

## IMPACT AND IMPORTANCE OF PRE-CONCEPTUAL TEST THROUGH ICT TOOLS IN TEACHING LEARNING PROCESS OF FUNCTIONS IN DISCRETE MATHEMATICS

M. KAMESWARI<sup>1</sup> AND M. SEENIVASAN

**ABSTRACT.** Algebraic tools allow us to express these functional relationships very efficiently. The universe of discourse for functions is the relation which in turn has the universe of discourse as the Cartesian product. Engineering students feel difficult in understanding the difference in their definitions and its further derivations. Traditional method of teaching this topic does not reveal efficient understanding because of lack of immediate practise. Cutting edge technology provides enormous facilities to the educational arena. Now-a-days, everything is dealt with cutting edge technology. Information and Communication Tools (ICT) is one of the cutting edge tools since it exhibits tremendous usage in different segments. Students expect to incorporate Teaching and Learning Process (TLP) with on line mode so it is essential for a teacher to blend his/her teaching methodology with cutting edge technology for efficient and often practise. In this paper, cutting edge technology for education is incorporated with the traditional method through educational ICTs. Multiple Choice Questions (MCQ) - Quiz 1, 2, 3 through Moodle is considered as pre-conceptual test and Continuous Assessment Test (CAT) -1 is considered as post-conceptual test. Comparison study is carried out between pre and post conceptual test statistically which reveals that students interest in learning is gradually increasing from Quiz 1 to Quiz 3 (Figure 11) and performance of post conceptual test is compared with the average of three quizzes which in turn endorses the learning interest rate of the topic function and relations.

<sup>1</sup>*corresponding author*

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## 1. INTRODUCTION

The mantra “I am teaching, are you learning?”. Learning means conceptual learning is insisted throughout this paper.

The Educational ICT such as MOODLE, CANVAS, Word Press, Google class room etc., helps a teacher to get answer for the interrogation of “Are you learning?”

Discrete Maths is needed to understand mathematical structures in the object along with their properties. This ability of problem solving in Discrete maths is important for software engineering, data scientists, security and financial analysts. It covers relations and functions, logics, combinatorics, graphs, probability, number theory etc., which are all universally needed. To deliver techniques and ideas in discrete mathematics to the learner, we extensively use interactive mode of TLP through cutting edge technology in this course.

The hierarchy of the definition of function is presented.

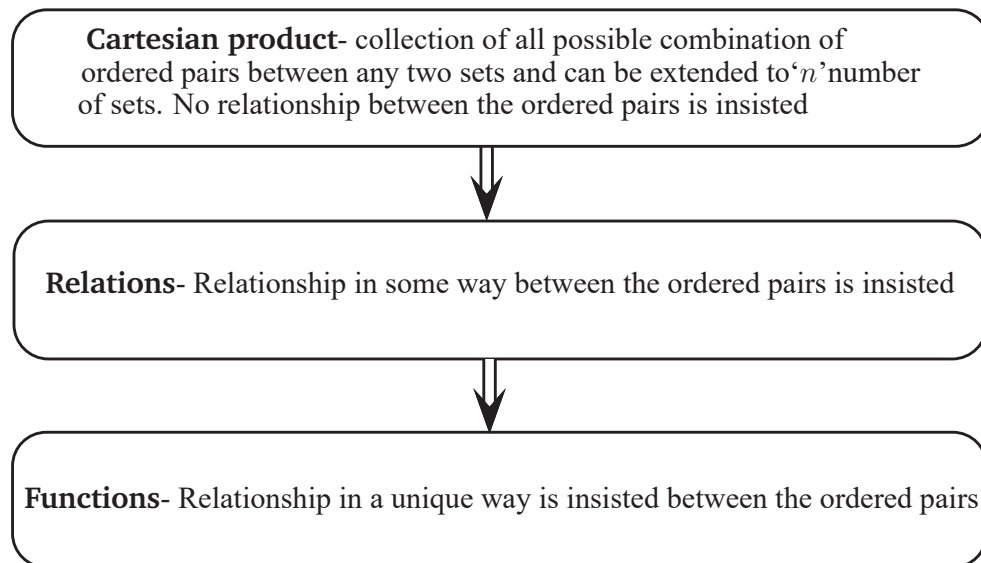


FIGURE 1

The mathematical form of the above verbal definition is given below:  
Let  $A, B$  be any two sets. Then:

