

Utilizing Information and Communication Technology (ICT) Based Learning over Traditional Learning



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Abstract: Information and Communication Technology (ICT) based teaching always helps the learners to aware with new trends and technologies. The flexibility and ease of using this technology brings new dimensions to the learners. The effectiveness of the learning depends on the content of e-learning material and its proper organization. ICT based Teaching approaches provides better understanding of the subjects to the learners in descriptive ways. The E-learning contents may includes text, audio, video graphics and animation or the combination of all of the above. The performance of learners may be improve when learning materials includes Information and Communication Technology. There are various approaches to compare the effectiveness of learning. One of the method of comparing traditional teaching and ICT based teaching is pre-test, post-test intervention. In this paper pre-test, post-test intervention approaches of comparison of traditional and ICT based teaching / learning has been used. In this approach student's t-Test is used to show the improvement on learning. Here, the t-value uses 't-value statistical chart' at 90% confidence level. The whole work is divided in to two sections; the former approach calculates the student's performance in different subjects of computer science & engineering (CSE) with normal class room teaching while the latter approach calculated the student's performance after ICT based learning. An experimental circumstance has been established for a group of 18 Post graduates students of computer science; for these purpose 10 different subjects of computer science has been taken in to considerations. When these students appeared in the test after normal teaching, their score were recorded.. When these students appeared in the test after ICT based teaching in the same subjects with the different set of question papers, their secured marks were again recorded. The t-test has been calculated with the help of the scores obtained by students using ICT based Teaching and normal class room teaching. This pre-test, post-test intervention provides better understanding of the subject in latter ICT based learning approaches. From the experimental results of t-test we are in position

to say that the ICT based learning approaches are better as compared to the normal traditional class room learning approaches.

Keywords: pre-test; post-test; ICT based learning; t-value; confidence level.

I. INTRODUCTION

The information and communication technology (ICT) is a facility available in almost every educational field. Teaching and learning process is not strict to physical classroom as ICT offers flexibility to both the users, students and teachers. Now the users can access any services anywhere, anytime or whenever needed because the users require 'learning on demand' and 'mobile learning' [1]. The previous research studies observed that the use of ICT can increase teaching quality, increase students' learning outcome.

The performance of any student depends on the teaching learning methodology used in the class room. In other sense, it is directly proportional to understanding of each topic of subject and study material provided to the student [2, 3]. In current era where the complexity and difficulty levels of any engineering problem requires a logical understanding and solution, the important of each subject must be clearly understood by the students. The logical understanding and their practical applications must be taught to the students [4, 5]. This was not possible previously generally for two reasons: first is limited to traditional teaching and second is unavailability of interactive e-learning material. Both the reasons are fulfilled these days as several e-learning modules are available and many institutions getting their benefits. Some e-learning modules such as NPTEL [6], Course Era, W3School and Wikipedia are available and popular among the learners [7, 8, 9, 10].

The present work verifies this improvement on the basis of pre-test post-test experiment where a group of 18 post graduate students of computer science of the same standard are taken as a sample data. For the experiment purpose, ten newly added total Ten subjects like, Programming in C, Computer Networks, DBMS, Data Structure, Fundamentals of Operating System, Theory of Automata, Software Engineering, Computer Graphics, Artificial Intelligence and Design & Analysis of Algorithms, are identified for experimentation purpose as well as two sets of multiple choice subject wise question papers are prepared. The pre-test is done after the normal teaching and on the first paper of each subject.

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On the other hand, the post-test is conducted after the teaching embedded by e-learning material and on the second set of papers. The t-values is calculated for each set of papers. The Methodology adapted for computing the t-value and 90% confidence level are considered [11].

The experimental analysis of the results of t-test shows that when ICT based teaching embedded with normal classroom teachings then the performance of students are better as compared to normal class room teaching alone.

