

## INFLUENCE OF SELECTED DEMOGRAPHIC FACTOR ON MATHEMATICAL CONCEPT ERROR

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**Abstract:** The aim of this paper is to exhibit the mathematical difficulties and concept error committed by students while solving the mathematical problems, which are not sufficiently known, recognize or aware by the teachers. In this present study Mathematics Diagnostic cum Achievement Test (MDAT) constructed by investigator was used to collect the data from a sample of 900 class nine students belonging to eighteen English medium coeducation schools in union territory of Puducherry. Proportionate stratified random sampling technique was employed. Chi-square and Cramer's V contingency coefficient had been calculated. The findings of the study show that there exist a remarkable association between the extent of concept error and the selected demographic factors.

### Introduction

Mathematics is the significant subject helpful for developing human thinking in a creative way to face the real world and a science of logical reasoning. Realising the importance of Zakhir Husain committee (1937) saw mathematics in relation to work, Kothari Education Commission (1964-66) remarked that Science and Mathematics should be taught on a compulsory basis to all pupils as a part of general education during the first ten years of schooling. In addition, there should be provisions of special courses in these subjects at the secondary stage, for students of more than average ability. National policy on education (1986) also visualized it as a "vehicle to train a child to think, reason, analyse, and articulate logically. Apart from being a specific subject it should be treated as a concomitant to any subject involving analysis and meaning". National curriculum framework (2005) remarked "succeeding or access to quality mathematics education should be seen as the right of every child. The teaching of mathematics should enhance the child's resources to think and reason, to visualize and handle abstractions, to formulate and solve problems". But in India (after completion of six seven years independence also) the shape of mathematics education still persistent in the same stage and the student's experience of difficulties, anxiety, failure and burdensome are increasing day by day which also produces mathematically disabled learners.

### Need for the study

Mathematics is not just the subject of memorizing few formulas and using them to solve problems. Even formulas have restrictions on them itself; it has to be used in the correct place of correct order. Mathematics learning is a continuous process of learning which needs to get the principle and concepts behind it. Without understanding the concept it is not possible to become a good mathematics learner. To produce a good mathematics learner is the aim of every mathematics teachers. Teacher's knowledge about student's concept error and mistakes act as one of the barrier to achieve their goals. Teachers generally do not take the issue of reducing errors committed by students as a challenge. Instead they accept that errors are natural phenomena which occurs inspite of their presumed good teaching. They do not explore the deep rooted causes and at best manner indulge generally in reteaching.

In learning mathematics the issues of student's difficulties exhibited in their performance and type of errors have not been addressed squarely by teachers in terms of what errors and why such errors are committed and what are the responsible factors. In the same way researcher who lists the errors do not provide the responsible factors and why such errors committed. If the empirical support in identifying associate or related responsible factor for making such errors are always limited if such related factors for each type of error commonly performed by the students are identified it may through some light on either for remediating such errors in career guidance. Hence this study focuses on understanding the student's characteristics related to performing concept error and the responsible selected demographic factor namely gender, place of residence, parental qualification, and type of school management at high school level.

### Concept Error in Mathematics

Hendrik Radatz (1979) classified errors based on the information processed by the learners. This provided a cognitive model of the causes of errors and suits for all the branches of mathematics. His categories are:

1. Errors due to deficient mastery of prerequisite skills, facts, and concepts- Engel Hardt(1977); Sharma (1988), Chuaboon Liang and Eric Wood (2005) also identified this error.
2. Errors due to incorrect associations or rigidity of thinking,
3. Errors due to the application of irrelevant rules or strategies

4. Errors due to difficulties in obtaining spatial information
5. Errors due to language difficulties.

The first category of Radatz (1979) classification 'Errors due to deficient mastery of prerequisite skills, facts, and concepts' treated as a concept error in this study and the responsible demographic factors were analysed.

