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Learning Objects and e-Learning System: A Research Review

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Abstract: e-Learning is becoming a major component in academia today. This study discusses the key findings of an investigation of e-Learning system a framework for learning by doing and explaining with a computer based Tutoring system. The e-Learning softwares that is commercially available has been developed mainly to satisfy the needs of the industry, whose goal is the fast acquisition of competences. On the other hand, universities deals with learning processes that develop themselves on a mediuni or a long term period and their main idea is to help students to develop a cognitive representation of those sectors in which they are expected to operate. This is just one of the reasons that induced us to develop our own e-Learning systems using Learning Objects. A study has been conducted to know the impact of Learning objects and e-Learning in Education Sector. The study intends to analyze and to find out the difference between the Traditional Teaching Method and Teaching by using e-Learning among Students of SCSVMV in Concepts of Object Oriented Programming using C++. The results of the study shows that the systematic use of Learning Objects as part of the instructional design process will improve the quality of Teaching and Learning and it plays an important role in e-Learning.

Key words: e-Learning, learning objects, e-Learning system, data analysis t-test, correlation, stanine

INTRODUCTION

Substantial support for a leaner centered e-Learning environment is essential in higher education where learning involves knowledge and skills acquisition. It is in this sector that e-Learning is believed to have considerable potential in the near future (Iahad and Dafoulas, 2004). Times are changing. Today, it is the age of e-Learning. The shift from instructorcentred to student-centred e-Learning was the immediate effect of the radical increase in student numbers and he struggle to find a sufficient number of experienced instructors with suitable skills. In e-Learning environment the instructor inevitably became a facilitator of the overall learning process (Lin and Hsieeh, 2001). An e-Learning System was created Using Learning Objects for Object Oriented Programming using C++ Course at SCSVMV, [Deemed University], Kancheepuram, Tamil Nadu, India to validate the suitability of e-Learning system. A study has been conducted to analyze and to find out the difference between the Traditional Teaching Method and Teaching by using e-Learning among Students of SCSVMV in Concepts of Computer Lab Programs in C++. The course was thought to the students in the conventional, facetoface mode for A section and by using e-Learning system for B section Students of Second Year Engineering Students. The maim objective is to find out the usability and the difference between the Traditional Teaching Method and Teaching by using e-Learning System Designed using Learning Objects among Students of SCSVMV, Deemed University based on Object Oriented Programming using C++ Lab programs.

e-LEARNING

The sciences of instruction, learning and knowledge are intricate and the e- before Learning adds another dimension of complexity while paving new learning paths for e-Learning. e-Learning is a combination of content and instructional methods delivered by media elements such as words and graphics on a computer intended to build job transferable knowledge and skills linked to individual learning goals or organizational performance. An instructional technology called learning objects (LTSC, 2000) currently leads other candidates for the position of technology of choice in the next generation of

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instructional design, development and delivery due to its potential generativity, adaptability and scalability. Learning objects are elements of a new type of computer based instruction grounded in the object oriented paradigm of computer science. The learning objects may provide instructional benefits by potentially increasing the speed and efficiency of e-teaching and instructional Development.

Reusable learning objects vs traditional other types of instructional media: The IEEE's Learning Technology Standards Committee has presented a definition of learning object any entity, digital or nondigital, that can be used, reused, or referenced during technology supported learning. A Learning Object is an independent and selfstanding unit of learning content that is predisposed to reuse in multiple instructional contexts. Object-orientation highly values the creation of components called objects that can be reused in multiple contexts. Examples of technology-supported learning include computer-based training systems, interactive learning environments and collaborative learning environments. Examples of Learning Objects include multimedia content, instructional content, learning objectives, instructional software and software tools and persons, organizations, or events referenced during technology supported learning (LOM, 2000).

Instructional designers can build small (relative to the size of an entire course) instructional components that can be reused a number of times in different contexts. Additionally, learning objects are generally understood to be digital entities deliverable over the Internet, meaning that any number of people can access and use them simultaneously, compared to traditional instructional media, such as an overhead or video tape, which can only exist in one place at a time. The general benefits of Learning Object-based Teaching compared to traditional instructor-led teaching includes Access is available anytime, anywhere, around the globe, Per student equipment costs are affordable, Student tracking is made easy, Possible learning object architecture supports on demand, personalized learning, Content is easily updated, Justin time Instruction, Promoting elaboration and understanding and all those shared by other types of technology-based Training.