II. LITERATURE REVIEW

Information and communication technology (ICT) based learning provides better learning approached to the learners to subjective and objective e understanding of the subjects. There are many researchers who addresses the ICT based learning, the detailed description about this type of learning approaches are addressed by researchers are as follows:

Yi Ren, et al. (2017) [12] designed an on-line course applicability assessment (OCAA) depends on statistics based performance of the learners. Authors divided the learners in to two major groups in the S1 group includes three characteristics of learners as 'learning styles', 'learning behavioral types' and 'prior knowledge' of students have significant impact on e-learning effect. Moreover, the role of these three individual characteristics functions differently on e-learning effectiveness for different on-line courses according to the results of S-1 group. In second group S-2, with the guidance of OCAA, students are allowed to select suitable on-line course according to their individual characteristics. The ANOVA comparison of post-test scores between S-1 and S-2 group shows that learners' performance was better with the assistance of OCAA. Based on the statistical analysis of the obtained results, OCAA approach could predict learner's learning effectiveness in a on-line course. On the basis of results people can assigned online the course to the students for better learning performance and understanding of the subjects. Thus, the OCAA could make easier to understand the online courses for learning with their individual characteristics from massive on-line learning materials. Students can choose the courses according to their learning capability the learning characteristics.

Cong Wang et al. (2019) [13] have illustrated the application of Basic Psychological Needs Scale (BPNS) into an online learning environment. Their first study provided psychometric evidence for applying BPNS in online learning contexts. The three-latent need factors and two-latent method factors model identified by Sheldon and Hilpert (2012) through face-to-face contexts demonstrated satisfactory fits with the online sample. Authors have also found one autonomy item and two relatedness items might need modifications to fit the online learning contexts. Their second study demonstrated the concurrent validity of the BPNS in online and face-to-face settings by examining the associations among learning environment, need satisfaction, need dissatisfaction, self-determined motivation, and learning outcomes with Structural Equation Modeling (SEM).

S.Hubalovsky et al. (2019) [2] developed a model for adoptive e-learning for primary school pupils. The students are allowed to learn the content of course with the help of

e-learning contents and some are allowed to learn some course with the traditional learning materials. The author's detected higher percentage of learning with the help of e-learning material. The e-learning provides better understanding of fundamental and formulation of the questions by pedagogical comparing the education objective can be achieved by the pupils who learn the e-contents as compared to the traditional learning contents. Authors also realize certain weaknesses given partly by the triviality of chosen adaptive e-learning algorithm and partly by the fact that the research was done with a limited sample—on a selected set of exercises. Besides the fact that the research results confirm the increase in the learning effectiveness, the authors realize that the research has to be extended by choosing the large amount of student's data. The authors plan realization of a similar research in all subjects, where e-learning exercises are implemented in and across all primary grades. The authors are intending to deal with further improvement of the primary e-learning adaptability. Authors also concludes that this research may be applied with the help of evolutionary algorithms like particle swan optimization techniques for providing the better results of learning. This work can be extended for the graduate lever and post graduate engineering /university courses.

F. Bahrambeygi, et al. (2018) [14] developed and compared the e-learning and traditional method for developing nurse's knowledge and behavior in caring patients with Venous Thrombo-Embolicism (VTE). Using an e-learning program on Continuing Medical Education (CME) programs is an effective learning method in addition to sitting in traditional course. The e-learning program is suitable for nurses to resolve the problems resulting from nurses' inability to be present at traditional courses because of shift schedules. E-learning is a powerful tool for medical education that is able to overcome traditional education obstacles and, furthermore, it is making the nurses active as well as a responsible part of their own education. E-learning has been developed for subjective learning of particular nursing course to improve the performance and learning ability of the nurses. , it can be one of the better education choices for nurses to learn interactively.

Montebello Matthew, (2017) [4] has introduced the use of a three-way comparison methodology to measure e-learning effectiveness, especially when details and finer analysis of specific variables are required. It was argued that it is not only necessary to meticulously design a research project, select the proper methodologies grounded in respective learning theories, but it is also essentially crucial to plan, design and execute an adequate and fitting testing methodology to tightly match and complement the empirical study. The three-way methodology has been documented in this paper to detail together and logistical and ethical issues are rigorously handled.

Chao et al. (2017) [5], presented the interactive e-learning system integrated into a nursing ethics course in the project effectively prompted students to identify ethical dilemmas, approach problems using multiple viewpoints, and make decisions based on deliberate consideration.

