Problem Solving." At the conclusion of the semester at the University of Technology Malaysia (UTM), students from three classes completed structured questionnaires to collect the majority of the data for this study. Imaging and three-dimensional sketching are viewed by the majority of both students and professors as the two most challenging aspects of learning Engineering Mathematics.

### Methodology

This is a quantitative research conducted using survey method. A structured questionnaire was given to selected students taking Mathematics course in engineering with 19 items to be rated.

### Participants

This research was conducted in engineering college in Telangana. The respondents have been sent a questionnaire through the google sheet, college by college. Out of 1025, only 610 students submitted the completed questionnaire.

### Data Collection

Data was collected using a set of questions and agreement on statements of problems toward mathematics questionnaire. A set of questionnaire with Nineteen items with responses gathered on a 5 point Likert scale (see Table 1). Scale 1 is for strongly disagree, scale 2 is for disagree, scale 3 is for neutral, scale 4 is for agree and scale 5 is for strongly agree.

**Table 1: Problems of students of studying Mathematics in Engineering**

S.No	Problems of studying Mathematics
1	Irregular to the class
2	Not taking notes from lectures
3	Concentration and attention difficulties in the class
4	Difficulty remembering math facts, concepts, rules, formulas, sequences, and procedures.
5	Mistakes such as number additions, substitutions, transpositions, omissions, and reversals in writing, reading, and recalling numbers.
6	Concepts are learned, but not understood / Lack of understanding
7	Math is built upon previous concepts
8	Lack of interest results and practice
9	Lack of confidence and patience
10	Lack of mathematical interest
11	Lack of basics at Elementary School
12	Not relevant to daily life
13	Not proper guidance
14	Last minute preparation
15	Understanding wrong concepts from you tube
16	Learning through pdf notes without practice
17	Confusing operations signs or performing them in wrong order.
18	Math anxiety and phobia
19	Mathematics is not a priority to engineering students

## Objective of the study

1. "To analyze the major problems and factors that affect engineering students in studying mathematics in Telangana."

## Factor analysis

To analyse the factorial structure of the SERVQUAL scale, an Analysis Of variance Analysis (EFA) was conducted using SPSS. The EFA algorithm used is the "Principle components method" with "Varimax rotation," and factors with eigen values larger than one were preserved independently.

## Sphericity Test

In order to assess the adequacy of the sampling confirmatory factor analyses, the Bartlett's Test as well as the Kaiser Meyer Olkin (Kaiser - meyer - olkin) Test were utilised. Perception and Expectations in Service: Part 2 of Bartlett's Test Customer Satisfaction has a P value of 0.000. The KMO readings are all over 0.9. This shows the data inside the test are factorable.

**KMO and Bartlett's Test**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.731
Bartlett's Test of Sphericity	Approx. Chi-Square	13703.913
	df	171
	Sig.	.000

According to the above table, the strength of the link between variables is high, as shown by the KMO statistic of .731, therefore the null hypothesis (Correlation equals identity matrix) for Bartlett's test is rejected, as indicated by the P-Value of .000. As a result, principal component analysis can be used.

**“Communalities: Initial Vs Extraction”****Communalities**

	Initial	Extraction
Irregular to the class	1.000	.696
Not taking notes from lectures	1.000	.908
Concentration and attention difficulties in the class	1.000	.820
“Difficulty remembering math facts, concepts, rules, formulas, sequences, and procedures.”	1.000	.854
“Mistakes such as number additions, substitutions, transpositions, omissions, and reversals in writing, reading, and recalling numbers.”	1.000	.921
“Concepts are learned, but not understood / Lack of understanding”	1.000	.902
Math is built upon previous concepts	1.000	.857
Lack of interest results and practice	1.000	.968
Lack of confidence and patience	1.000	.881
Lack of mathematical interest	1.000	.855
Lack of basics at Elementary School	1.000	.900
Not relevant to daily life	1.000	.868
Not proper guidance	1.000	.962
Last minute preparation	1.000	.808
Understanding wrong concepts from you tube	1.000	.830
Learning through pdf notes without practice	1.000	.768
“Confusing operations signs or performing them in wrong order.”	1.000	.885
Math anxiety and phobia	1.000	.778
“Mathematics is not a priority to engineering students”	1.000	.712

Extraction Method: Principal Component Analysis.