Learning objects the instructional technology of online learning: To facilitate the widespread adoption of the learning objects approach, the Learning Technology Standards Committee (LTSC) of the Institute of Electrical and Electronics Engineers (IEEE) formed in 1996 to develop and promote instructional technology standards (LTSC, 2000). Without such standards, universities, corporations and other organizations around the world would have no way of assuring the interoperability of their instructional technologies, specifically their learning objects. The IMS Project, which develops and promotes compliance with technical standards for online learning, is funded solely by memberships. The highest level of participation is Contributing Member, with an annual fee of $50,000, retroactive to the project's beginning. Over 30 vendors, universities and other organizations belong to Instructional Management System program (IMS, 2000) whose membership list reads like a who's who of software developers and high powered organizations: Microsoft, Oracle, Sun, Macromedia, Apple, IBM, UNISYS, the US Department of Defense, the US Department of Labor, the California State Universities, International Thompson Publishing and Educational Testing Service, to name a few. The next level of membership down, the Developers Network, has over 200 members, most of which are universities. Recognition, adoption and the potential for future support for the learning objects idea is significant and includes some of the biggest players in software, higher education and even investment. Learning objects may become the instructional technology of online learning.

e-Learning system and population and sample: To Measure the significant difference between the Traditional Teaching Method and Teaching by using e-Learning, the investigator collected sample from section A of 60 Engineering Students by Tacking Class by using Traditional Teaching Method (Board and Chocke pieces) and form section B of 60 Engineering Students by Tacking Classes using e-Learning System Designed using Learning Objects at Sri Chandrasekharendra Saraswathi ViswaMaha Vidhyalaya, deemed university, Enathur, Kanchipuram.

Objectives:

- To find out the usability and the difference between the Traditional Teaching Method and Teaching by using e-Learning System Designed using Learning Objects among Students of SCSVMV, Deemed University based on Object Oriented Programming using C++ Lab programs.
- To find out the relationship between Traditional Teaching Method and teaching by using e-Learning System Designed using Learning Objects among Students of SCSVMV, [Deemed University].
- To structure the profile showing the difference between the Teaching by using e-Learning System Designed using Learning Objects and Traditional Teaching Method for Engineering Students of SCSVMV, [Deemed University] based on Object Oriented Programming using C++.

DATA ANALYSIS

Instrumentation: Hence, it is essential to understand the importance of Object Oriented Programming Concepts and the difference between the Teaching by using e-Learning System Designed using Learning Objects and Traditional in this modern complex world. To measure the difference between the Teaching by using e-Learning System Designed using Learning Objects and Traditional in Programming Skills among the students of SCSVM//V, the investigator used objective test.

Questionnaire: This consists of 50 questions which are followed by 4 responses, the student has to select and tick (√) one correct response. The respondents were informed that this is a test of their knowledge and their responses would be kept confidential. They were also informed that there is no fixed time limit and asked to complete all the 50 questions within 30 min as far as possible. This questionnaire is in English. One mark is given for correct response and zero for wrong answer and also for unanswered.

Validity of the tools: The validity of a test, or of any measuring instrument, depends upon the fidelity with which it measures what it purports to measure. A test is valid when the performance is otherwise independently measured or objectively defined.

Content validity: Content validity of the tests and the instructional materials were processed by a thorough and systematic examination of relevant objectives. The classification of questions of Concepts of Basic Computer Science under various values is given in the Table 1.

Hypothesis:

- There will be a significant difference between Teaching by using e-Learning System Designed using Learning Objects and Traditional Teaching Method based on Object Oriented Programming using C++ Lab programs.
- There will be a high/substantial/low relationship between Teaching by using e-Learning System Designed using Learning Objects and Traditional Teaching Method based on Object Oriented Programming using C++ Lab programs.
- Teaching by using e-Learning System Designed using Learning Objects and Traditional Teaching Method will differ significantly in terms of based on Object Oriented Programming using C++ Lab programs.

Table 1: Classification of basic computer science concepts

Concepts of object oriented programming	Questions
Classes and Objects	6, 14, 17, 19, 42, 43, 62, 87, 95, 98, 100
Inline and Outline functions	12, 15, 28, 29, 36, 37, 47, 54, 57, 63, 66
Inheritance	10, 13, 22, 32, 34, 35, 46, 56, 74, 75, 76
Operator Overloading	3, 5, 7, 8, 16, 18,23, 26, 50, 52, 61, 92
Friend Functions	4, 27, 38, 48, 49, 51, 58, 60, 64, 65, 93
Memory Management	39, 44, 53, 55, 67, 69, 70, 71,77, 80, 81
Virtual Functions	11, 24, 30, 40, 41, 59,82, 83, 88, 89, 99
Polymorphism	1, 2, 9, 20, 31, 33, 45, 84, 86, 90, 94
Templates	21, 25, 68, 72, 73, 78, 79, 85, 91, 96, 97