The system also fostered better learning in recognition of different viewpoints than the traditional teaching methods. However, it remains unclear whether differences in improvement in only two dimensions of ethical decision making competency warrant the extensive effort required developing and implementing e-learning modalities in nursing ethics education. It may be worthwhile; however, it is better to incorporate some of the elements of the web-based course into traditional courses to improve the learning.

Chih-Ming Chen et al. (2015) [11] observed that, while the three video lecture types enhance learning performance, learning performance with lecture capture and picture-in-picture types is superior to that associated with the voice-over type [8]. The visual e-learning materials and learning aids are better to understand the subjective knowledge and the same learning performance with the three video types. Additionally, sustained attention induced by the voice-over type is markedly higher than that with the picture-in-picture type. Sustained attention of verbalizes is also significantly higher than that of visualizes when learning with the three video lectures.

III. OBJECTIVES

We have designed this paper to evaluate the learning level of students at different level. The first evaluation is done after normal class room teaching while second evaluation is done when class room is embedded with ICT mode teaching materials. For this purpose, we have identified eighteen post graduate students and executed both the plans on these students. The evaluation is being done through ten computer science subjects. These subjects are totally unknown to the students and never being taught earlier during their course.

The complete execution and evaluation have following four parts:

- Student evaluation through pre-test method
- Student evaluation through post-test method
- T-model: Statistical study using t-value at 90% confidence level [15].
- Analysis of two evaluations and comparing the effectiveness of student's performance.

IV. MATERIAL & METHODS

The objectives of this research work have been fulfilled with the following statistical methodologies:

Table 2 : Marks scored in 10 different subjects by 18 students using normal teaching

S.N.	Subject wise Marks Scored by Students out of 30									
	Sub-1	Sub-2	Sub-3	Sub-4	Sub-5	Sub-6	Sub-7	Sub-8	Sub-9	Sub-10
1	26	24	22	18	22	22	22	25	27	26
2	24	23	25	17	25	23	25	23	25	23
3	22	22	22	22	26	22	24	26	21	27
4	22	25	26	22	27	22	18	28	14	23
5	19	25	23	18	18	23	18	22	23	22
6	22	23	22	22	23	22	23	27	26	22
7	19	25	22	21	22	21	22	21	22	21
8	26	21	28	26	16	22	16	18	25	23
9	14	25	10	25	26	12	19	12	22	25

4.1 Student evaluation through pre-test method

All 18 students of post graduate students of computer science we are allowed to learn total Ten subjects like, Programming in C, Computer Networks, DBMS, Data Structure, Fundamentals of Operating System, Theory of Automata, Software Engineering, Computer Graphics, Artificial Intelligence and Design & Analysis of Algorithms. The following Methodology has been adapted for computing the t-value and 90% confidence level [15].

The students learning can be checked through pre-test method. This method can be done after traditional (Black board) teaching methodology. Here, ten newly added subjects of Computer Science and Engineering have been taken. These are mentioned along with subject code in Table-1.

A unit of syllabus of all of the above subject codes is being taught to 18 students. An exam is conducted one by one for each of the subjects and their marks are recorded which is shown in Table-2.

Table 1: Details of subjects & Codes in which students have been examined

S.No.	Subject Code	Subject Name
1	SUB-1	Programming in C
2	SUB -2	Computer Networks
3	SUB -3	DBMS
4	SUB -4	Data Structure
5	SUB -5	Fundamentals of Operating System
6	SUB -6	Theory of Automata
7	SUB -7	Software Engineering
8	SUB -8	Computer Graphics
9	SUB -9	Artificial Intelligence
10	SUB -10	Design & Analysis of Algorithms

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10	19	22	21	24	23	22	23	26	21	24
11	22	23	20	25	12	22	12	18	25	25
12	25	26	22	23	22	28	22	17	27	27
13	21	23	21	21	22	22	22	18	26	23
14	19	26	21	19	21	27	21	28	25	23
15	25	24	27	22	23	26	23	21	26	22
16	22	25	19	21	23	28	23	21	23	26
17	23	26	12	20	22	19	25	19	22	28
18	22	23	10	21	24	22	19	22	23	23

The analysis has been done on the above table. The marks scored by each student in any of the subjects are varying in nature and do not follow a definite trend.