Concept Errors are happen due to poor mastery of basic facts, concepts, and requirement skill in mathematics. This error includes the lacking of mastery of basic facts, erroneous procedures in applying mathematical procedure, ignorance of algorithms, and inadequate knowledge of necessary concepts and symbols. This type of mathematical errors makes the students to deviate from the mathematics major and act as a disease which makes our students learning disabled.

### **Sample for the Study**

A sample of 900 students selected from the eighteen different types of management schools, included 439 boys and 461 girls from urban and rural schools of Puducherry.

### **Tools Used in the Study**

The following tools were used in the study

- i. Information Schedule
- ii. Mathematics Diagnostic cum Achievement Test (MDAT) constructed by Investigator.

### **Mathematics Diagnostic cum Achievement Test**

Mathematics Diagnostic cum Achievement Test has 150 test items from different branches namely, algebra, geometry, Mensuration, trigonometry, statistics and probability. It is a multiple choice test with four alternative responses chosen by the learners out of four multiple choices one of the alternatives must kept correct. The remaining three alternative distracters were wrong responses. But each of the three wrong responses was designed in such a way to identify different level of thinking which matches three surface levels of SOLO taxonomy.

### **Objectives of the study**

- To identify the concept errors in mathematics committed by IX standard students.
- To find out the association between the extent of concept error and the following demographic factors
  - (i) Gender
  - (ii) Place of Residence
  - (iii) Parental Qualification
  - (iv) Type of School Management

### **Hypothesis of the study**

- There is no association between gender and proportions of students classified according to different extent of concept error committed by them.
- There is no association between place of residence and proportions of students classified according to different extent of concept error committed by them.
- There is no association between parental qualification and proportions of students classified according to different extent of concept error committed by them.
- There is no association between type of school management and proportions of students classified according to different extent of concept error committed by them.

### **Statistical Technique Used**

To study the association between Concept error and demographic variable - Chi- square and Cramer's V contingency coefficient had been calculated.

### **Data Analysis for the study**

Data analysis for the study was done as per the objectives of the study. The responses of each student were analysed to determine how many times each of the concept error are committed. Quartiles were calculated for concept error based on the quartiles the students were divided into three groups. The students who did not commit any error in any one place he/she was identified as 'Non Error Doers' in that error type. Based on the frequencies of errors committed by students error doers in each type separate frequency distribution were made for all the 900 students taken together. There were four groups of error doer's classified on concept errors. Frequency and percentages of students committing concept error where classified according to gender, place of residence, type of school management and parental qualification were calculated. The frequency, percentage and pie chart of Quantum of Concept Error groups, the result of Chi-Square for association between concept error and demographic factors is given in Table 1 and Table 2.

Table 1: Quantum of Concept Error Groups with Non Error Doers

Level of Concept Error Doers	Frequency	Percent
High Error Doers(HED)	199	22.1
Average Error Doers(AED)	493	54.8
Low Error Doers(LED)	53	5.9
Non Error Doers(NED)	155	17.2

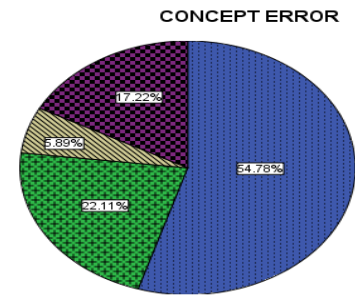


Table 2: Result of Chi-Square Test for association between Gender, place of residence, type of school management and parental qualification and Proportions of Students Classified according to Different Extent of Concept Error

Demographic Factors		Extent of Concept Error				Chi Square Value	Asymp. 2-Sig.
		HED	AED	LED	NED		
Gender	Male	89	254	26	70	3.607 (3)	0.307
	Female	110	239	27	85		
Place of Residence	Urban	105	229	22	94	11.64 (3)	0.009
	Rural	94	264	31	61		
Type of School Management	Govern	69	146	32	53	10.89 (6)	0.283
	Aided	62	168	16	54		
	Private	68	179	5	48		
Parental Qualifications	Illiterate	25	69	11	23	25.13 (9)	0.000
	Below X	88	203	24	65		
	Above X	67	139	14	45		
	College	19	82	4	22		

