RESEARCH PAPER | Physics | Volume : 5 | Issue : 2 | Feb 2015 | ISSN - 2249-555X

Development and Validation of e-Content on "Crystal Structures" to Teach Physics to Engineering Students

KEYWORDS: e-Learning, Physics, Crystal Structures, e-Content, Development, Validation,

Mr.P.Gershom Jebaraj
Head, Department of Physics, V.S.B. Engineering College, Karur, Tamilnadu

Dr. K.Mohanasundaram
Principal, Government Arts College, Kumbakonam, Tamilnadu

ABSTRACT *e-Contents are the powerful tool of education. e-Content is the latest method of instruction, which has attracted more attention of educationists. A study was undertaken to develop an e-Content on 'Crystal Structures' which is included in the First Semester Syllabus of Engineering Physics subject of "Anna University, Chennai, Tamil Nadu" and to validate the developed e-Content. A pre-test, post-test two group experimental design was adopted. Sample of 60 First Year Engineering students were exposed to different treatments such as teaching through e-Content and conventional method of teaching. The study was also focused on finding out the significant differences between control and experimental group of First Year Engineering students in their academic achievement while learning "Crystal Structures" with reference to gain scores. The achievement scores were analyzed using different statistical techniques. It was found that the experimental group students who were taught through e-Content material had better achievement scores than the control group students in learning "Crystal Structures".*

Introduction

The present era is an era of academic globalization. Engineers of today and tomorrow are expected to be far more creative and innovative. Now a days with the tremendous developments in technology, possibilities are emerging to provide **technical** education in an innovative way to meet global demands. With the help of new kind of educational programmes we can provide multidimensional and multi disciplinary educational experiences to the learners. e-Learning is a general term used to refer computer enhanced learning. It is the employment of technology to aid, enhance and enrich learning. It complements traditional learning and **puts the learner in the center** instead of the educator.

Need and Significance of the Study

Engineering Education plays a vital role in building a nation and contributing to the economic growth of a country. It is evident that the quality of Engineering education is the direct consequence and outcome of the quality of Engineers. Till today, the traditional methods such as Lecture methods, Chalk and Talk methods are widely used to teach Engineering Physics subject in most of the Engineering Colleges in Tamilnadu. Moreover, most of the Teaching Staff in Engineering Colleges are not having a basic degree in Education such as B.Ed or M.Ed. Only with M.Sc and M.Phil degree, they become Assistant Professors. They may not know the educational technology and integration of ICT in Teaching. Hence there is less possibility of incorporating technology to teach Engineering Subjects. And also there is no quality e-Contents were developed for Engineering Physics Subject. Hence the investigators made an attempt to develop, validate an e-Content on "Crystal Structures" in Engineering Physics subject and to estimate the effectiveness of that developed e-Content.

Objectives

- To develop an e-Content on "Crystal Structures".
- To validate the developed e-Content.
- To find out the effectiveness of developed e-Content in teaching "Crystal Structures" to first year Engineering students.

Hypotheses

- There is no significant difference between control and experimental group at pre-test level
- There is no significant difference between control and experimental group at post-test level
- There is no significant difference between the pre-test and post-test scores of the control group
- There is no significant difference between the pre- test and post-test scores of the experimental group

Development of E-Content

For the present study, e-Content on "Crystal Structures" in the form of Short Learning Object (SLO) was prepared by the investigators. That content runs about 19 minutes. The selected topic is prescribed in the Engineering Physics syllabus of Anna University, Chennai. The e-Content has relevant text, animated pictures, voice over narration, static pictures and appearance of the Investigator to explain the concept of "Crystal Structures". Initially, the investigator wrote the script and the footage for the video was filmed using digital video camera. Background voice, graphics and titles were added simultaneously. Power Direct, Microsoft Power Point, Internet Explorer, HTML, Flash and Windows Movie Maker are the softwares used. DVDs, CD-ROMs and Pen Drives are used as the secondary storage devices.

Validation of E-Content

The prepared e-content on "Crystal Structures" was screened to a group, consisting of experts in the subject, to ascertain subject matter. Service of senior teachers, who are teaching Engineering Physics subject in reputed Engineering Colleges were utilized. The Educational Technologists ascertained the validity of the e-content on production aspect. Technical validity was also tested. Finally the validated e-Content was used for the study. These ensures the content and construct validity.