Also, one student may secure good marks in one subject while lesser marks in another subject.

For example, the 9th student scored good marks in Sub-2, Sub-4, Sub-5 and Sub-10 while the same student could not performed in subjects Sub-3, Sub-6 and Sub-8. The comparison can be done with much accuracy in the above scenario.

4.2 Student evaluation through post-test method

The same unit has been taught again to the similar group of 18 students. This time ICT based e-learning material is

incorporated. The e-learning material contains video lectures, practical aspects, application of that part of the syllabus, assignments and tutorial sheets.

For the difference, we have asked the teachers to make a different paper in each of 10 subjects. The syllabus is same as we have done for the first methods. Therefore, this time, the exam paper is set little difficult than previous one and conducted for each of the mentioned subjects. Since, the syllabus has been taught with some real life applications, on-line assignments and tutorial sheets have also been floated, we were more concerned about the marks scored by the students in these papers. The marks scored by each student are mentioned in Table-3:

Table 3: Marks scored in 10 different subject codes by 18 students using video lectures teaching

S.N.	Subject wise Marks Scored by Students out of 30									
	Sub-1	Sub-2	Sub-3	Sub-4	Sub-5	Sub-6	Sub-7	Sub-8	Sub-9	Sub-10
1	22	26	27	22	22	28	30	27	26	24
2	23	28	22	23	26	25	27	26	28	25
3	22	25	22	22	23	27	22	25	23	27
4	23	29	22	22	26	27	23	24	28	25
5	26	25	26	21	25	23	22	21	26	23
6	24	23	22	22	23	22	10	23	21	28
7	25	25	27	21	27	26	28	23	26	26
8	26	21	20	26	29	25	28	30	27	22
9	26	28	21	25	23	24	22	22	23	28
10	23	29	27	26	22	22	28	23	25	29
11	22	27	24	23	27	23	28	28	27	23
12	22	24	28	23	25	24	23	22	25	29
13	23	22	23	21	27	21	25	23	21	23
14	23	21	21	19	25	29	27	25	23	23
15	21	22	22	22	18	22	20	28	25	26
16	26	28	20	28	19	23	19	22	26	27
17	22	26	20	27	21	23	21	21	28	26
18	22	28	28	23	29	27	23	22	27	25

The comparison of marks shown in Table 2 and in Table 3 increases our thought process and requires deep analysis. At many points and in few subjects, the marks scored by students are different. This shows that these two methodologies do the different impact on the student's learning and their performance.

4.3 t-Models: Statistical study using t-value at 90% confidence level

The t-value is the number of standard deviations from the mean of a data set.

It is a measure of number of standard deviations below or above the population mean. A t-value is also known as a standard score and it can be placed on a normal distribution curve.

This paper introduces t-model that works on t-value. The attributes for the t-value are:

A T-Test [16] is a form of the statistical hypothesis test based on students t-statistical and t distribution to find out the p value (probability) which can be used to accept or reject the null hypothesis.

T test analysis if the mean of two data sets are greatly different from each other

The T-Test [16] can be calculated using equation number 1 as:

$$t = \frac{(\sum D) / N}{\sqrt{\frac{\sum D^2 - \left(\frac{(\sum D)^2}{N}\right)}{(N-1)(N)}}} \quad (1)$$

Where

$\sum D$: Sum of the differences of two scores mark

$\sum D^2$: Sum of the squared differences

N : Number of students appeared in the test

Table 4: Calculation of T-Test for C-Programming

S.no.	SUB-1 Normal	SUB-1 video	Difference (D)	square (D) ²
1	26	22	4	16
2	24	23	1	1
3	22	22	0	0
4	22	23	-1	1
5	19	26	-7	49
6	22	24	-2	4
7	19	25	-6	36
8	26	26	0	0
9	14	26	-12	144
10	19	23	-4	16
11	22	22	0	0
12	25	22	3	9
13	21	23	-2	4
14	19	23	-4	16
15	25	21	4	16
16	22	26	-4	16
17	23	22	1	1
18	22	22	0	0
N=18		total	$\sum D = -29$	$\sum D^2 = 329$

The t-value shall be calculated using equation (1) and table -4. And we consider only positive value of t whenever it comes negative we take the mod of the obtained results.