STATISTICAL TECHNIQUES

The various statistical techniques used for analyzing data were

- **t-test:** To find out the significance of difference between the mean scores of Teaching by using e-Learning System Designed using Learning Objects and Traditional Teaching Method among students of SCSVMV, Deemed University, Kanchipuram.
- **Correlation:** To find out the relationship between Theoretical Knowledge, Programming Skills and Object Oriented Programming Concepts by Teaching by using e-Learning System Designed using Learning Objects and Traditional Teaching Method among Students.
- **The stanine:** To draw the profile showing the relationship between Teaching by using e-Learning System Designed using Learning Objects and Traditional Teaching Method among students on Theoretical Knowledge, Programming Skills and Object Oriented Programming Concepts.

Null hypothesis: Null hypothesis is one of the most important techniques used by the researchers in the field of education. A null hypothesis is useful in testing the significance of difference. The null hypothesis states that no relationship exists between the variables studied or no difference will be found between treatments. Here research hypothesis of the experiment stated in positive and substantive forms are restated in this section in null form as advocated by Best before the relevant statistical test is applied.

Differential studies: This section highlights the differential studies identifying the difference between any two subgroups of the sample by applying t-value.

Awareness of object oriented programming concepts: The following table furnishes the difference between Theoretical Knowledge, Programming Skills and Object Oriented Programming Concepts among Students by Traditional Teaching Method and Teaching by using e-Learning System Designed using Learning Objects.

Table 2: The traditional teaching method (TTM) vs teaching by using e-Learning system designed using learning objects (ELDLO) (scsvmv engineering students)

Variables	Region	Mean	SD	t-value	Level of significance
Theoretical knowledge	TTM	68.38	12.69		
	ELDLO	70.88	11.33	1.47	NS
Programming skills	TTM	29.38	8.16		
	ELDLO	31.24	8.91	1.54	NS
Classes and objects	TTM	6.51	2.20		
	ELDLO	7.10	2.37	1.83	NS
Inline and outline	TTM	6.52	2.27		
functions	ELDLO	6.49	1.87	0.10	NS
Inheritance	TTM	6.30	2.35		
	ELDLO	6.44	2.00	0.45	NS
Operator overloading	TTM	6.47	2.17		
	ELDLO	8.09	2.73	4.64	0.001
Friend functions	TTM	6.18	2.41		
	ELDLO	5.85	2.43	0.97	NS
Memory management	TTM	6.32	2.29		
	ELDLO	6.74	2.05	1.37	NS
Virtual functions	TTM	6.27	2.13		
	ELDLO	7.12	2.30	2.61	0.01
Polymorphism	TTM	6.48	2.44		
	ELDLO	6.99	2.13	1.58	NS
Templates	TTM	7.45	2.40		
	ELDLO	8.30	2.44	2.49	0.05
Total for all concepts	TTM	58.50	18.01		
	ELDLO	63.12	16.87	1.87	NS

From Table 2, it is inferred that there is no significant difference between the Traditional Teaching Method and Teaching by using e-Learning System Designed using Learning Objects among SCSVMV engineering students in Theoretical Knowledge, Programming Skills, Classes and Objects, Inline and Outline functions, Inheritance, Friend Functions, Polymorphism and as a whole. There is a significant difference between the Traditional Teaching Method and Teaching by using e-Learning System Designed using Learning Objects among students in Templates Concept in favor of ELDLO Method at the level of significance of 0.05.

HYPOTHESIS TESTED

Research hypothesis (H_R): There will be a significant difference between the Traditional Teaching Method and Teaching by using e-Learning System Designed using Learning Objects among engineering students in their understanding of Object Oriented Programming using C++ Concepts and Programming Skills.

Null hypothesis (Ho): There will not be a significant difference between the Traditional Teaching Method and Teaching by using e-Learning System Designed using Learning Objects among engineering students in their understanding of Theory Subject of Object Oriented Programming Concepts. Based on the analysis of the data given in Table 2, the inferences drawn are presented in Table 3.

