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Research Papers

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## Null effect of basic aspects on Conceptual understanding of calculus and discrete mathematics.

**J K Pendharkar,**  
K J Somaiya College of  
Science and commerce,  
Mumbai, 400077.

**Mandar N Khasnis**  
C H M College Ulhasnagar,  
Maharashtra, 421003

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### Abstract

*The conceptual understanding of fundamental topics like calculus and discrete mathematics in Mathematics are believed to be dependent on Gender, medium of instruction at school level, their achievement at H S C level (that is performance at 12th standard), in 10+2+3 pattern of university of Mumbai. The survey was taken on undergraduate students of Degree College, and based on the information like Gender, medium of instruction and entry level performance, some co relations were found, which were discussed in this research paper. It was found that there is no effect of these parameters except that of entry level performance, on the conceptual understanding of mathematics in the undergraduate students.*

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### Objectives:

Every survey intends to find relations in quantifying form so that some new correlations can be derived from it. In this survey the students filled two types of forms. Firstly the basic information form, secondly the questionnaire which tests their conceptual understanding, which is objectives type of test.

From these observations following Objectives were set:

1. To observe the effect of gender in the conceptual understanding of calculus and discrete mathematics.
2. To observe the effect of medium of instruction at school level, on the conceptual understanding of these aspects of mathematics.
3. To observe the effect of entry level performance, that is, class obtained at H S C level, on the conceptual understanding of above aspects of mathematics.
4. To observe over all conceptual understanding of mathematics in undergraduate students.

### Methodology and tools used:

This was survey and co relational type of research.

(i) The information like entry level performance, gender, language of instruction up to school level (that is up to 10th standard), knowledge of computers etc was obtained from basic information form, filled by the students in the respective classes.

(ii) The conceptual understanding of calculus and discrete mathematics was tested by objective type of test each aspect was tested by 10 brainstorming question and given one mark for each correct answer. Thus in all twenty questions carried twenty marks. The time duration for entire exercise was 45 minutes only.

### Conceptual test on calculus and discrete mathematics:

This particular test was constructed by author and its validity was checked by subject experts. It

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was composed of 20 multiple choice questions. Out of four responses given for each question only one response was designed to be correct. Students were expected to select one alternative. Each correct answer was given one mark. The students were categorized in to three possible slots of marks. That is from 0 to6, 7 to13, and from 14 to 20 marks.

The test particularly checks their knowledge, comprehension, ability of applying knowledge, analyzing ability, ability to solve problems, capacity of evaluation of certain basic concepts etc.

**Following are the variables which were considered for finding co relations:**

T1: marks obtained in the test of calculus, T2: marks obtained in the test of discrete mathematics.

Gender: F/M. Entry level performance: class obtained in 12th standard

Computer savvy: Computer knowledge. Note that all the students are having knowledge of computer.

**Selection of sample:**

The survey was implemented for finding the co relations. The attempt was made for finding reasons for the poor response obtained by students at undergraduate level. Since calculus and discrete mathematics are some of the important topics in mathematics, the test on it was selected as a probe to check the conceptual understanding of mathematics. The results were then compared with the gender, medium of instruction etc..For this project, the sample used was the undergraduate students at FYBSC standard, of C H M College, Ulhasnagar, Maharashtra, India.

In all 68 students were examined.

**Tools used:**

**1)Basic information form:** With the help of this form, the information like gender, medium of instruction at school level, performance at H S C level, etc was obtained. This information was useful in forming co relations between these parameters with the conceptual understanding of mathematics.

**2)The conceptual test on mathematics:** This test was designed by the main author and is comprised of testing of conceptual understanding of aspects like Calculus and discrete mathematics. First 10 objective questions for 10 marks were testing conceptual understanding of Calculus of undergraduate students while later 10 questions for 10 marks were testing conceptual understanding of discrete mathematics. The said test was examined by subject experts.

**3)T test:** T test is used to test the significance of difference between two independent samples means drawn from the same population or from independent population. The starting point for applying the T test is to formulate the null hypothesis. The null hypothesis is the statement or assumption about the no difference. In other words it emphasizes that there exists no difference between two population means and the difference found between sample means is accidental and insignificant.

This test was used while finding the significant difference between the marks obtained by boys and girls, by students obtained first, and second and third class, and by students having or not having English as their language of instructions at school level.

**Analysis of response:**

**Analysis of the response of the conceptual test on Mathematics:**

It was test of objective types of questions. There were 20 such questions each having four options and only one option was correct. Each correct answer was given one mark. As a result the maximum marks that can be obtained in this test were 20.

The total number of students=68

Sample= undergraduate students.

Number of girls= 35

Number of boys=33

(1) Conceptual profile: Marks Vs number of students was as follows:

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
<b>Number of students</b>	0	0	1	0	4	3	7	5	4	11	7
<b>Marks</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>	
<b>Number of students</b>	8	5	3	3	3	3	1	0	0	0	

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(2) Response obtained from students with respect to gender, entry level performance (class obtained at 12 standards), and medium of instruction was found to be poor, also T test showed that there was no significant difference in the marks obtained except for entry level performance, as shown.

(Number of students received marks less than 7/20=15/68

Number of students received marks between 7 and 14/20=43/68

Number of students received marks above 14/20= 10/68

Number of students having English as their language of instruction at school level= 35

Number of students having some other language of instruction at school level= 33)

Parameters	Marks obtained/20	T test	conclusion
Gender	Female= 9.68	T=0.24	No significant difference in the marks obtained.
	Male=9.46		
Entry level performance	I Class = 10.6	T= 3.19	Significant difference in the marks obtained.
	II/III, Class= 8.07		
Medium of instruction	English = 9.46	T= 0.25	No significant difference in the marks obtained.
	Non English= 9.67		

#### Main findings:

The number of undergraduate students was 68, in which number of girl students were 35 while number of boys students were 33. The conceptual understanding of mathematics were analysed for both girls and boys and using T test it was found that there is no significant difference in the marks of conceptual test. This indicates that the conceptual understanding of mathematics is gender insensitive. (The similar result was also found for the case of conceptual understanding of Physics, Ref1)

The effect of medium of instruction was also not affecting the conceptual understanding of mathematics. This was very important finding. The T test showed that there is no significant difference in the marks obtained by students having English as their language of instruction from the students having some other language of instruction.

There is significant difference between the students having first class or distinction and students having second or third class. The T test showed this difference to be important. This showed that the knowledge acquired at H S C level or at the entry level is important and it is reflecting in the conceptual test taken at undergraduate level. It is thus important to have good knowledge of mathematics at basic level.

The overall performance was average. The maximum number of students got marks between 7 to 13, while very few got above 13 out of twenty. This showed that one has to revise the teaching methodology to improve the conceptual understanding of students. Also, the trend of selecting English medium schools is also found to be unnecessary, as there is no difference in the marks obtained as showed by T test.

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