

TRIGONOMETRY COMPETENCY AND ACADEMIC ACHIEVEMENT IN MATHEMATICS AMONG HIGH SCHOOL STUDENTS

Suyambukani.V¹ & S.Malathi², Ph.D.

¹M.Ed. Scholar, N. K. T. National college of Education for women, Chennai.

²Associate Professor of Education, N. K. T. National college of Education for women, Chennai.

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Abstract

Trigonometry is an area of mathematics that students believe to be particularly difficult and abstract compared with the other subjects of mathematics. Trigonometry is often introduced early in year eight with most textbooks traditionally starting with naming sides of right-angled triangles. Students need to see and understand why their learning of trigonometry matters. In this research paper an attempt has been made to find out the gender wise and school wise difference in Trigonometry competency and Academic achievement in mathematics among high school students. 300 students of IX class were selected randomly as a sample of the study. Trigonometry Concept Test (TCT) constructed by Dr. Jasdeep Kaur Sachdeva and Pooja Arora were used as tool of study. The results revealed that sex wise and school wise students do not differ significantly from each other with respect to Trigonometry competency and Academic achievement.

Keywords: Trigonometry competency and Academic achievement among high school students, obstacles for learning.



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Introduction

Mathematic use of paramount importance in all walks of human life. There are various branches of mathematics like arithmetic, algebra, statistics, geometry, trigonometry etc. Trigonometry is a subject that is highly valued. It has a long history as a component of the mathematics curriculum with methods reaching far back before the 20th century. Trigonometry has appeared in both the Curriculum and Evaluation Standards (NCTM, 1989) and Principles and Standards for School Mathematics (NCTM, 2000). At the same time, it is also a subject that has been regarded as an important in domains outside of mathematics particularly those in science, technology, and engineering. Careers in physics, astronomy, computer graphics, optics, and many branches of engineering require an understanding of trigonometric functions

and their application. Moreover, principles of trigonometry have a practical application in the work of carpenters, surveyors, architects, and navigators (Hoachlander, 1997). Despite its relevance, trigonometry continues to be a subject with which many students struggle (Blackett & Tall, 1991; Kendal & Stacey, 1998; Weber, 2005).

Conceptual understanding of trigonometry, an important branch of mathematics which is introduced in ninth class in our country is the gateway to advanced mathematics in science in higher education. It has application in both pure mathematics and in applied mathematics. Using the principles of trigonometry the geometric properties of objects can be calculated easily to an unerring degree of accuracy. The mathematic topics of Fourier series and Fourier transform rely heavily on the knowledge of trigonometry function and find application in number of areas as in the study of radiation, wave motion, modulation of radio waves in electronics and electric power engineering. Trigonometry grew to be a major branch of mathematics because of the enormous amount of applications it has in the above mentioned fields and proper understanding of trigonometry requires in-depth knowledge of concepts in trigonometry which act as a means of achieving higher platforms of learning trigonometry.

There are several research related to analyzing problem solving in trigonometry problems. One of which is that a study of 80 senior secondary students in Nigeria. The researchers used the Mathematics Achievement Test (MAT) and the Trigonometry Diagnostic Test (TDT) to investigate the type of errors that were done by the students. The results indicated that students still struggled to solve trigonometry problems. Also, the teacher should give more opportunities for students to do regular problems, and concentrate to solve problems one step at the time. The researchers Usman MH, Hussaini MM(2017) suggest that this study has to be expanded in different level of education

Need for the Study

The purpose of this study was to develop an interest among the students to learn in-depth of the concepts in trigonometry. An individual's mathematical knowledge is her or his tendency to respond to perceived mathematical problem situations by reflecting on problems and their solutions in a social context and by constructing or reconstructing mathematical actions.

Statement of the problem

The problem of the study is stated as “Trigonometry competency and Academic achievement in mathematics among High school students”

Objectives of the study

The following objectives were formulated.

- To find out the level of trigonometry competency of high school students.
- To find out whether there is any significant relationship between trigonometry competency and academic achievement in mathematics among high school students.
- To find out whether there is any difference between male and female students in trigonometry competency.
- There is no significant difference in academic achievement in mathematics between male and female students.
- To find out whether there is any significant difference in trigonometry competency among students studying in different types of schools.
- To find out whether there is any significant difference in achievement in mathematics among students studying in different types of schools.

Hypotheses of the study

The following hypotheses were formulated.

- There is no significance relationship between trigonometry competency and achievement in mathematics among high school students.
- There is no significance difference between boys and girls in trigonometry competency.
- There is no significance difference between boys and girls in achievement in mathematics.
- There is no significance difference in trigonometry competency among students studying in different types of schools.
- There is no significance difference in academic achievement in mathematics among high school students studying in different types of schools.

