

An Experimental Study on X standard students regarding difficulties in learning and effectiveness of remedial teaching of trigonometry in Mathematics

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Abstract:

Trigonometry is a very important topic in mathematics subject. In the class 10th integrations memorization, conceptual understanding, problem-solving ability, etc covers in the syllabus which is very important in daily lives. The causes of an individual's difficulties in learning may be physiological, and emotions such as anxiety, fear, hatred of mathematics or problems at home, poor home environment, lack of encouragement and facility, low intelligence, or pedagogical reasons. Pedagogical causes are related to syllabi and teaching and learning activities. Mathematics learning largely consists of building an understanding of concepts onto already understood concepts. The suggested remedies are found to be effective in math teaching. All types of students can equally benefit from this way of learning. The learner showed a positive attitude toward the Remedial Teaching Method. Students showed a more favorable attitude towards the Remedial Teaching Method than the lecture method. The cause of this popularity is due to the fact that the Remedial Teaching Method provides the advantage of individualized learning which is not available in true traditional class teaching.

Keywords: *Mathematics, Trigonometry, Remedial Teaching, Difficulties in learning, X standard students Experimental Study.*

INTRODUCTION:

Mathematics is a subject that has a significant impact on people. People need mathematics to solve problems in daily activities. Mathematics is a study of measurement, numbers, and space, which is one of the first signs that humans work to develop because of its great importance and benefits. Mathematics plays a vital role in all aspects of life, whether in everyday matters such as time tracking, driving, cooking, or jobs such as accounting finance, or banking, mathematics is used as an essential tool in many fields, including natural science, engineering, medicine, and social science. Mathematics is the cradle of all credit creations, without which the world cannot move an inch. Mathematics helps us understand the world and provides an effective way of building mental discipline. Mathematics encourages logical reasoning, critical thinking, creative thinking, abstract thinking, and spatial thinking. Problem-solving and even, Effective communication skills are nurtured by it. In the 9th standard, students are introduced to the new topic of trigonometry, architects, Draftsman, engineers, scientists, pilots, game developers, and even chemists use trigonometry. Trigonometry is one of the important fields of mathematics, particularly for careers that are built around calculating angles. Working knowledge of trigonometry and its use are important for students. Being a mathematics teacher, it has been observed that children develop a phobia of the subject as he or she moves on to higher classes. Which results in dislike towards the subject and poor achievement in the examination? Thus, this became the intention of the researcher to select this as the research topic. While diagnosis is the process of investigating the learners' difficulties and the reasons for this, its follow-up leads to actions that may help children make up for their deficiencies. This step is generally termed remedial teaching. So, you have to be skilled in preparing or arranging for such materials which may be used to undertake corrective instruction and thus enhance the quality of learning.

BACKGROUND OF THE STUDY:

Trigonometry is a fascinating world of ratios, angles, and transcendental functions and is a part of every high school mathematics curriculum. It is an area of pure mathematics that has important applications in every scientific discipline. It may be developed from considerations of the ratios of the sides of a right-angled triangle or from the rotation of a point on the unit circles.

Trigonometry is an important course in the high school curriculum. Understanding trigonometric functions is a prerequisite for understanding topics in Newtonian physics, architecture, surveying, and many branches of engineering. Further, as trigonometry is one of the earliest mathematics topics that link algebraic, geometric, and graphical reasoning, it can serve as an important precursor to understanding pre-calculus and calculus. The main role of a teacher is to Promote quality learning among the students. This is possible only when the teacher act as a guide and the students actively participates in the process of learning. During the teaching-learning process, the teacher has to locate and identify the areas where the learner commits mistakes. It is a crucial stage of the teaching-learning process where he or she has to DIAGNOSE and prepare the instructional material for REMEDIAL teaching to ensure their desired quality of learning. It is used in education to determine the learning difficulties or deficiencies of the learner. In this RESEARCH an attempt is being made to analyze the effectiveness of diagnostic tests. A diagnostic test is a form of pre-assessment that allows a teacher to determine students' individual strengths, weaknesses, knowledge, and skills prior to instruction. It is primarily used to diagnose students' difficulties and to guide lesson and curriculum planning. Thorndike and Hagen (1970) suggested that a diagnostic test should provide a detailed picture of the strength and weakness of a pupil in a particular area. It has been observed that most students today have little interest in the Trigonometry subject. It is on this premise that this research was conducted to explore the effectiveness of Remedial teaching, an approach for intensifying students' academic performance in Mathematics. Considering that Mathematics is a hard subject, how teach it is a challenge. As quoted by Ignacio Estrada, 108 "If a child can't learn the way we teach, maybe we should teach them the way they learn". The current situation in which students rely on modules to learn gave the researcher an idea about what kind of modules would help the learners enhance their academic performance, especially in Trigonometry. Thus, the researcher conducted this study to determine the effectiveness of remedial teaching in Trigonometry.

