DIAGNOSIS AND REMEDIATION OF LEARNING DIFFICULTIES IN GEOMETRY OF STANDARD VIII STUDENTS

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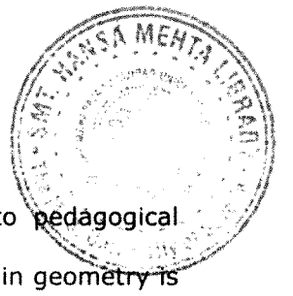

1. Introduction

UNESCO (1973) "....Modern conception of school Geometry is still open to pedagogical research, and that the establishment of an acceptable program of instruction in geometry is one of the most difficult curriculum problems today." Also, Bhardwaj (1987) found that the error rate at middle standard in all the three areas that is arithmetic, algebra and geometry came out to be 30.4 percent, 50.6 percent and 51.4 percent respectively and there was a significant improvement in achievement of the students after they had gone through the remedial exercises. It is also mentioned by the National Curriculum Framework (2000) that Remediation and Proper Evaluation should constitute an integral component of teaching-learning of Mathematics. Reflecting on this and comparing with the research trend it can be seen that the ratio of the researches in mathematics and the researches carried out in Geometry is not satisfactory. Also, for establishing an acceptable program of instruction in geometry there should be diagnosis of the learning difficulties faced by the students in learning geometry.

In the present study the units from geometry considered are Point, Line & Concept of Distance, Line-segment & Ray, Plane, and Angle as these are the basic and fundamental things and the complex structures in geometry cannot be studied without them. Hence, the interest of the investigator to conduct the present study.

2. Statement of the Problem

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3. Objectives of the Study

1. To identify the errors committed by the students of standard VIII in geometry.
2. To identify the learning difficulties in geometry of standard VIII students.
3. To provide remedial measures to overcome the learning difficulties in geometry of standard VIII students.

4. To study the impact of remedial measures with reference to the learning difficulties in geometry of standard VIII students.

4. Explanation of Terms

- **Errors:** Few topics of standard VIII geometry were identified viz. Point, Line, Concept of Distance, Line Segment, Ray, Plane and Angle. The achievement test was prepared and administered to the standard VIII students. Each item was associated to the specific instructional objective. And based on this the number of incorrect responses for each item identified the errors with respect to each topic and subtopics of geometry.
- **Learning Difficulties:** Based on the error identification and the commonly occurring errors the diagnostic test was prepared and administered to the standard VIII students. The errors committed by the students were analysed. Based on the analysis the probable causes for the errors were identified as learning difficulties.
- **Impact of Remedial Measures:** The scores of the students on the achievement test after the remedial measures were considered as the impact of the remedial measures.

5. Delimitations of the Study

- The present study was delimited to the four units of standard VIII geometry. The units are:
  i. Point, Line, and Concept of Distance
  ii. Line Segment and Ray
  iii. Plane
  iv. Angle
- The study was delimited to the Secondary English medium schools of Vallabh Vidyanagar and Anand city following the Gujarat Secondary and Higher Secondary Education Board Syllabus of the academic year 2007-'08.

6. Methodology of the Study

6.1 Design of the Study

For the present study the investigator used a true experimental, control group, pre-test and post-test design. The investigation was conducted in four phases.

PHASE I: Construction of Achievement Test

An achievement test was prepared by the investigator based on the topics and subtopics of each unit of geometry. Each item was related to the specific instructional objective.

PHASE II: Identification of Errors

The test was administered to identify the errors committed by the students i.e. to locate where exactly the errors are committed by the students in terms of the topics and subtopics related to the each particular unit in geometry. The identification of errors was done with the help of error identification table.

PHASE III: Construction of the Diagnostic Test

Commonly occurring errors in standard VIII geometry were identified based on the error identification, opinion of mathematics teachers, observation of the internal tests' answer books of the average and low achieving students and their notebooks. The investigator prepared a test based on the commonly occurring errors.

Each item was framed in such a way that the responses can be analyzed in terms of incorrect answer and its probable cause.

PHASE IV: Identification of Learning Difficulties

This phase included the two major tasks as follows:

Studying Errors

For each particular item the errors were studied by the investigator in terms of the incorrect responses. So, related to each item there will be a list of incorrect answers.

Error analysis

Based on the errors studied by the investigator an error analysis was carried out using the

error analysis sheet for each item i.e. analysis was carried out in terms of the categorization of errors committed by the students (what kind of errors?) and the investigator inferred the probable cause for the error. The analysis led to the identification of the learning difficulties faced by the students in attempting the item correctly.

PHASE V: Remediation of Learning Difficulties

Remedial measures in accordance with the learning difficulties associated with the topics and subtopics of the units of geometry were given by the investigator to the students.

Remediation was done through:

a) Small group teaching and group activities

Discussion

Problem solving

b) Use of teaching aids

Mathematical models and

Manipulatives

Remedial programme was conducted for 40 hours duration.

PHASE VI: Impact of the Remedial measures

Retesting was done on the students after providing remedial measures through the parallel test to the achievement test.