Extraction: In contrast, the extraction communalities provide the ultimate communalities, which are frequently less than the initial communalities of 1.0 and represent the proportion of variance in the parameter explained by parts with Eigen values greater than 1.0. If the extracted communalities are less than 0.40, the variable is deleted from the component analysis. No factors need to be eradicated.

**"Total Variance Explained"**

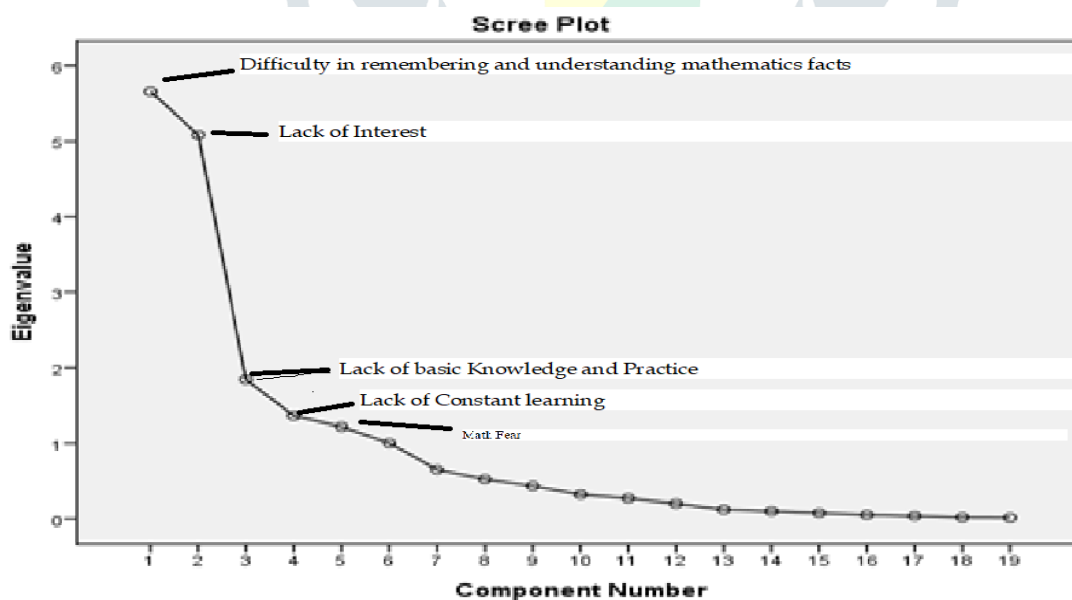
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.660	29.789	29.789	5.660	29.789	29.789	4.613	24.280	24.280
2	5.084	26.758	56.546	5.084	26.758	56.546	3.533	18.597	42.877
3	1.845	9.709	66.256	1.845	9.709	66.256	2.356	12.402	55.279
4	1.363	7.176	73.432	1.363	7.176	73.432	2.197	11.562	66.841
5	1.218	6.413	79.845	1.218	6.413	79.845	1.953	10.282	77.122
6	1.002	5.274	85.119	1.002	5.274	85.119	1.519	7.996	85.119
7	.649	3.418	88.537						
8	.524	2.759	91.296						
9	.435	2.288	93.584						
10	.321	1.690	95.274						
11	.271	1.428	96.702						
12	.200	1.053	97.754						
13	.123	.647	98.401						
14	.102	.536	98.938						
15	.077	.405	99.343						
16	.052	.274	99.617						
17	.038	.200	99.817						
18	.020	.103	99.920						
19	.015	.080	100.000						

"Extraction Method: Principal Component Analysis."

### Retaining the Maximum Number of Components

For determining how many factors should be retained in a factor analysis solution, a number of rules have indeed been proposed. The following are two of most popular:

1. The eigenvalue criteria for latent roots. The Scree test is number two.



The Scree Test displays latent roots vs the number of components in their extraction roots. The size of consecutive eigenvalues decreases dramatically and eventually tends to stabilize. Maintain all eigenvalues (and hence components) throughout the steep decline before the line when they begin to level off. Consider the scree plot. Thus, according to the scree plot criteria, a four-factor solution is sufficient to represent the data.