JUSTIFICATION OF PRESENT STUDY:

In the professional journals, the Mathematics Teacher, Mathematics in School, and Mathematics Teaching, teachers highlighted the activities to teach trigonometry, e.g., the real-world activities, the relation between geometry, algebra, and trigonometry, and the introduction of trigonometry by using different approaches. Of the few research studies available, Blackett and Tall (1991) examined the role of interactive computer graphics in learning introductory trigonometry and found a greater improvement in experimental students' performance. The survey review of the literature on trigonometry and remedial teaching in trigonometry revealed that less research has been done in the area of trigonometry at the secondary school level, in terms of student performance and curriculum design. Secondly, the researcher focused on the studied students at the local level.

STATEMENT OF PROBLEMS

An Experimental Study on X standard students regarding difficulties in learning and effectiveness of remedial teaching of trigonometry in Mathematics

OBJECTIVES

The general objective of the study

1. To form a Diagnostic test for Trigonometry.
2. To find out the mistakes done by the students in Trigonometry.
3. To give the remedial teaching on the basis of mistakes done by the students in Trigonometry.
4. To measure the effect of remedial teaching in the unit of Trigonometry.

SPECIFIC OBJECTIVE:

To compare the mean score of Pre remedial test or diagnostic test and post Remedial test or post-test in the unit of Trigonometry.

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Hypothesis:

Alternative Hypothesis:

H1- There will be a significant difference between the achievements of Pre remedial test or diagnostic test and post Remedial test or post-test in the unit of Trigonometry.

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Null Hypothesis:

H2-There will be no significant difference between the achievements of Pre remedial test or diagnostic test and post Remedial test or post-test in the unit of Trigonometry.

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OPERATIONAL DEFINITIONS :

Trigonometry: Trigonometry is the branch of mathematics dealing with the relations of the sides and angles of triangles and with the relevant functions of any angle.

Mathematics: Mathematics is the science of structure, order, and relation that has evolved from elemental practices of counting, measuring, and describing the shapes of objects. It deals with logical reasoning and quantitative calculation and its development has evolved an increasing degree of idealization and abstraction of its subject matter.

Difficulties: Difficulty refers to something that hinders a person or causes a person to have to face challenges or the state or condition of being challenged or having a hard time. And obstacle that hinders the achievement of a goal. And I think that causes a problem. A factor causing trouble in achieving positive results or tending to produce a negative result. A condition or state of affairs almost beyond one's ability to deal with and requiring great effort to bear or overcome.

X standard students: X standard students are students who completed their upper primary education and entered high school or secondary school. It is the second year of high school. Students are usually, 15 to 16 years old in adolescence period. It is an important phase of life known as the transition phase.

Learning: Learning is the process. Of acquiring a new understanding of common knowledge, behaviors, skills, values, attitudes, and preferences. Learning is the act of acquiring or modifying and reinforcing. Existing knowledge, behaviors, skill values, performances, and many others involve synthesizing different types of information. Learning is a natural phenomenon that is natural to all organisms. Concept of learning. Is of huge importance in human behavior. Human beings go on learning from birth till death.

Analyze: To study or examine something in detail in order to discover or understand more about it.

Effectiveness: The degrees to which objectives are achieved and the extent to which targeted problems are solved. Increase in the achievement scores of the students after implementing remedial teaching as compared to the conventional method of teaching.

Remedial Teaching: The meaning of remedial is to improve or remedy something. It is a process of removing pupils' learning distortion or subject matter difficulties that have crept into the understanding. It is a concept of reteaching and reinforcing previously taught basic skills to improve students' outcomes in current or future course work. It provides instructional correctives and fills the learning gap

ASSUMPTIONS

- Students have a phobia of math, especially trigonometry.
- Students have difficulties in learning trigonometry.
- Students perform errors while solving trigonometrical problems.
- The suggested remedies will help the students to overcome the difficulties in trigonometry.

VARIABLES

In research, variables are any characteristics that can take on different values such as height, age, temperature, or test scores. Researchers often manipulate or measure independent and dependent variables in studies to test cause and affect relationships.

In this research independent variable is remedial teaching and the dependent variable is students' performance.