Methodology

Pre-Test-Treatment-Post Test-equivalent two group experimental design was followed in the study. The Sample consists of 60 First Year Engineering students with 30 in Con-

Volume : 5 | Issue : 2 | Feb 2015 | ISSN - 2249-555X

trol Group and 30 in Experimental Group belongs to V.S.B. Engineering College, Karur. The First Year Engineering Students of two different Classes were selected as sample for the present study. The Experimental group and Control group students have been selected based on pre achievement scores. Here both the groups were equally matched in terms of their knowledge at Pre-test level. The samples of two groups were subjected to different treatments. After one week the experimental group was taught through the e-content and the control group was taught with the traditional teaching. At the end of the treatment, the post-achievement test was administered to both the control group and experimental group. The difference between the mean scores of control and experimental group was analyzed by using proper statistical techniques. The results are tabulated. The scores obtained by the First Year Engineering Students were converted into percentages for easy analysis.

Tools

Following tools were used for the present study:

Intelligent Test–Test of "g": Culture Fair-Scale 2, (Form B), developed and validated by R.B.Cattell and A.K.S.Cattell.

e-Content on "Crystal Systems" developed and validated by the investigators for teaching Physics to the First Year Engineering Students.

Achievement Test in "Crystal Systems" developed and validated by the investigators to measure the academic achievement of the First Year Engineering Students.

Data Analysis

Hypothesis 1: There is no significant difference between control and experimental group at pre–test level

Table 1: Comparison between pre test-test scores of Experimental and Control groups

Group	N	Mean	S.D	"t"	Level of Significance
Control	30	18.4	3.17	0.47	Not Significant
Experimental	30	18.2	2.94		

The calculated t-value 0.47 is less than the critical value 2.10 corresponding to the 0.01 level of significance. This implies that the control group and experimental group do not differ significantly in the level of achievement at pre test, agreeing with the hypothesis 1.

Hypothesis 2: *There is no significant difference between control and experimental group at post- test level*

Table 2: Comparison between post-test scores of Experimental group and Control group

Group	N	Mean	S.D	"t"	Level of Significance
Control	30	19.5	3.29	3.44	Significant
Experimental	30	24.8	3.65		

The calculated t-value 3.44 is greater than the critical value 2.10 corresponding to 0.01 level of significance. This implies that the control group and experimental group differ significantly in their achievement at post test; this is contrary to hypothesis 2. It is also to be concluded that the experimental group has better level of achievement than the control group. This indicates that e-content material is more effective than traditional instruction.

Hypothesis 3: *There is no significant difference between the pre-test and post test scores of the control group*

Table 3: Comparison between pre –test and post- test scores of Control group.

Test for Control Group	N	Mean	S.D	"t"	Level of Significance
Pre-Test	30	18.4	3.17	0.65	Not Significant
Post-Test	30	19.5	3.29		

The calculated t- value 0.65 is less than the critical value 2.07 corresponding to 0.01 level of significance. This implies that the pre-test and post- test scores of control group do not differ significantly in their achievement, in agreement with hypothesis 3.

Hypothesis 4: *There is no significant difference between the pre- test and post- test scores of the experimental group*

Table 4: Comparison between pre-test and post-test scores of Experimental group

Test for Experimental Group	N	Mean	S.D	"t"	Level of Significance
Pre-Test	30	18.2	2.94	4.85	Significant
Post-Test	30	24.8	3.65		

The calculated t-value 4.85 is higher than the critical value 2.81 corresponding to 0.01 level of significance. This implies that the experimental group students differ significantly in their achievement based on the scores of pre-and post-test. This is contrary to hypothesis 4. Further, based on this difference, it is concluded that the instruction assisted by e-content material is better than the conventional method.

Findings

The Table 1 indicates that the control group and experimental group do not differ significantly in the level of achievement at pre test. It is observed that the pre-test scores of the control group and experimental group is almost same with no significant difference between them before treatment.

Table 2 indicates that the experimental group has better level of achievement than the control group. This indicates that e-content material is more effective than traditional instruction.

From table 3 it is observed that there is no significant difference in the pre-test and post- test scores of control group.

From table 4 it is observed that there is significant difference in the pre-test and post- test scores of experimental group. It is also to be concluded that the instruction assisted by e-content material is superior to conventional method.