**Findings of the study**

From the above Table 1, it is evident that 155 students out of 900 (17.2%) students have not committed any concept error and the remaining 82.8 % of students have committed concept error. It is found that 493 (55%) out of 900 students who committed this error belong ‘average error doers’. That is these students have committed this type of error in different branches of mathematics namely, Algebra, Geometry, Mensuration, Trigonometry, Statistics and Probability, not less than 31 and not more than 56 out of 90 chances. Similarly, 199 (22.1%) out of 900 students who committed this error belong ‘high error doers’ not less than 57 out of 90 chances. Only 53 students out of 900(5.9%) were ‘low error doers’ less than 30 out of 90 chances.

Concept error was committed by 82.8% of students

- Among them 41% were males and 41.8% were female students. Female students committed less number of errors than male students. Female students committed low and high concept error more than males. But male students committed average concept error more than females.
- Among them 41% were urban and 41.8% were rural students. High percentage of Non- error doers were urban students. Urban students committed less number of concept error than rural students. Rural students committed low concept error and average concept error more than urban students. But, urban students committed high concept error more than rural students
- Among them 27.5% were government school, 37.4 % were aided, and 27.1% were private schools students. High percentage of Non- error doers were aided school students. Government school students committed both low and high concept error more than aided and private school students. Private school students committed average concept error more than government and aided school students.
- Among them 11.7% student’s parents were illiterate, 35.1 % were below X standard, 24.4% were above X standard and 11.6% were completed their college education. High percentage of Non- error doers parents were qualified below X standard. Student’s parental qualification below X standard committed concept error less than other three categories namely student’s parental qualification was illiterate, above X standard, college education.
- From the above Table, it is revealed that obtained Chi-Square value 3.607 for df 3 is not significant at 0.05 level. Hence, there is no association between gender and the proportions of students classified among different

extent of concept error committed by them. Thus gender and extent of concept error committed by students are not associated.

- From Table 2, the obtained Chi-Square value 11.64 for df 3 is significant at 0.05 level. Hence, there is an association between place of residence and the proportions of students classified among different extent of concept error committed by them. The Cramer's value 0.063 reveals that there is a moderate relationship between place of residence and the different proportions of concept error committed by students. Thus place of residence and extent of concept error committed by students are associated.
- From Table 2, it is revealed that obtained Chi-Square value 10.89 for df 6 is not significant at 0.05 level. Hence, there is no association between type of school management and the proportions of students classified among different extent of concept error committed by them. Thus type of school management and extent of concept error committed by students are not associated.
- From Table 2, it is revealed that obtained Chi-Square value 25.13 for df 9 is significant at 0.05 level. Hence, there is an association between parental qualification and the proportions of students classified among different extent of concept error committed by them. The Cramer's value 0.064 reveals that there is a weak relationship between parental qualification and the different proportions of concept error committed by students. Thus parental qualification and extent of concept error committed by students are associated.
- This study found that there is no influence of the gender, type of school management on concept error and clearly showed that a student who commits high concept error are female, urban and government students, and also it shows there exists a weak relationship with parental qualification and mathematical concept error.

### Conclusion

One or the other way mathematics teacher was blamed for the student's failure in mathematics. Freudenthal (1989) believes that "students who make errors always do so with the teacher who teaches them; at least partially the error's role is connected with the teachers' role in the learning process." Similarly, according to Booker (1989, 101) "the origins of many errors are rooted not so much in students but in the manner children are introduced to mathematics". So mathematics teacher should understand the concept error and the responsible demographic factor to provide explanation to mathematical concept and ensure that students understand the concept as taught. Students level of learning and styles are different, so mathematical activities should be employed to promote their level of understanding. Mathematics teacher should use mathematical terms and language to improve students understanding and the symbols should be fixed in the minds of learners.

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