- (1) the Cartesian product of  $A, B$  is defined as  $A \times B = \{(x, y)/x \in A, y \in B\}$ ;

- (2) the relation ' $R$ ' between the set  $A, B$  is defined as  $A \times B = \{x, y\} / x \in A, y \in B, xRy$  in some way };
- (3) the function ' $f$ ' between the sets  $A, B$  is defined as  $A \times B = \{(x, y) / x \in A, y \in B, xRy$  in an unique way}.

Clarity in understanding of the topic function is highly important to incorporate with the core subjects in their disciplines such as Data structure, RDBMS, Programming etc. The concept of functions can be understood as input and output process in Machine Learning which takes a high boon in this era. Drawbacks in the traditional method are realized and to overcome it, a new attempt is made in incorporating TLP of the topic function with the cutting edge technology. Since the students are living in digital era, students rate of interest increases tremendously in working through digital mode rather than the traditional paper and pen method [6, 7]. Hence, often practising problems on function has become easier because of ICT. The objective of this present exercise is to discuss about the impact and importance of MCQ-Multiple Choice Question in TLP of functions in Discrete Mathematics through ICT Tools. This methodology is assessed through pre conceptual test via MCQ in ICT and post conceptual test via Continuous Assessment Test (CAT). This activity was implemented to third semester undergraduate engineering in information technology.

## 2. LITERATURE SURVEY

Technology is changing the way faculty teachers and students learn. It becomes a critical complement to the educational experience, opening more opportunities for the learner than can be encompassed by one campus [1]. Advances in technology means that it can now be an effective tool in learning and development. Many organizations and educational institutions are utilizing technology for a variety of reasons.

Teaching occupies an honourable position in the society. ICT helps the teacher to update the new knowledge, skills to use the new digital tools and resources [2]. By using and acquire the knowledge of ICT, student teacher will become effective teachers. ICT is one of the major factors for producing the rapid changes in our society. It can change the nature of education and roles of students and teacher in teaching learning process. Teachers in India now started using technology in the classroom. Laptops, LCD projector, desktop, EDUCOM, smart

classes, memory sticks are becoming the common media for teacher education institutions. MCQ enhances the teacher to access student's cognitive level [3].

Research work carried out in the usage of ICT tools in mathematics subject at college level is very rare. In this paper, analyzation in the cognitive level through ICT in the quiz mode for the topic function and relations in Discrete Mathematics is carried out and presented.

### 3. METHODOLOGY

No literature is dealt with present work especially in the topic of discrete mathematics at college level.

III semester B. Tech Information technology students are considered for the study. MCQ questions are taken to meet remember and understand level of blooms taxonomy with respect to the course outcome mentioned in the course plan. For every five contact hours, one MCQ with minimum 10 questions with the above said coverage is posted in the LMS. Quiz has been carried out in three stages - Quiz 1, Quiz 2 and Quiz 3 covering the topics relations and functions. Moodle is selected as Learning Management System (LMS). MCQ is treated as the pre conceptual test to CAT 1 exam and CAT 1 is treated as post conceptual test for the Quiz 1, 2 & 3. Online feedback received from the students reveals that, the above followed process increases their rate of interest.

In today's scenario, it is essential to understand the student's cognitive level in understanding the learning interest in teaching everyday's topic. MCQ enhances in high manner to measure their cognitive level in learning [4, 5].

In the topic relations, sub topics such as equivalence relation, representation of relations, and composition of relations, as somehow difficult to learn by one time teaching. Hence, it is essential to practice those topics often in a depth manner. MCQ provides opportunity to learn tactics of every sub topics.

