Effectiveness of Database Technology on some Selected Cognitive Variables at Higher Education Level

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ABSTRACT

Education for sustainable development is an emerging concept that encompasses a new vision of higher education that empowers the learner to assume responsibility for creating a sustainable future. Learners are facing many challenges in higher education. Higher education is still struggling to adopt the personalization in learning. Personalized learning thrives in this technology-rich environment, but it is not sufficient to revolutionize the learning experience. Progress in learning depends upon creative mind and educational innovations

Database Technology is one of the digital technologies that can be used by the learner for supporting their learning step by step. Database software is the phrase used to describe any software that is designed for creating databases and managing the information stored in them. Database software tools are primarily used for storing, modifying, extracting and searching for information within a database. It will enhance the learner to amplify their learning ability by selecting the content, study materials, understanding the concept, modifying the content, making valid decisions and presenting their ideas in a comprehensive manner. Learning outcomes of this strategy can be measured by means of cognitive variables such as Remember, Understanding and Application. In this context, the authors developed database software and analyzed its effectiveness in learning at the higher education level.

Keywords: Database Technology, Database Software, Higher Education, Cognitive variable

INTRODUCTION

The need for learner-centred learning is emphasized heavily in higher education. This approach will guide the learner towards progress in learning step by step. The one-to-one initiatives allow the learners to have far more access to relevant information. Students who need help to overcome deficiencies can use the technology available to enhance learning. Technology-enabled learning is the application of some form of digital technology to teaching and also learning in an educational context **[7].**

Computer technologies presently have a tremendous influence on learning at all levels. Students are interested in using computers for their learning. It has become essential to use computers for learning. Database technology is one of the types of computer technologies. The software package developed by using this technology will provide the learner to search the content from different kinds of resources, store it in the memory space and retrieve it for learning. A learner can search for relevant information from the websites. With the increasing amount of content available over the internet, the major challenge for the learner is not just access to information and knowledge but to understand what is more important to know and where the best source of that knowledge is available. Learners at the undergraduate level are taking a lot of efforts to find the appropriate study material. Database technology will assist the learner in storing the materials and using them for learning. The introduction of database technology for self-learning is still at the formative stage. Though some learning packages are used, they are used as readymade tools and students cannot do their learning on their own. The software prepared by the professionals normally does not meet the local needs. Therefore attention has been drawn to the development, application and evaluation of database technology in the field of learning at the higher education level. The software package prepared for this study will provide a personalized environment on which learner can store the learning material according to their need. The learner can manipulate the information within the database quickly at any given time. The learner can also share the content with their peer group and teachers. The learner can easily retrieve the content by using the quick search option. Provision is given to take a print out of the required items.

Statement of the Problem

Higher education, also called post-secondary education is leading to an academic degree. Different learning styles are used by the students but still, there are problems in acquiring appropriate knowledge, thorough understanding, applying the principles and acquiring relative skills. Specially designed software is applied to develop meaningful learning. The researcher has developed a software package using the database technology which will enable the learner to store, manipulate, update and retrieve the study material according to their learning ability. The researcher also made an attempt to study the effectiveness of database software with respect to the learning at the undergraduate level especially on selected cognitive variables such as remember, understanding, and application and hence the research is the study of "**Effectiveness of Database Technology on some Selected Cognitive Variables at Higher Education Level".**

Operational Definitions

Effectiveness in this study refers to the ability to produce the desired result. It means it has an intended outcome and produces a deep, vivid and vibrant impression. Database technology is a core technology that links information management, processing data analysis, data visualization, presentation multimedia and hypermedia. The term cognitive is connected with thinking or the conscious mental process involved in knowing, learning and understanding things. Cognitive variables are used to process information. These variables are used to describe why one learner is lacking in learning ability, yet exhibits high competence in a specific area. In this study, cognitive variables associated with learning such as Remember, Understanding and Application are applied.

Experimental Design

The experimental method was used by the investigator. The investigator has developed database software for storing the learning materials collected by the learner on the specific content. To study the effect of database technology as compared to the conventional methods of learning, the investigator adopted the Two Group Experimental design in which the two groups were treated with different learning strategies. This design was used to compare the status of a

group that has received an experimental treatment with one that has not. The two groups were treated with two different learning strategies and equated as nearly as possible. Conventional learning strategy was followed by the students in the control group. The experimental group was exposed to the use of database technology with the help of the software for learning. The Pre-test and Post-test Experimental Design was followed for this study.

The sample was divided into two different groups' viz., the Experimental group and Control group. The control group was allowed to learn through a conventional method whereas the experimental group was exposed with the database package. At the end of the study, the difference between the mean scores of the control group and the experimental group in their learning outcome was analyzed statistically.