From table 4 and equation (1) the calculated t value is 1.6781

Table 5: Calculation of T-Test for Computer Networks

S.no.	SUB-2 Normal	SUB-2 video	Difference (D)	square (D) ²
1	24	26	-2	4
2	23	28	-5	25
3	22	25	-3	9
4	25	29	-4	16
5	25	25	0	0
6	23	23	0	0
7	25	25	0	0
8	21	21	0	0
9	25	28	-3	9
10	22	29	-7	49
11	23	27	-4	16
12	26	24	2	4
13	23	22	1	1
14	26	21	5	25
15	24	22	2	4
16	25	28	-3	9
17	26	26	0	0
18	23	28	-5	25
N=18		total	$\sum D = -26$	$\sum D^2 = 196$

The t-value shall be calculated using equation (1) and table -5. And we consider only positive value of t whenever it comes negative we take the mod of the obtained results.

From table- 5 and equation (1) the calculated t-value is 2

Table 6: Calculation of T-Test for Data Base Management System

S.no.	SUB-3 Normal	SUB-3 video	Difference (D)	square (D) ²
1	22	27	-5	25
2	25	22	3	9
3	22	22	0	0
4	26	22	4	16
5	23	26	-3	9
6	22	22	0	0
7	22	27	-5	25
8	28	20	8	64
9	10	21	-11	121
10	21	27	-6	36
11	20	24	-4	16
12	22	28	-6	36
13	21	23	-2	4
14	21	21	0	0
15	27	22	5	25
16	19	20	-1	1
17	12	20	-8	64
18	10	28	-18	324
N=18		total	$\sum D = -49$	$\sum D^2 = 775$

The t -value shall be calculated using equation (1) and table -6. And we consider only positive value of t whenever it comes negative we take the mod of the obtained results. From table 6 and equation (1) the calculated t value, $t = 1.88$

Table 7: Calculation of T-Test for Data Structure

S.no.	SUB-4 Normal	SUB-4 video	Difference (D)	square (D) ²
1	18	22	-4	16
2	17	23	-6	36
3	22	22	0	0
4	22	22	0	0
5	18	21	-3	9
6	22	22	0	0
7	21	21	0	0
8	26	26	0	0
9	25	25	0	0
10	24	26	-2	4
11	25	23	2	4
12	23	23	0	0
13	21	21	0	0
14	19	19	0	0
15	22	22	0	0
16	21	28	-7	49
17	20	27	-7	49
18	21	23	-2	4
N=18		total	$\Sigma D = - 29$	$\Sigma D^2 = 171$

The t -value shall be calculated using equation (1) and table -7. And we consider only positive value of t whenever it comes negative we take the mod of the obtained results. From table 7 and equation (1) the calculated t -value, is $t = 10.06$

Table 8: Calculation of T-Test for Data Structure

S.no.	SUB-5 Normal	SUB-5 video	Difference (D)	square (D) ²
1	22	22	0	0
2	25	26	-1	1
3	26	23	3	9
4	27	26	1	1
5	18	25	-7	49
6	23	23	0	0
7	22	27	-5	25
8	16	29	-13	169
9	26	23	3	9
10	23	22	1	1
11	12	27	-15	225
12	22	25	-3	9
13	22	27	-5	25
14	21	25	-4	16
15	23	18	5	25
16	23	19	4	16
17	22	21	1	1
18	24	29	-5	25
N=18		total	$\Sigma D = - 40$	$\Sigma D^2 = 606$

The t -value shall be calculated using equation (1) and table -8. And we consider only positive value of t whenever it comes negative we take the mod of the obtained results.