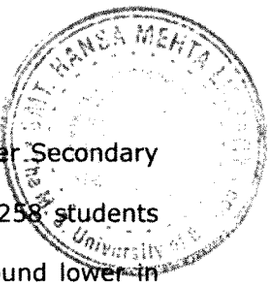
6.2 Population and Sample

Population

The population of the study is standard VIII students of all English medium schools, which are following the Gujarat Secondary and Higher Secondary Education Board Syllabus.

Sample

Two schools viz. I.B.Patel English Teaching School and Salvation Army English Medium School were selected randomly by lottery method for error identification from all the four



Secondary English medium schools following the Gujarat Secondary and Higher Secondary Education Board Syllabus of Vallabh Vidyanagar and Anand city. There were 258 students for error identification. Out of the two selected schools the one which was found lower in the performance was selected for the diagnosis and remediation of learning difficulties. All the students of standard VIII of Salvation Army English Medium School formed an experimental group. The experimental group included 32 students. There were four divisions of Standard VIII in I.B.Patel English Teaching School. All the standard VIII students of the randomly selected division 'D' formed control group. There were 52 students in control group. All the standard VIII students of the selected schools were considered as a sample.

6.3 Tools for Data Collection

Achievement Test

An achievement test was prepared by the investigator. It contained items related to the topics and subtopics of the four units in geometry. The test was of objective type and one mark each. It served as pre-test.

The items were of short and objective type. The test was prepared based on the instructional objectives of different levels i.e. Knowledge level, Understanding level and Application level. Each item of the test was related to the instructional objective. This aspect helped the investigator in identifying the errors committed by the students.

Diagnostic Test

A diagnostic test was prepared by the investigator based on the commonly occurring errors in standard VIII geometry. These errors were identified based on the error identification, opinion of mathematics teachers, observation of the internal tests' answer books of the average and low achieving students and their notebooks. Each item was framed in such a way that the responses can be analyzed in terms of probable incorrect answer and its cause.

The test prepared as mentioned above was used for identifying the learning difficulties.

Both the tests were validated by the four subject experts in the area of mathematics.

Error Identification table

The table below was designed and used by the investigator to locate and identify the errors committed by the students in terms of the instructional objectives of the units in geometry, as each item is related to the instructional objective.

As the items in the test were of one mark each, so either student attempted the item correctly or failed to attempt correctly and accordingly in the error identification table under the each item either 1 or 0 was entered respectively.

Error Analysis Sheet

The error analysis sheet was designed by the investigator to list down the categorization of errors with respect to each item and to identify the learning difficulties with respect to each topic and subtopic by inferring the probable cause of the error:

Parallel Test

Parallel test to the Achievement test was prepared which served as a post-test. The test was of objective type and one mark each. Each item was related to the specific instructional objective.

6.4 Data Collection

The data was collected by the investigator in different phases as follows:

PHASE I:

The data regarding the errors committed were collected in terms of the correct or incorrect responses of the students on the items of the achievement test. The score of the students was considered as the score on pre-test.

PHASE II:

1. Through the informal talk with the mathematics teachers the data were collected from

them in form of the opinion regarding the commonly occurring errors by the VIII standard students in four units of geometry.

2. The data regarding the commonly occurring errors by the students in the above four units were collected through the observation of the internal tests' answer books of the average and low achieving students and their notebooks.

The diagnostic test was prepared by the investigator based on the data collected.

PHASE III:

The data were collected in terms of the responses to the diagnostic test questions given by the standard VIII students of the experimental group, which were analyzed.

PHASE IV:

The remedial measures were provided to the students of the experimental group for 20 days, two hours daily.

The parallel test was administered as the post-test to the students of both the groups, experimental and control group.

The data were collected in form of the responses given by the students of both the groups on the parallel test, which will be scored to get the data of their scores on the post-test.

6.5 Data Analysis

1. Firstly, the errors related to each item were identified with the help of error identification table. Then the learning difficulties related to each topic and subtopic were identified with the help of the error analysis sheet. After studying the learning difficulties necessary remedies were provided.
2. ANOVA was used to find the significant difference in achievement on pre-test among the schools.
3. For objective four, data collected from achievement test administered as pre-test and post-test to the students of experimental and control group were analyzed using ANCOVA and pre-test score was used as covariate.

7. Major Outcomes

1. The data located and identified the errors committed by the students of standard VIII related to the units of geometry viz. Point, Line, and Concept of Distance; Line Segment and Ray; Plane; Angle. The list is prepared for the types of error committed by the students of standard VIII in geometry.
2. The analyzed data identified the learning difficulties faced by the students of standard VIII in geometry. The major learning difficulties were related to the basic understanding of the geometrical concept (understanding the postulates of geometry, comprehending the meaning of different symbols of geometry, differentiating between the geometrical terms related to two dimensional geometry (line) and geometrical concepts related to three dimensional geometry (Plane)).
3. The findings have shown the positive impact of the remedial measures on the students of standard VIII with reference to the learning difficulties in geometry. It was found that the remedial measures helped the students to reduce the learning difficulties and achieve better in geometry.
4. During the process of remediation various interactive methods and teaching materials were used. It was found that students were interested in the process of learning as they got the opportunity to share and discuss their own learning.
5. The discussion before the remedial measures many a times gave an insight to the misconceptions hold by many of the students related to the basic concepts of geometry. These misconceptions were addressed during the remediation and were clarified, which helped students to achieve higher level of objectives of learning.