### Rotating the Constraints

Rotation is a technical term that refers to the process of tilting the axis of each component to the right in order to ease the variables' association or affinity with a single factor, therefore reducing the variables' dispersed interaction with other factors. Thus, by rotating the original factor axis in a new direction, we can facilitate factor understanding.

Rotated Component Matrix <sup>a</sup>						
	Component					
	1	2	3	4	5	6
Irregular to the class						
Not taking notes from lectures		.905				
Concentration and attention difficulties in the class						
"Difficulty remembering math facts, concepts, rules, formulas, sequences, and procedures".				.783		
"Mistakes such as number additions, substitutions, transpositions, omissions, and reversals in writing, reading, and recalling numbers."			.849			
"Concepts are learned, but not understood / Lack of understanding"	.925					
Math is built upon previous concepts					.816	
Lack of interest results and practice		.941				
Lack of confidence and patience	.903					
Lack of mathematical interest				.822		
Lack of basics at Elementary School			.843			
Not relevant to daily life	.902					
Not proper guidance		.935				
Last minute preparation						.733
Understanding wrong concepts from you tube				.858		
Learning through pdf notes without practice			.829			
"Confusing operations signs or performing them in wrong order."						.735
Math anxiety and phobia					.796	
Mathematics is not a priority to engineering students						
"Extraction Method: Principal Component Analysis".						
"Rotation Method: Varimax with Kaiser Normalization."						
a. "Rotation converged in 7 iterations."						

Varimax seeks to simplify factor loadings by limiting them to values close to zero or one. Varimax is a robust and straightforward approach that often improves the comprehensibility of factors, making it the most widely used orthogonal rotation scheme. In the preceding table, the Rotated Component Matrix displays the "rotated factor loadings," which are the orders of magnitude of these vertical projection, or the correlations of the factors with the new factors. When a factor is highly correlated, its loading is close to 1 or, more precisely, more than .5. We depend on that factor to aid in the interpretation and comprehension of the factor. These discovered aspects or components correspond to the four distinct dimensions through which a client evaluates his or her pleasure / discontent using a weighted average. The preceding section contains the findings of the factor analysis.

### Final Solution of Factor

	C1	C2	C3	C4	C5	C6
"Dimensions "	"Difficulty in remembering and understanding mathematics facts"	"Lack of Interest"	"Lack of basic Knowledge and Practice "	"Lack of Constant learning"	"Math Fear"	"Careless attitude"
1	"Concepts are learned, but not understood / Lack of understanding"	"Lack of interest results and practice"	"Mistakes such as number additions, substitutions, transposition	"Understanding wrong concepts from you tube"	"Math is built upon previous concepts"	"Confusing operations signs or performing them in

			s, omissions, and reversals in writing, reading, and recalling numbers"			wrong order."
2	"Lack of confidence and patience"	"Not proper guidance"	"Lack of basics at Elementary School"	"Lack of mathematical interest"	"Math anxiety and phobia"	"Last minute preparation"
3	"Not relevant to daily life"	"Not taking notes from lectures"	"Learning through pdf notes without practice"	"Difficulty remembering math facts, concepts, rules, formulas, sequences, and procedures."		
Eigen Values	5.660	5.084	1.845	1.363	1.218	1.002
Variance %	29.789	26.758	9.709	7.176	6.413	5.274
Cumulative	29.789	56.546	66.256	73.432	79.845	85.119

From the above table, the criteria which is highly responsible for choosing a bank are given below:

C1 = "Difficulty in remembering and understanding mathematics facts"

C2 = "Lack of Interest"

"C3 = "Lack of basic Knowledge and Practice "

"C4 = "Lack of Constant learning"

C5 = "Math Fear"

C6 = "Careless attitude"

With 29.489 percent, the primary problem impacting the visitor is promise keeping. Professionalism is the second component, while Sympathy and sincerity make up the third component. The fourth aspect is physical infrastructure.

### Conclusion

As a result of the study, Six important variables have been discovered among the nineteen, namely "Difficulty in remembering and understanding mathematics facts", "Lack of Interest", "Lack of basic Knowledge and Practice", "Lack of Constant learning", "Math Fear", and "Careless attitude". all of which have a significant impact on the engineering student.

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