Dependent Variables: Achievements

Independent Variables: Remedial teaching

Extraneous Variables: Fatigue, stress, Concentration of students **Controlled Variable:** Position of lectures in the timetable duration of lectures

SCOPE

- All mathematics teacher who teaches mathematics subject to standard X.
- The students of X standard who study math as one of the compulsory subjects.

LIMITATION:

- I. The study includes 30 students.
- II. This research is limited to X standard students of Dr. Zakir Hussain Urdu high school, Khadki The study is limited to X standard students studying under Maharashtra state board of secondary education.
- III. The findings of the research will be limited to the academic year 2021- 2022
- IV. The findings of the research will be limited to the experiment done by the researcher.
- V. Among possible constraints in the conduct of the study is the students' performance regardless of their attendance and attitudes towards Trigonometry which is not included in the study.
- VI. The findings of the research will be limited to the concept selected by the researcher i.e.
 - Six trigonometric ratios: sine, cosine, tangent, secant, cosecant, and cotangent
 - Finds the trigonometric ratios of special angles.
 - Illustrates angles of elevation and angles of depression.
 - Uses trigonometric ratios to solve real-life problems involving right triangles.

DELIMITATIONS:

- The researcher delimited the use of diagnostic remedial teaching strategies in mathematics.
- The research delimited to schools in the Khadki area.
- The research delimited to the students of Maharashtra state board schools in the Khadki area.
- The researcher will use the scores of the post-test for drawing conclusions.

RESEARCH METHODOLOGY:

Research Method for the present research study, the researcher uses the experimental method. The research design was based on a Diagnostic test (Pre-test), Post-test.

SAMPLES:

The Sample of 30 students of Dr. Zakir Hussain Urdu High School studying in X standard under Maharashtra State Board of secondary and higher secondary education was taken by the researcher.

TOOLS AND TECHNIQUES:

Tools of achievement tests were made for data collection. Mean, Percentage, Standard deviation 't'-scores Bar graphs were used for data analysis and interpretation.

DATA TABLES:

1. Analysis is the process of breaking complex topics into a smaller part and Find out its percentage with a graph chart
2. It analyzes the hypothesis set for the study

Frequency table

Pre- Test

Test score	Frequency
2	4 (13.33%)

3	4 (13.33%)
4	6 (20%)
5	5 (16.67%)
6	6 (20%)
7	5 (16.67%)

Post test

Test score	Frequency
6	4 (13.33%)
7	4 (13.33%)
8	5 (16.67%)
9	8 (26.67%)
10	5 (16.67%)
11	2 (6.67%)
12	2 (6.67%)

ANALYSIS

DIFFERENCE IN MEAN SCORE

MEAN	PRE-TEST	POST-TEST	Total score
	4.66	8.66	20

ANALYSIS-DIFFERENCE IN MEAN SCORE

Pre-test SD	1.66
Post-test SD	1.70

OBSERVATION AND INTERPRETATION:

The mean post-test score is 8.66 and the mean pre-test score is 4.66. There is a significant increase in the mean post-test scores from 4.66 to 8.66. increase in the mean by 4.00. There is a significant difference between the mean of pre-test and post-test. The standard Deviation for the pre-test is $S=1.667815$ and for the post-test $S=1.708666$. There is a significant increase between the standard Deviations of pre-test and post-test. An increase in the score is by 0.040851. There is a significant difference between the standard Deviations of the pre-test and Post-test. The t-score of the pre-test and post-test is 9.1797 shows that the Research Hypothesis is accepted. The difference in the Mean of the two samples is significant at 0.05 levels. There is a significant increase in the achievement scores of the students. Thus, the research directional hypothesis is accepted.

FINDINGS:

The findings of the present experiment may be described as follows:

1. The causes of an individual's difficulties in learning maybe physiological, emotional such as anxiety, fear, or hatred of mathematics or problems at home, poor home environment, lack of encouragement and facility, low intelligence, or pedagogical reasons.
2. Pedagogical causes are related to syllabi and teaching, and learning activities. Mathematics learning largely consists of building an understanding of concepts onto already understood concepts.
3. Student performs concept error, principle error, or algorithmic error, Triangle concept error, Error concept of right angle, Mistakes in using the Pythagorean theorem, Error in determining the solution of trigonometric equations, Mistakes in using trigonometric identities, Errors in using trigonometric ratio formulas in right triangles, Errors in determining the value of the

trigonometric, ratio of special angles, Error simplifying fraction form, Calculation error, error multiplying both sides by a number, error multiplying root form

4. The suggested remedies are found to be effective. The achievement A score of the students in post-test has been increased, and the difference the two mean scores of the tests are significant at a 0.01 level which established the superiority of REMEDIAL TEACHING METHOD.