Review of Related Literature

Ananthi Sheshasayee and Nazreen Bee M (2018) in their research paper discussed the modes of improving the higher education system. Educational data mining can be applied to automate the learning process. Data mining in an e-learning system favourably adopt students who need sufficient knowledge as well as analyzing students who have faced difficulties in acquiring new knowledge. The researchers compared the new intellectual styles with old intellectual styles and proposed a new architectural design for educational technology system. **Anupama Chodha (2018)** has prepared an efficient clustering algorithm in Educational data mining. The Handbook of research on knowledge management for contemporary Business Environment prepared by the author suggested a suitable algorithm for knowledge management. In order to help the educational administration, the author developed an efficient clustering algorithm in educational data mining. Clustering is a technique of segregating the object into partitions such that the

object on a group is more similar to each other than objects of other groups. **Rai P.K and Pramod Singh (2017)** analyzed the security threats to the databases. The developers of the database management system must understand the security aspects. The attackers will try to perform privilege abuse, privilege elevation, inference, SQL injection, misconfiguration, buffer overflow, weak audit, covert channel and weak authentication. The author pointed out the important aspects to be included as security factors such as authorization and authentication, encryption, access control etc. The authors suggested the discretionary access control, mandatory access control and role-based access control. **Raji N.S and Kaur R (2019)** conducted research on meta-cognition skills among college-going students. Their objectives of this study were to assess the differences among college-going students in academic achievement and metacognitive skills based on gender and to evaluate the relationship between academic achievement and metacognitive skills among college-going students. Descriptive survey method was used for this study. Simple random sampling was employed to select 200 college-going students from Jalandhar district of Punjab state. It is clear from the statistical analysis that the mean score of the metacognition Skill of males and females are 78.910 and 76.450 respectively. The t-value is 1.938 which is not significant at 0.05 levels. It reveals that males and females do not differ significantly on their mean score of metacognition skill. **Elileen O Donnel and Liam O Donnel (2018)** have studied the challenges in developing adaptive educational hypermedia systems. The purpose of an adaptive hypermedia system is to provide each learner with learning experiences which have been specially tailored to their specific learning requirements. **Guy Harrison (2015)** in his book entitled ' Next Generation Databases' explained the three database revolutions. In the chapter on database models, he proposed that ideal database architecture

would support multiple data models, languages, processing paradigms and storage formats within one system.

Objectives of the study

1. To develop and validate a database package for assisting undergraduate students in their learning.
2. To compare the achievement of learners through the conventional method of learning and learning with the support of a database package.
3. To find out the achievement of learners through the conventional method of learning and learning with the support of database package for cognitive variables viz., Remember, Understanding and Application.

Hypotheses

1. Undergraduate students who were learnt through database technology and conventional learning methods differ significantly in their post-test achievement scores.
2. There is a significant difference between the learning outcomes through the database package and conventional method at Undergraduate level in their i. Remember ii. Understanding iii. Application

Development of database software

Interactive database software was developed to measure the effectiveness of database technology in learning against the conventional method of learning at the higher education level.

SOFTWARE DETAILS (OPEN SOURCE)

1. **Relational database:** MySQL version 5.5.60 / MariaDB
2. **Web Server:** Apache 2.4.6
3. **Web Development language:** PHP Version 5.6.38
4. **Front –end frame work:** Bootstrap 4, HTML5/CSS3/JavaScript/Ajax/Slim REST API

The researcher has adopted the following eight stages in the development of database software package.

i. Define the purpose of using the relevant study materials
ii. Provide login credentials to the learner
iii. Display of the prescribed syllabus of the course
iv. Collection of learning materials
v. Generation of ideas for the collection of learning materials
vi. Organize the learning materials
vii. Storage and retrieval of content
viii. Evaluate the effectiveness of the content

Research Paradigm

The students at the undergraduate level in the Bharathidasan University, Tamilnadu, India formed the universe of the study. 84 students studying UG programmes in four Arts and Science colleges were selected as sample for this purpose. Purposive sampling method was used for sample selection. There were 46 students in the experimental group and 38 students in the control group. The treatment variables were the learning strategies namely (a) Using the database software package and (b) Conventional method of learning. The dependent variable was

"Achievement of students". The tools used by the researcher consisted of the database software developed by the researcher called CVLP, achievement tests for pre-test and post-tests developed by the investigator and the personal data blank to collect data from the sample students. An achievement test is a tool generally used to test the learning outcome of the learner. In consultation with the professors in the field of Education, due weightage was given to the instructional objectives viz., Remember, Understanding, and Application.

In this study, t-Test to analyze the differential hypotheses using SPSS package is the statistical techniques applied to draw conclusion.

The following experimental design was adopted for the study.

R =

E_R	P_r	L_1	Po
C_R	P_r	L_2	Po

Where E_R and C_R denote the samples chosen for the Experimental group and Control group respectively. P_r denotes the pre-test measure of the scholastic performance in learning physics. Po denotes the post-test measure of the scholastic performance of in learning physics. L_1 denotes learning through the software developed using the database technology and L_2 denotes the learning through the conventional method. The database software developed by the researchers is available in the URL: http://139.59.57.143/cvlp. Important pages are shown in Fig.1, Fig.2 and Fig. 3.