Table 3: Traditional teaching method vs teaching by using e-Learning system designed using learning objects (scsvmv engineering students)

Values	H_O	H_R	S
Theoretical knowledge	A	R	-
Programming skills	A	R	-
Classes and objects	A	R	-
Inline and outline functions	A	R	-
Inheritance	A	R	-
Operator overloading	R	A	Teaching by using e-Learning system designed using learning objects
Friend functions	A	R	-
Memory management	A	R	-
Virtual functions	R	A	Teaching by using e-Learning system designed using learning objects
Polymorphism	A	R	-
Templates	R	A	Teaching by using e-Learning system designed using learning objects
Total for all concepts	A	R	-

Note: In the following Table: Ho-Null Hypothesis, A-Accepted, H_R-Research hypothesis, R-Rejected, S-Superiority

Interpretation phase-I: There is no significant difference between the Traditional Teaching Method and Teaching by using e-Learning System Designed using Learning Objects among SCSVMV engineering students in Theoretical Knowledge, Programming Skills, Classes and Objects, Inline and Outline functions, Friend Functions, Polymorphism and as a whole.

Relationship studies: In this section, the investigator adopts a statistical technique correlation to analyze the relationship between Programming Skills, Object Oriented Programming Concepts and Theoretical Knowledge.

Correlation and relationship of criterion variables with correlates: In this section, an attempt has been made to find out the correlation between the criterion variable (Theoretical Knowledge) and the correlates (Object Oriented Programming Concepts) of the whole sample and each of the subgroup classified in the study.

From Table 4, the following inferences are drawn for each subgroup.

Traditional teaching method: Theoretical Knowledge has high positive relationship with Classes and Objects, Inline and Outline functions, Memory Management and as a whole.

Teaching by using e-Learning system designed using learning objects: Theoretical Knowledge has low positive relationship with Inheritance and Memory Management Concepts. Theoretical Knowledge has negligible positive relationship with Classes and Objects, Inline and Outline functions, Operator Overloading, Friend Functions, Polymorphism, Templates concepts and as a whole.

Stanine: The statisticians of US air force in their programme of testing and classification during II world war derived a single digit nine point scale called Stanine scale (Best, 1977). Stanine is shortened form of standard nine. The stanine is a scale of condensed stanine scores run from 1 to 9 along a baseline. If the normal curve constituting a scale in which the unit is 0.5 and the medium is 5.

Stanine conversion of raw scores: In the following Table 5, the investigator has attempted to draw profiles showing the relationship between the criterion variables and the study variables (based on stanine) and also a brief description and interpretation of the profile for each subgroup and the study variable.

The following Table 6 furnishes the mean scores and the corresponding Stanine values of Teaching by Using e-Learning System Designed using Learning Objects and Traditional Teaching Method among students

Table 4: Relationships between theoretical knowledge and object oriented programming concepts

Variables	TTM	ELDLO	Sample
Theoretical knowledge	1.00	1.00	1.00
Classes And objects	0.65	0.08	0.37
Inline and outline functions	0.60	0.11	0.38
Inheritance	0.54	0.20	0.39
Operator overloading	0.55	0.08	0.32
Friend functions	0.52	0.10	0.31
Memory management	0.60	0.25	0.45
Virtual functions	0.56	0.01	0.30
Polymorphism	0.47	0.06	0.30
Templates	0.49	0.03	0.28
Total for all values	0.63	0.12	0.41

Findings differential studies: From the above profile (Fig. 1), it is clear that there is no gap between Traditional Teaching Method and Teaching by Using e-Learning System Designed using Learning Objects among engineering students in Theoretical Knowledge, Inline and Outline functions, Inheritance, Memory Management and Polymorphism Concepts. There is a gap of one or more stanines between Teaching by Using e-Learning System Designed using Learning Objects and Traditional Teaching Method among engineering students in Classes and Objects, Friend Functions, Virtual Functions, Operator Overloading, Templates Concepts and in the whole sample.

Interpretation-phase III: Teaching by Using Learning Objects and Traditional Teaching Method for engineering students have higher level in Theoretical Knowledge, Inline and Outline functions, Inheritance, Memory Management and Polymorphism Concepts.

Teaching by Using Learning Objects among engineering students had higher level in Programming Skills, Class and Objects, Operator Overloading, Virtual Functions, Templates and as the whole.

Traditional Teaching Method among engineering students had higher level in Friend Functions. Traditional Teaching Method among engineering students had lower in science and technology, Basic Concepts, Operator Overloading, Virtual Functions and Files Concepts and as a whole.