In the topic functions, sub topics such as bijection functions, inverse of the functions, composition functions are hard to understand at the glance. For better understanding, MCQ is opted for practicing tactics of these topics. MCQ is carried out in three different stages as Quiz 1, Quiz 2 and Quiz 3.

#### 4. RESULTS AND DISCUSSION

Experimental results are presented below. Sample of study: B. Tech- IT III semester students sample size: 60; Pre-conceptual test: Quiz 1, 2, 3 Post-conceptual test: CAT 1

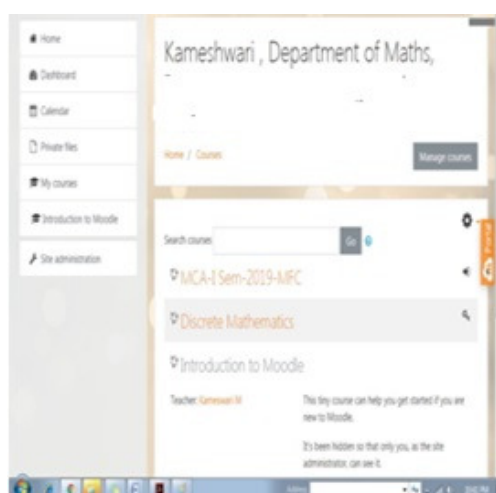


FIGURE 2. Initiation of Moodle class

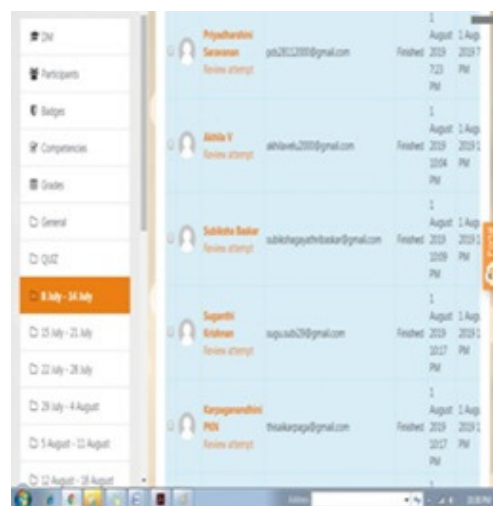


