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Study of Students' Mistakes While Solving Simple Algebra of Matrix Problems

Rakeyshh Sidu Byakuday

Lecturer in Mathematics, DKTE Society's Yashwantrao Chavan Polytechnic, Ichalkaranji, Maharashtra, India

ABSTRACT: The aim of the present study is to investigate mathematical mistakes related to matrices committed by Yashwantrao Chavan Polytechnic students at First Year Diploma Level in their academic. Moreover, this study aimed at the causes behind the mistakes. For this study 15 students from first year diploma classes were chosen randomly. The samples of this study were collected from the test attempted by the participants. These errors are classified in to the following categories; addition of Matrix, subtraction of Matrix, multiplication of Matrix. However, it is found that the problems are due to the poor understanding of order of matrices, wrong insertion of elements, confusion between the signs and carelessness of the students while using rows and columns.

KEYWORDS: Addition Matrix, Subtraction of Matrix, Multiplication of Matrix, Error Analysis.

I. INTRODUCTION

Matrix is one of the mathematical concepts which are used in Engineering, Science & technology field. It is used for plotting graphs, statistics and also to do the scientific studies and research in various different fields. Matrices can also be used to represent real world data like the population of people, infant mortality rate etc. They are the best representation methods for plotting surveys. Matrices are used in the compression of electronic information of biometric data. The practical function of EA is the function of that knowledge in remedial action to overcome the mismatch between the knowledge of the leaners and the demands of the situation (Corder, 1981).
Error analysis is a method commonly used to identify the cause of student errors when they make consistent mistakes. It is a process of reviewing a student's work and then looking for patterns of misunderstanding. Errors in mathematics can be factual, procedural, or conceptual, and may occur for a number of reasons.

Crystal (2003) defines error analysis as a technique of identifying classifying and systematically interpreting the mistakes that learner of second language commit while they are performing oral or written tasks by using any of the principles and procedures provided by linguistics. EA is also a means of describing the learners' knowledge of the target language in any particular moment in their learning to relate this knowledge to the teaching they have been receiving (Corder , 1974)

II. OBJECTIVES OF THE STUDY

The present study analyses the mathematical mistakes committed by the First Year Diploma students during solving the problems. It also focuses light on the reasons behind the mistakes. Accordingly, the study attempts to:

a) Investigate the mathematical mistakes in using addition of Matrix, subtraction of Matrix, multiplication of Matrix, division of Matrix by First Year Diploma Level students.
b) Shed light on the reasons behind their mathematical mistakes.
c) Suggest different ways that students and teachers can employ to overcome these difficulties.
d) Encourage the students to solve the more mathematical questions to avoid the mistakes.

III. SIGNIFICANCE OF THE STUDY

The significance of the study will be of great value to the teachers of Mathematics to give much time to teach basic concepts, more attention and considerable time for solving mathematical problems.

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IV. RESEARCH QUESTIONS

1. What are the mathematical mistakes committed by YashwantraoChavan Polytechnic students at First Year Diploma Level in their academic?
2. What are the reasons behind these mathematical mistakes while solving the problems related to matrices?

V. METHODS, SAMPLES AND PROCEDURES

A) SUBJECTS

The subjects of the present study are the 15 students enrolled in First Year Diploma Programme at YashwantraoChavan Polytechnic. The targeted samples are the engineering students who will complete their diploma certification in one of the following streams: Civil Engineering, Computer Science and Engineering, Electrical Engineering, Electronics and Tele-Communication Engineering and Mechanical Engineering. The students attend
4 lecture hours and 2 tutorial hours per week. The students' age ranged from 17 to 18 and they have been learning Basic Concepts of Mathematics for ten years. The participants were chosen randomly.