Results and Analysis

From the table 4, significant statistical difference is noted between the scores of pre-test and post-test of experimental group. Hence, it is concluded that the First Year Engineering students in the experimental group who learned "Crystal Structures" through the developed e-Content are at the higher level in their academic achievement than the students in the control group who learned "Crystal Structures" through conventional method. So the developed e-

Volume : 5 | Issue : 2 | Feb 2015 | ISSN - 2249-555X

Content is more effective than the conventional method in teaching "Crystal Structures" to the First Year Engineering Students.

Limitations of the Present Study

The present study was undertaken by keeping in mind with the following limitations.

1. The study was conducted only to First Year Engineering students.
2. Only Engineering Physics Subject was taken for the study
3. Sampling is limited to Karur District.

Recommendations of the Present Study

1. Chalk and talk method of teaching Engineering Physics Subject should be reduced. Newer instructional technologies using e-Contents shall be introduced in Engineering Colleges.

2. e-Content approach can be extended for teaching the subjects like English, Chemistry and Mathematics etc., in all the Engineering Colleges.

3. e-Contents presentation shall be used to enhance theoretical as well as practical knowledge of the Engineering College students those who are studying in various branches.

4. Assistant Professors, Associate Professors and Professors of Engineering Colleges shall be trained to develop e-Contents for their own field. In-service training and orientation programmes shall be arranged for them in regular intervals regarding the development and implementation of e-Contents.

Conclusion

e-Learning is the latest catchphrase today. e-Learning breaks all barriers such as geographical, cultural, gender and time. It will enhance the flexibility and innovativeness of open learning. The learners will find more avenues of learning to get the knowledge. Hence the investigators have developed an e-Content on "Crystal Structures" to teach Engineering Physics to the First Year Engineering Students. This present study clearly indicates that the developed e- content on "Crystal Structures" is more effective. The effectiveness was found in terms of post-test scores of the students of experimental group who were taught through e-content.

REFERENCE

1. Anandakrishnan, M. (2008) Educational Responses to Global Competitiveness. Education Plus. The Hindu, January 7, 2008, pp-8. | 2. Gershom Jebaraj, P. (2013) A Text Book of Engineering Physics-I. S C M Publishers, Erode. | 3. Jebaraj G. P & Mohanasundaram, K. (2008) Effectiveness of e-Content in Teaching of Physics at Tertiary Level. Journal of Educational Research and Extension, Volume 45 (1), January- March 2008, ISSN: 0973-6190, pp1-8. | 4. Jeya Shanmugaraja et.al. (2012) A study of Effectiveness of e-Content on Teaching Zoology at Higher Secondary Level. International Journal of Current Research, Volume (4), Issue (09), pp 205-206, ISSN:0975-833X. | 5. Lizeron Eremias, R & Subash. (2013) e-Content Development: A Milestone in the dynamic progress of e-Learning. International Journal of Teacher Educational Research (IJTER), Volume (2), No.(1), January 2013,pp43-49,ISSN: 2319-4642. | 6. Mohanasundaram, K. & Gershom Jebaraj, P. (2007) Integrating Mobile Phone Technology in Teaching – Learning process at Higher Education Level. University News, Volume (45), Number (46), November 12-18, 2007, ISSN: 0566-2257, pp 8-12, 15. | 7. Muppudathi, G. (2013) A Study on Experts' Validation of E-Content. Indian Journal Of Applied Research, Volume (3), Issue (11), Nov 2013, pp150-151, ISSN - 2249-555X. | 8. Nachimuthu,K. (2012) Need of e-Contents Development in Education. Education Today, An International Journal of Education & Humanities, APH Publishers, New Delhi, Volume(03)No.(02) July-Dec 2012, pp72-80, ISSN: 2229-5755. | 9. Pio Albina,A & Edward William Benjamin, A. (2013) Effectiveness of e-Content in teaching Mathematics for XI Students. Indian Journal of Applied Research, Volume (3), Issue(9), Sept 2013, pp183-184, ISSN:2249-555X. | 10. Ravi P Bhatia. (2011) Features and Effectiveness of E-learning Tools. Global Journal of Business Management and Information Technology, Volume 1, Number 1 (2011), pp. 1-7. | 11. Rekha, N & Muthuchamy, I. (2013) Development and Validation of e-Content on DNA Replication in Botany at Higher Secondary Level. International Journal of Scientific and Research Publications, Volume (3), Issue(6), June 2013, pp1-3, ISSN:2250-3153. |