From table 8 and equation (1) the calculated t value of is $t = 1.720$

Table 9: Calculation of T-Test for Theory of Computation

S.no.	SUB-6 Normal	SUB-6 video	Difference (D)	square (D) ²
1	22	28	-6	36
2	23	25	-2	4
3	22	27	-5	25
4	22	27	-5	25
5	23	23	0	0
6	22	22	0	0
7	21	26	-5	25
8	22	25	-3	9
9	12	24	-12	144
10	22	22	0	0
11	22	23	-1	1
12	28	24	4	16
13	22	21	1	1
14	27	29	-2	4
15	26	22	4	16
16	28	23	5	25
17	19	23	-4	16
18	22	27	-5	25
N=18		total	$\Sigma D = - 36$	$\Sigma D^2 = 347$

The t -value shall be calculated using equation (1) and table -9. And we consider only positive value of t whenever it comes negative we take the mod of the obtained results. From table 9 and equation (1) the calculated value of $t = 2.247$

Table 10: Calculation of T-Test for Software Engineering

S.no.	SUB-7 Normal	SUB-7 video	Difference (D)	square (D) ²
1	22	30	-8	64
2	25	27	-2	4
3	24	22	2	4
4	18	23	-5	25
5	18	22	-4	16
6	23	10	13	169
7	22	28	-6	36
8	16	28	-12	144
9	19	22	-3	9
10	23	28	-5	25
11	12	28	-16	256
12	22	23	-1	1
13	22	25	-3	9
14	21	27	-6	36
15	23	20	3	9
16	23	19	4	16
17	25	21	4	16
18	19	23	-4	16
N=18		total	$\Sigma D = - 49$	$\Sigma D^2 = 855$



The t-value shall be calculated using equation (1) and table -10. And we consider only positive value of t whenever it comes negative we take the mod of the obtained results. From table 10 and equation (1) the calculated t value of t = 1.777

17	22	28	-6	36
18	23	27	-4	16
N=18		total	$\Sigma D = -32$	$\Sigma D^2 = 380$

Table 11: Calculation of T-Test for Computer Graphics

S.no.	SUB-8 Normal	SUB-8 video	Difference (D)	square (D) ²
1	25	27	-2	4
2	23	26	-3	9
3	26	25	1	1
4	28	24	4	16
5	22	21	1	1
6	27	23	4	16
7	21	23	-2	4
8	18	30	-12	144
9	12	22	-10	100
10	26	23	3	9
11	18	28	-10	100
12	17	22	-5	25
13	18	23	-5	25
14	28	25	3	9
15	21	28	-7	49
16	21	22	-1	1
17	19	21	-2	4
18	22	22	0	0
N=18		total	$\Sigma D = -43$	$\Sigma D^2 = 408$

The t-value shall be calculated using equation (1) and table -11 and we consider only positive value of t whenever it comes negative we take the mod of the obtained results. From table 11 and equation (1) the calculated value of t is 2.393

Table 12: Calculation of T-Test for Artificial Intelligence

S.no.	SUB-9 Normal	SUB-9 video	Difference (D)	square (D) ²
1	27	26	1	1
2	25	28	-3	9
3	21	23	-2	4
4	14	28	-14	196
5	23	26	-3	9
6	26	21	5	25
7	22	26	-4	16
8	25	27	-2	4
9	22	23	-1	1
10	21	25	-4	16
11	25	27	-2	4
12	27	25	2	4
13	26	21	5	25
14	25	23	2	4
15	26	25	1	1
16	23	26	-3	9

The t-value shall be calculated using equation (1) and table -12. And we consider only positive value of t whenever it comes negative we take the mod of the obtained results. From table 12 and equation (1) the calculated t -value is 1.730

Table 13: Calculation of T-Test for Design & Analysis of Algorithms

S.no.	SUB-10 Normal	SUB-10 video	Difference (D)	square (D) ²
1	26	24	2	4
2	23	25	-2	4
3	27	27	0	0
4	23	25	-2	4
5	22	23	-1	1
6	22	28	-6	36
7	21	26	-5	25
8	23	22	1	1
9	25	28	-3	9
10	24	29	-5	25
11	25	23	2	4
12	27	29	-2	4
13	23	23	0	0
14	23	23	0	0
15	22	26	-4	16
16	26	27	-1	1
17	28	26	2	4
18	23	25	-2	4
N=18		total	$\Sigma D = -26$	$\Sigma D^2 = 146$