5. The treatment of REMEDIAL TEACHING METHOD of students produces a significant positive effect upon the achievement in the post-test.

6. REMEDIAL TEACHING METHOD is found to be effective at the lower-level achievement (Bloom's)7. The REMEDIAL TEACHING METHOD is particularly suitable for lower-level intelligence students

8. The attitude of the learner towards REMEDIAL TEACHING The METHOD was positive. The students express their opinion that through REMEDIAL TEACHING METHOD they learn better.

9. The opinion of the learner about the REMEDIAL TEACHING The METHOD is favourable. REMEDIAL TEACHING METHOD is useful for any educational institute

CONCLUSIONS:

The findings of the present experiment may be described as follows:

The causes of an individual's difficulties in learning may be physiological, and emotions such as anxiety, fear or hatred of mathematics or problems at home, poor home environment, lack of encouragement and facility, low intelligence, or pedagogical reasons. Pedagogical causes are related to syllabi and teaching and learning activities. Mathematics learning largely consists of building an understanding of concepts onto already understood concepts. Student performs concept error, principle error or algorithmic error, Triangle concept error, Error concept of right angle, Mistakes in using the Pythagorean theorem, Error in determining the solution of trigonometric equations, Mistakes in using trigonometric identities, Errors in using trigonometric ratio formulas in right triangles, Error in determining the value of the trigonometric, ratio of special angles, Error simplifying fraction form, Calculation error, error multiplying both sides by a number, error multiplying root form. The suggested remedies are found to be effective. The achievement score of the students in post-test has been increased, and the difference between the two mean scores of the tests is significant at 0.01 level which established the superiority .

REMEDIAL TEACHING METHOD:

The achievement score for pre-tests and the post-test score differs significantly. The significant t value shows that the two means differ significantly.

Since the Mean score of the post-tests is greater than that of the pre-test, thus the post-test achievement is superior to the pre-test achievement. It May be concluded that the student taught by using the remedial teaching method performed better. The remedial teaching method was found to be more effective from the above analysis. The investigator of the present attempt finds the Remedial Teaching Method effective. From the survey of related literature also it is found that there is a significant increase in the achievement of students through the Remedial Teaching Method.

The Remedial Teaching Method is an effective method of teaching in so far as the learning effect is measured either of the students' lower-level achievement or in teams of the low-level achievement. The Remedial Teaching Method is an effective means of instruction for a variety of students such as students with below-average levels and the low average level of intelligence. Students of every category can proceed at their pace of speed. All types of students can equally benefit from this way of learning. The learner showed a positive attitude toward the Remedial Teaching Method. students showed a more favorable attitude towards the Remedial Teaching Method than the lecture method. The cause of this popularity is due to the fact that the Remedial Teaching Method provides the advantage of individualized learning which is not available in true traditional class teaching. Again, there are some advantageous factors in the Remedial Teaching Method such as the principle of small steps and the principle of immediate reinforcement which stimulates learners to appreciate this type of instruction more than the traditional method. In the present investigation also, the investigator finds that 90% of students taught through the Remedial Teaching

Method scored higher marks therefore the conclusion is that the Remedial Teaching Method is a comparatively more effective method of teaching

RECOMMENDATIONS:

The findings of the study reveal that Remedial Teaching Method is definitely a better method for student achievement.

1. The student should be made aware of the necessity of the Remedial Teaching Method.
2. Teachers should be encouraged to use these models in the classroom
3. The teachers should be given orientation on the theoretical bases of the Remedial Teaching Method and its practical utility in the classrooms.
4. Curriculum designers should also develop awareness about Remedial Teaching Method instructions so that they can implement them in the curriculum.
5. Since the application of the Remedial Teaching Method in the classroom will facilitate better learning and retention, hence this model should be introduced in schools

SUGGESTIONS OR FURTHER RESEARCH

In the course of Involvement In different dimensions of the works done here and in the related fields, the present investigator has come across a number of points that suggests the scope of further research end extension of the present work. These are placed in brief in the following

1. The investigator of the present study confined her area to limited course content. But there is ample scope to make attempt in diverse areas in teacher training curriculum programs.
2. The sample of the present investigation is confined only to a limited number of samples. The same study can be replicated with large samples also with varied grade levels.
3. Another important area for investigation is that the attitudes of the teachers toward the Remedial Teaching Method are measures of its feedback.
4. Further investigators can study the relative effectiveness of the Remedial Teaching Method developed with the present curriculum and with an innovative curriculum.
5. A survey can be done to identify the schools in which some innovations are used to improve the teaching-learning process, the various innovations done and its effects can be studied.

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