FIGURE 3. Enrolment by III semester IT students

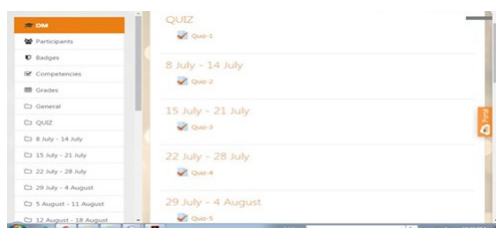


FIGURE 4. Initiation of Quiz 1, 2, 3

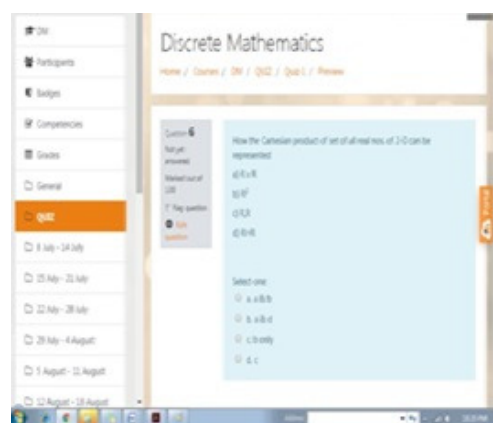


FIGURE 5. Model Quiz questions

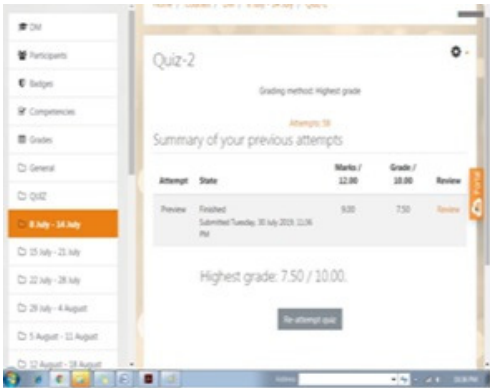


FIGURE 6. Students attempt of Quiz 2

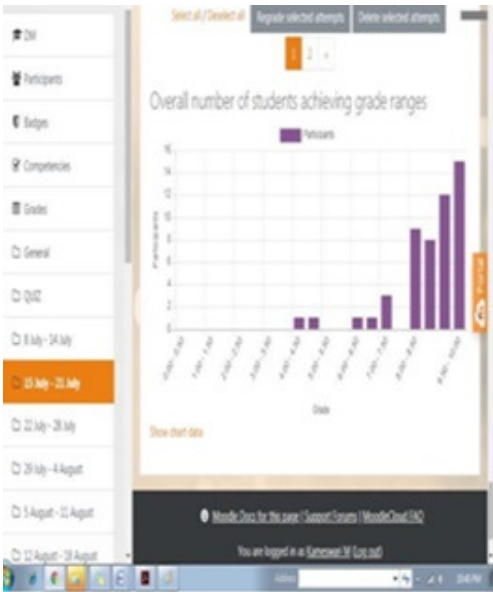


FIGURE 7. Students performance in Quiz

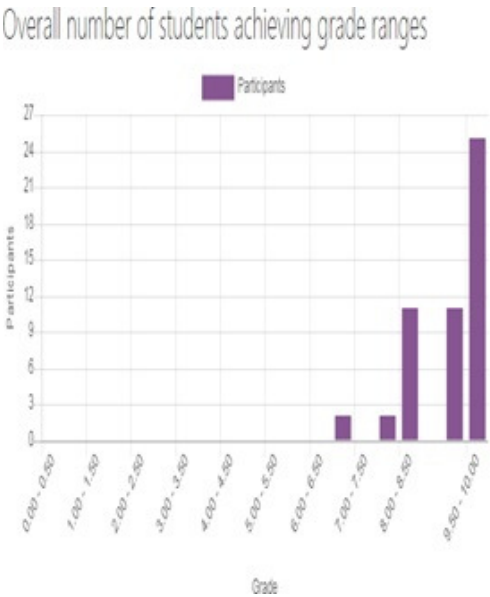


FIGURE 8. Students performance in Quiz 2

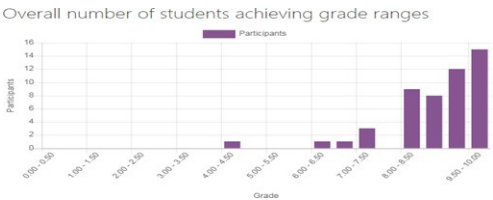


FIGURE 9. Students performance in Quiz 3

Figure 11 exhibits the increase in their learning interest through preconceptual test.