B) INSTRUMENTS

In order to collect reliable and authentic data, the following instruments were employed in this study:

C) STUDENTS' TEST

The Researcher developed 15 marks test. The test consists of the mathematical problems of matrices in the following category; addition of Matrix, subtraction of Matrix, multiplication of Matrix. In order to answer the first research question of what are the mathematical mistakes committed by the students at First Year Diploma Level in their academic? Following the steps was followed.
1. Collected a sample of student work for each type of Matrices problem related to addition of Matrix, subtraction of Matrix, multiplication of Matrix**.**
2. Recorded all student responses in written format.
3. Analyzed the responses and looked for patterns among common problem types.
4. Described the patterns observed in simple language and the possible reasons for the
Student's problems

Table 1 provides description of the mathematical mistake patterns and possible causes for each mistake.

Example	Mistake Pattern	Description Possible cause
Addition of Matrix 1.If $A=\begin{bmatrix}3 & 2\\1 & -1\\0 & 4\end{bmatrix}$ $B=\begin{bmatrix}-1 & -1\\3 & 2\\4 & 2\end{bmatrix}$ Verify that A+B=B+A.	Rows are added in the column Columns are added in the row Signs mistakes	Lack of basic knowledge of determinant Carelessness of the students Fear of mathematics
Subtraction of Matrix 2.If $A=\begin{bmatrix}5 & 3\\-1 & 1\end{bmatrix}$ $B=\begin{bmatrix}2 & -1\\3 & 2\end{bmatrix}$	Confusion between rows and columns Confusion between position of the elements of the matrix	Lack of interest Lack of knowledge of Scientific calculator

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Find A-B.	Signs mistakes	Lack of basic knowledge of determinant
Multiplication of Matrix 3.If A=$\begin{bmatrix}1 & 2 & 3\\4 & 5 & 6\end{bmatrix}$ B=$\begin{bmatrix}1\\-8\\9\end{bmatrix}$ find AB	Confusion while using the signs Confusion in row and column Order of matrix	Lack of concept understanding Confusion between the order matrix

Table 1

VI. RESULTS AND DISCUSSION

The collected written data by the students was examined by the researcher and the results showed that the main mathematical mistakes were in the following categories; addition matrix, subtraction matrix and multiplication of matrix. A total number of 93 mathematical mistakes were found. Table 2 below displayed these mathematical mistakes in number and percentage:

Mistakes Category	**Number of Mistakes**	**Percentage of Mistakes**
Addition of Matrix	21	22.58%
Subtraction of Matrix	32	34.40%
Multiplication of Matrix	40	43.01%
Total	**93**	**100 %**

Table 2

Table 2 classification of the type of errors generated in the context of the study

- **Addition of Matrix**

The number of mistakes in Addition of Matrix is 21 basic mistakes that compromises 22.58 % of the total mistakes generated in the data analysis process. These mathematical mistakes were divided into the subcategories in table 3 below:

Type of Mathematical mistake	**Number**
Rows are added in the column	5
Confusion between position of the elements of the matrix	9
Signs mistakes	8

Table 3

- **Subtraction of Matrix**

The number of mistakes in subtraction of Matrix is 32 basic mistakes that compromises 34.40 % of the total mistakes generated in the data analysis process. These mathematical mistakes were divided into the subcategories in table 4 below:

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Type of Mathematical mistake	Number
Confusion between rows and columns	10
Columns are added in the row	8
Signs mistakes	14

Table 4

- **Multiplication of Matrix**

The number of mistakes in subtraction of Matrix is 40 basic mistakes that compromises 40.01 % of the total mistakes generated in the data analysis process. These mathematical mistakes were divided into the subcategories in table 5 below:

Type of Mathematical mistake	Number
Confusion while using the signs	20
Confusion in row and column	12
Order of matrix	8

Table 5

VII. CONCLUSION

This study shows that the first year diploma level students face problems while solving basic mathematical problems in matrices due to the confusion of signs, poor understanding of order of matrix, lack of basic knowledge of determinant, Confusion between positions of the elements of the matrix. This study will be helpful for the teachers of mathematics to develop more understanding of use of matrices among the students.

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