The t-value shall be calculated using equation (1) and table -13. And we consider only positive value of t whenever it comes negative we take the mod of the obtained results. From table 13 and equation (1) the calculated t value is 11.552

4.4 Analysis of ICT based teaching method and traditional class room teaching method for comparing the effectiveness of student’s performance

The subject wise analysis of t-value has been obtained using the above formula and calculated value of t is shown in the

Table 14: Details of Subject codes, Name of Subject & calculated t value have been examined by experimental calculation

S.No.	Subject Code	Name of Subject	calculated t value
1	SUB-1	Programming in C	1.6781
2	SUB -2	Computer Networks	2
3	SUB -3	Data Base Management System	1.88
4	SUB -4	Data Structure	10.06

5	SUB -5	Operating System	1.720
6	SUB -6	Theory of Computation	2.247
7	SUB -7	Software Engineering	1.777
8	SUB -8	Computer Graphics	2.393
9	SUB -9	Artificial Intelligence	1.730
10	SUB -10	Design & Analysis of Algorithms	11.552

The Table -14 and corresponding graph of equivalent to the subject has been shown in figure 1.

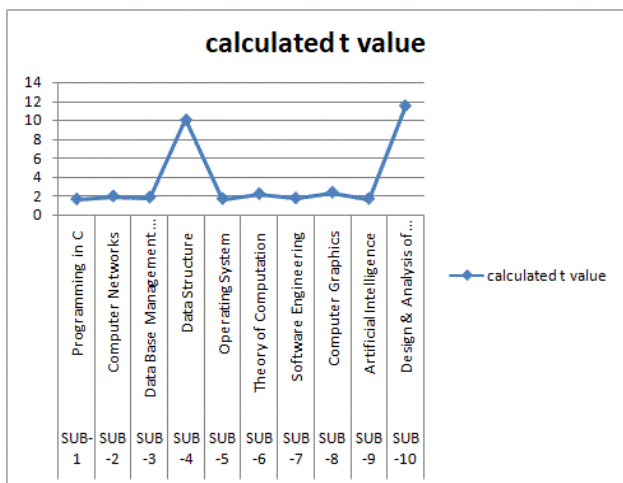


Figure 1: Details of Subject codes, Name of Subject & calculated t value have been examined

V. EXPERIMENTAL RESULTS AND ANALYSIS

The Table -4 provides details of the marks obtained by students in C-Programming subject. The calculated value of *t* from, the Table -4, is *t* = -1.6781. Here we choose Degree of Freedom as 17 because Df= no. of participations student in learning – 1. So Df = 18-1=17. The *t* value in the T table [17] at confidence level 90% with Df value 17 =1.740. And the calculated value of *t* obtained from Table -4, and equation 1 is *t* = 1.6781, the calculated t value is less than the *t* value of the *t*- table.

The Table -5 provides details of the marks obtained by students in Computer Networks subject. The calculated value of *t* from, the Table -5, is *t* = -2. Here we choose Degree of Freedom as 17. The *t* value in the T Table [17] at confidence level 90% with Df value 17 =1.740

And the calculated value of *t* obtained from Table -5, and equation 1 is *t* = 2, the calculated t value is greater than the *t* value of the *t*- table.

The Table -6 provides details of the marks obtained by students in Data Base Management System subject. The calculated value of *t* from the Table -6, is *t* = 1.88. Here we choose Degree of Freedom as 17. The *t* value in the T table[17] at confidence level 90% with Df value 17= 1.740 .And the calculated value of *t* obtained from Table -6, and equation 1 is *t* = 1.88, the calculated t value is greater than the *t* value of the *t*- table.

The Table -7 provides details of the marks obtained by students in Data Structure subject. The calculated value of *t* from the Table -7, is *t* = 10.06. Here we choose Degree of Freedom as 17. The *t* value in the T table at confidence level 90% with Df value 17= 1.740 .And the calculated value of *t* obtained from Table -7, and equation 1 is *t* = 10.06, the calculated t value is greater than the *t* value of the *t*- table.