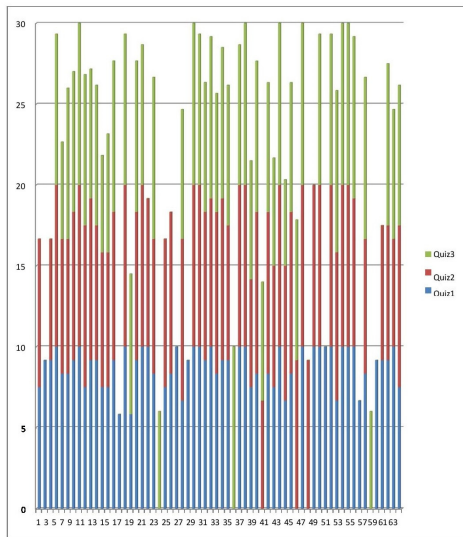


FIGURE  
10. Distribution of  
grade report generated  
for all three quizzes

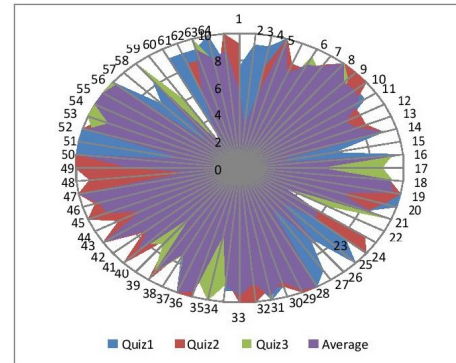


FIGURE  
11. Distribution of  
marks of three quizzes  
and average

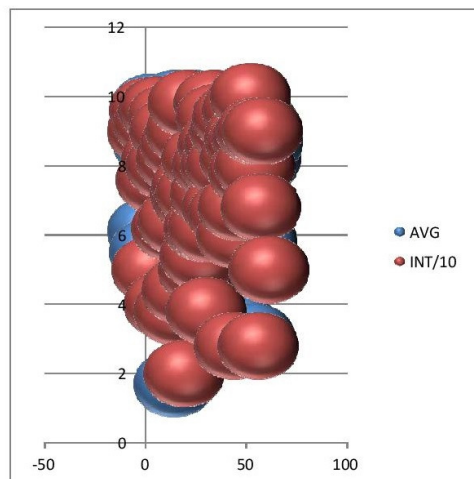


FIGURE 12. Comparison of CAT and Avg marks of Quiz

**4.1. Important observation with respect to pre-conceptual test.** In Quiz-1, students secured marks in the range [4,4.5]; [5.5,5] but in Quiz 2, no student

had secured marks in the ranges [4, 4.5]; [5, 5.5] and also it is observed that more number of students secured marks in the range [9, 9.5] when compared with Quiz 1. In Quiz 3, rich cluster can be viewed in the ranges [8, 8.5] and [9, 9.5], [9.5, 10]. Almost in each Quiz some students secured marks in the range [9.5, 10]. These transition exhibits their gradual but quick increase in their conceptual learning interest and self responsibility towards attempting quiz on or before the last date indicated in Moodle.

**4.2. View and comments on pre-conceptual test.** Regarding discrete mathematics especially in the topic functions, initially students struggled to cooperate with the blended mode of Teaching Learning Process through ICT Tool. Conceptual learning is highly essential to all subjects especially to mathematics because all the other subjects exhibits the concepts involved in it explicitly. Learning computations only in mathematics would not provide project engineers. For doing computations there are many software available. Unless or otherwise conceptual TLP is insisted in mathematics subjects, learner will be ignorant in the application part and they might be struggling to which application which math has to be applied. To overcome these hurdles, implementation of pre-conceptual test is essential to assess their conceptual understanding at 365 degrees.

**4.3. Continuous assessment test as post-conceptual test.** CAT 1 test is considered as post-conceptual test and the following figure shows the better performance in the CAT 1 (Continuous Assessment Test 1) because of the conduct of pre-conceptual test, which includes the topic functions.

## 5. CONCLUSION

To achieve the outcomes effectively, all the technical institutions are moving towards student centric rather than teacher centric education. So MCQ mainly focuses on student's centric learning process. Moodle is one of the best supporting education tools in the cutting edge technology which is effectively used for MCQ, since for its effective exhibition of detailed analysis. The practise which is carried out in this study reveals increase in rate of interest in learning the topics relations and functions through MCQ which is turn stakeholders (students) produces excellent performance in the consequent CAT and terminal exams. So this study manifest and recommend MCQ for pre-conceptual test before CAT and



terminal exam (post-conceptual test) with its impact and importance through ICT tools.

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DEPARTMENT OF MATHEMATICS  
 SCHOOL OF ADVANCED SCIENCES  
 KALASALINGAM ACADEMY OF RESEARCH AND EDUCATION  
 KRISHNANKOIL, SRIVILLIPUTHUR-626126, TAMILNADU, INDIA.  
 Email address: m.kameshwari@klu.ac.in

DEPARTMENT OF MATHEMATICS  
 ANNAMALAI UNIVERSITY  
 ANNAMALAINAGAR-608002, TAMILNADU, INDIA.  
 Email address: emseeni@yahoo.com