Research Method

For conducting the present investigation, descriptive survey method of research was used. The subjects for the study were 300 students drawn from Government-Aided, Government and Private High school students. The students' responses to the test were analysed and categorized. Observations notes were considered

Instrumentation

The instrument used in this study was designed to ascertain the mathematics interest of the students on the trigonometry. The problems in this trigonometry were modelled based on the

curriculum on trigonometry competency for high school. The trigonometry concept test has multiple choice type 50 items and it is the self-administering test. Each item has four options. Only one is correct. A Score of one is assigned for each correct response and the total score obtained by a student is the total number of his correct responses. The scoring can be done according to scoring to scoring key and it has six concepts. The questions used in this study had been checked for their validity and reliability.

Reliability value is calculated using Cronbach’s Alpha method which was found to be 0.74. The content validity of the test was done in the process of test development by seeking opinion of teachers teaching trigonometry to high school students and experts related to the field. The index of validity has been computed by finding the square root of validity was found to be 0.86 and hence the scale is considered to be having high reliability and validity.

The students were given the assessment, told to answer all the question to the best of their ability. Time was not intended to be a factor, however, 60 minutes was allotted for completion. The students were allowed to stop working on the assessment if they felt they could no longer answer the questions. None of the students took no longer than 60 minutes.

Mathematics Quarterly marks of High school students were taken for Academic Achievement in Mathematics.

Data Analysis

Data collected from the subjects were subjected to appropriate statistical analysis to draw up inferences from it. ‘t’ test ,ANOVA were used for data analysis.

Answers to research questions

Research question 1: Is there any significant relationship between Trigonometry competency and academic achievement in mathematics among high school students.

Table 1: Showing the relationship between Trigonometry competency and Academic achievement

Variables	Trigonometry competency	Academic achievement
Trigonometry competency	1	.136*
Academic achievement	0.136*	1

**correlation is significant at the 0.05 level (2-tailed)*

The calculated ‘r’ value in the above table shows that there is significant relationship between Trigonometry competency and Academic achievement in Mathematics.

Research question 2: Is there any significant difference between male and female students in Trigonometry competency.

Table 2: Showing the mean difference between male and female students in Trigonometry competency

Variables	Gender				t value	Level of significance
	Male		Female			
	Mean	SD	Mean	SD		
Trigonometry competency	46.6776	2.64100	46.8446	2.29674	.584	NS
Academic achievement	64.5921	15.20167	63.5743	15.27084	.578	NS

Note: NS-Not Significant

It is inferred from the above table value that there is no significant difference between male and female students in Trigonometry competency.

Research question 3: Is there any significant difference between students based on school type in Trigonometry competency and Academic achievement in Mathematics.

Table 3: Showing the mean difference between school type among high school students in Trigonometry competency and Academic achievement in Mathematics

Variables		Sum of squares	Difference	Mean square	F	Level of significance
Trigonometry competency	Between groups	4.500	2	2.250	.366	NS
	Within groups	1826.220	297	6.149		
	Total	1830.720	299			
Academic achievement	Between groups	4.860	2	2.430	.010	NS
	Within groups	69247.710	297	233.157		
	Total	69252.570	299			

Note: NS-Not Significant

It is inferred from the above table value that there is no significant difference in Trigonometry competency and Academic achievement based on school type.

Discussion

Identifying and helping students to overcome the fear and to develop the interest in learning trigonometric concept. The students had problems with prior and new knowledge about

concept, process in learning trigonometry. The reasons of errors, which students made in trigonometry lesson, were memory-level teaching, mal-rule teaching or teaching concepts. This may be especially important at the introductory level.

Conclusion

The study found students may gain the interest when the teaching method is modified and the basic concept were understood clearly.

Prospects for further work

As a result of the study, to determine the relationship of the trigonometry concepts and academic achievement one should 'investigate the students' cognitive processes. For an in depth understanding of the students' problems in trigonometry, the interviews can be done with the students.

From the result above can be concluded that students generally have neither understanding nor solving the trigonometry questions given. The average score they got was low. This happens can be caused by two aspects. First, the student has no proper prior knowledge, particularly in algebra operation and its properties. It can be shown from the students' answer while doing the question that they still make an error when they have to find the solution of x in the square root. Second, the students have very few understanding of trigonometry, particularly in trigonometry properties. It can be inferred from the students' answer that most of them find difficult to explain, reason and make an argument regarding the trigonometry statement. Because of they cannot explain correctly, then the score they get is low. From the qualitative result, generally, the students' performance in mathematical argumentations in trigonometry is mostly inappropriate. Although the students give the reason as the question asked, however, the reason does not have a connection between the steps. They still do not understand the definition of a trigonometric value, cannot differ between angle and a value of the trigonometric function, unable to construct the causes and consequences. Moreover, many students ignore mathematical symbol and do not engage with it. They can easily change the mathematical symbol. These results suggest that there are many things in teaching and learning of mathematics that need to be fixed particularly in trigonometry. For the teacher of mathematics, knowing the students' weaknesses in mathematics, i.e. in which part of the material need to emphasize or what student ability need to enhance is useful to engage teaching and learning process.

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