The Table -8 provides details of the marks obtained by students in Operating System subject. The calculated value of *t* from the Table -8, is *t* = 1.720. Here we choose Degree of Freedom as 17. The *t* value in the T table at confidence level 90% with Df value 17= 1.740 .And the calculated value of *t* obtained from Table -8, and equation 1 is *t* = 1.720, the calculated t value is less than the *t* value of the *t*- table.

The Table -9 provides details of the marks obtained by students in Theory of Computation subject. The calculated value of *t* from the Table -9, is *t* = 2.247. Here we choose Degree of Freedom as 17. The *t* value in the T table at confidence level 90% with Df value 17= 1.740 .And the calculated value of *t* obtained from Table 9, and equation 1 is *t* = 2.247, the calculated t value is greater than the *t* value of the *t*- table.

The Table -10 provides details of the marks obtained by students in Software Engineering subject. The calculated value of *t* from the Table -10, is *t* = 1.777. Here we choose Degree of Freedom as 17. The *t* value in the T table at confidence level 90% with Df value 17= 1.740 .And the calculated value of *t* obtained from Table -10, and equation 1 is *t* = 1.777, the calculated t value is greater than the *t* value of the *t*- table.

The Table -11 provides details of the marks obtained by students in Computer Graphics subject. The calculated value of *t* from the Table -11, is *t* = 2.393. Here we choose Degree of Freedom as 17. The *t* value in the T table at confidence level 90% with Df value 17= 1.740 .And the calculated value of *t* obtained from Table -11, and equation 1 is *t* = 2.393, the calculated t value is greater than the *t* value of the *t*- table.

The Table -12 provides detail of the marks obtained by students in Artificial Intelligence subject. The calculated value of *t* from the Table -12, is *t* = 1.730. Here we choose Degree of Freedom as 17. The *t* value in the T table at confidence level 90% with Df value 17= 1.740 .And the calculated value of *t* obtained from Table -12, and equation 1 is *t* = 1.730, the calculated t value is less than the *t* value of the *t*- table.

The Table -13 provides details of the marks obtained by students in Design & Analysis of Algorithms subject. The calculated value of *t* from the Table -13, is *t* = 11.552. Here we choose Degree of Freedom as 17. The *t* value in the T table at confidence level 90% with Df value 17= 1.740 .And the calculated value of *t* obtained from Table -13, and equation 1 is *t* = 11.552, the calculated t value is greater than the *t* value of the *t*- table.

VI. RESULTS AND CONCLUSION

The table-2 and Table-3 provide details of the marks obtained by 18, students of post graduate students of computer science II year.



We have taken pre-test for normal class room teaching approach of all 18 students of post graduate students of computer science II year.

The students are allowed to teach ten subjects which is mentioned above. We have taken for two weeks the entire Students' tough ICT based video lectures and again a post test conducted for evaluation of improvement of learning in seven Subjects Computer Networks, Data Base Management System, Data Structure, Theory of Computation, Software Engineering, Computer Graphics, Design & Analysis of Algorithms with the same group of students. Only three subjects are not improvement.

The experimental results shows that the calculated t value for seven subjects the e-learning approach provides better in terms of learning analytical skills of the student's. Thus from above results of the values of t we are in position to conclude that ICT based video lectures based methodologies are very effective in terms of subject understanding and learning.

Subjects Design & Analysis of Algorithms and Data Structure has maximum calculated value of tat 90% confidence level due to ICT based video lectures as compared to traditional teaching approach for the all 18 students.

Subjects C-Programming, Operating System and Artificial Intelligence do not good t calculated value at 90% confidence level in ICT based video lectures methodology among the all 18 students. It may be due to the level and capacity of learning of particular students. But the overall 70% subjects better value of tat 90% confidence level as compared to traditional classroom teaching approach. Traditional classroom teaching approach totally depends on expertise and experience of the recourse person (Lecturer). Different lecturers have different capability the understanding of subject and the knowledge. Subject knowledge totally depends on expertise and experience of a particular lecturer. On the other hand in online/ offline ICT based teaching methodology students got same level and expertise of the Video lecture; due to availability of video lecture at any time the learning may repetitive and students learn more as compare to class room approach. Students will learn all the time with same expertise. Therefore the ICT based Video lectures approach provides better learning of the students.

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