There is no difference between Teaching by Using Learning Objects and Traditional Teaching Method

Table 5: Stanine conversion of raw scores-awareness of values and science and technology

Stanine	Score (%)	Cum % score	Cum % score (200)	1	2	3	4	5	6	7	8	9	10	11	12
1	4	4	8	46	12	2	3	2	2	1	2	2	2	3	25
2	7	11	22	54	17	4	4	3	4	3	3	3	4	4	33
3	12	23	46	61	25	5	5	5	6	4	5	5	5	6	48
4	17	40	80	66	30	7	6	6	7	6	6	6	6	8	62
5	20	60	120	73	34	8	7	7	8	7	7	8	7	9	69
6	17	77	154	78	37	9	8	8	9	8	8	9	9	10	74
7	12	89	178	86	39	9	9	9	11	9	9	9	9	10	80
8	7	96	192	91	42	10	10	9	11	10	10	10	10	11	84
9	4	100	200	96	45	11	11	11	12	11	11	11	11	11	89

Note: The scores under these columns indicate the ceiling score corresponding to the stanine concerned

Table 6: Traditional teaching method vs teaching by using e-Learning system designed using learning objects (engineering students)-stanine

	Traditional teaching method		Teaching by using learning objects	
Variables	Mean	Stanine	Mean	Stanine
Theoretical knowledge	68.38	5	70.88	5
Programming skills	29.38	4	31.24	5
Classes and objects	6.51	4	7.10	5
Inline and outline functions	6.52	5	6.49	5
Inheritance	6.30	5	6.44	5
Operator overloading	6.47	4	8.09	6
Friend functions	6.18	5	5.85	4
Memory management	6.32	5	6.74	5
Virtual functions	6.27	4	7.12	5
Polymorphism	6.48	5	6.99	5
Templates	7.45	4	8.30	5
Total For all concepts	58.50	4	63.12	5

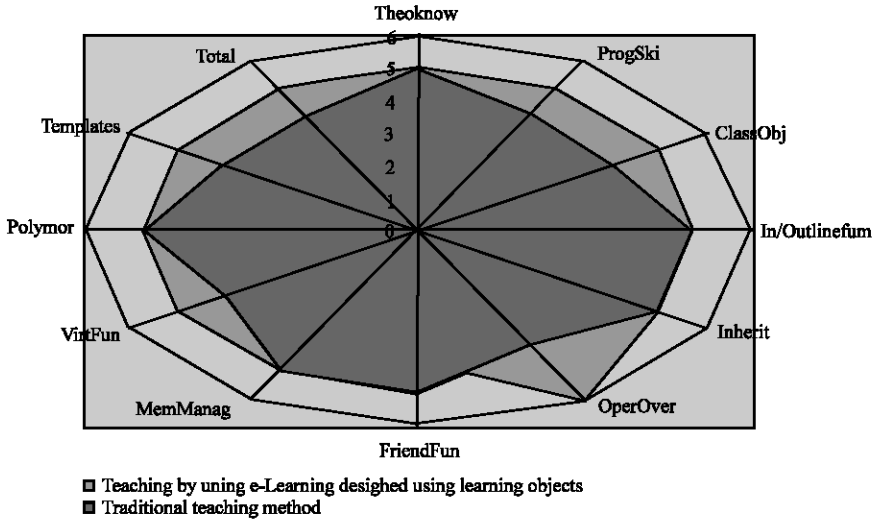

Fig. 1: Traditional teaching method vs teaching by using e-Learning system designed using learning objects

among engineering students in Theoretical Knowledge, Inline and Outline functions, Inheritance, Memory Management and Polymorphism Concepts.

SCOPE FOR FURTHER STUDY

The study can be extended to all type of institutions like Arts and Science Colleges, various universities, etc. The present study is confined to Second year engineering students only. Similar studies can be made by including Post Graduate students, teachers and other officers working in different levels. The present study is not vast and comprehensive. Further research is possible and necessary for a more complete picture of the area studied.

CONCLUSIONS

Learning objects are elements of a new type of computer based instruction grounded in the object oriented Software Engineering. The Usability of Learning Object is an independent and selfstanding unit of learning content that is predisposed to reuse in multiple instructional contexts. The e-Learning System Designed using Learning Objects provides instructional benefits by potentially increasing the speed and efficiency of e-teaching and instructional development. The Results of the study states that their is a significant difference between the Traditional Teaching Method and Teaching by using e-Learning System Designed using Learning Objects. The basic idea is that usability of such components can lead to important savings in time and money and enhance the quality of digital learning experiences and it Leeds to faster, cheaper and betters learning. The results of the study shows that the systematic use of Learning Objects as part of the instructional design process will improve the quality of Teaching and Learning and it plays an important role in e-Learning.

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