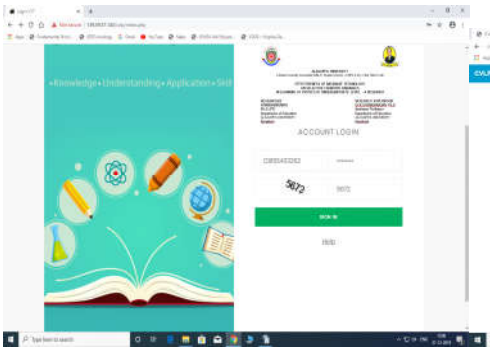

Fig. 1

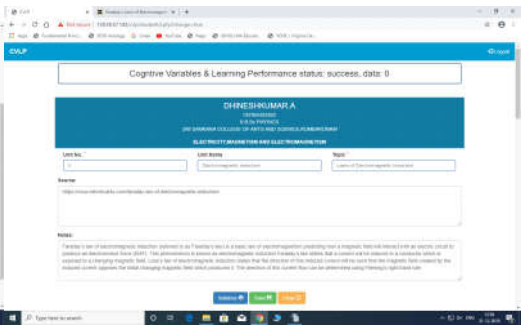

Fig. 2

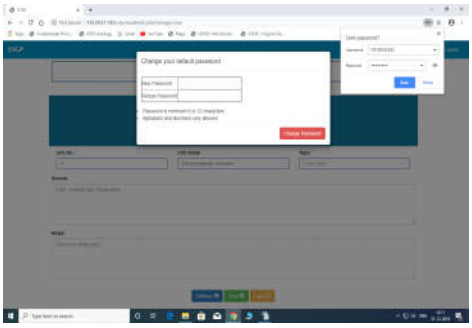

Fig.3

Analysis and Interpretation

Hypothesis - 1

Undergraduate students who were learnt through database technology and conventional learning methods differ significantly in their post-test achievement scores.

In the experimental study, it is also essential to find a significant difference in the achievement level of the experimental group and control group at the post-test level. The outcome of the analysis will help the researcher to study the effect of database technology in learning physics at the undergraduate level. Hence this study was conducted to study the significant difference between the two groups. In the present study, the achievement of students in the post-test was studied.

Table 1

Comparison of Post-Test Achievement scores of experimental group and control group

Group	Size (N)	Mean (ẍ)	SD	t - value	p - value	Remark
Experimental	46	25.98	5.3	7.73	<0.00001	Significant*
Control	38	18.50	2.98			

* Significant at 0.05 level

The calculated t – value 7.73 and the p-value is less than 0.00001 and thus it is significant at 0.05 level. This implies that the difference in mean scores between the two groups is significant. Therefore, it is evident from Table 1 that the achievement of the experimental group was significantly different from the achievement of the control group. The students in the experimental group performed better than the control group. **The hypothesis is accepted at 0.05 level of significance.**

Hypothesis - 2

There is a significant difference between the learning outcomes through the database package and conventional method at Undergraduate level in their i. Remember ii. Understanding iii. Application

The mean gain scores of the experimental group and control group are studied in the three dimensions namely Remember, Understand and Apply.

Table 2

Comparison of mean gain scores for selected cognitive variables

Cognitive variable	Group	Size (N)	Mean gain score	SD	t - value	Remark
Remember	Experimental	46	8.30	3.80	9.09	Significant*
	Control	38	2.32	1.54		

Understand	Experimental	46	1.85	1.98	2.74	Significant
	Control	38	0.87	1.07		
Apply	Experimental	46	1.20	1.54	2.55	Significant
	Control	38	0.47	0.69		

*At 0.05 level

From Table 2, it is inferred that the mean gain scores of the experimental group and control group differed significantly at 0.05 level of significance in all the three variables viz. Remember, Understand, apply. The higher mean scores of the experimental group indicated that their performance based on remember, understand and application of the concept, through database technology were better than the students who used the conventional method for learning. **The hypothesis is accepted at 0.05 level of significance.**

Conclusion

The investigator has developed the database software package. The database software developed by the investigator is simple to access and user- friendly. The achievement level of the undergraduate students who have used the database software using database technology is better than the achievement of the students who have used conventional learning methods. Database technology is found to be more effective on learner's achievement than the conventional method. At the higher education level, the database software using database technology is more effective in the realization of instructional objectives viz., remember, understand and apply than the conventional method of learning. For self-learning, database software is an effective tool. The Learner can use the software to select the desired content based on their potentiality and stored it in the database. Whenever and wherever required the content can be retrieved easily. This helps to increase the achievement level of the students. This learning package accelerated the power of acquisition of knowledge than the conventional method. In terms of understanding and application of knowledge, the effect of database software developed by using the database

technology does not differ much from the conventional method of learning. When the students are using the database software continuously, they will perform well in the understanding and application levels. As experienced by the researcher, the use of database software package developed using database technology has helped the learners the effective use of knowledge. It acts as a supportive mechanism in learning. It stimulated learner towards learning. Students will select the content independently and store it in their database.

REFERENCES

[1] Abraham Siberschatz.,Henry F.Korth and Sudharshan.S.(2006).*Database System Concepts*, Singapore: McGraw Hill Education(Asia), Fifth edition.

[2] Adham Mohsin Saeed. (2017). Rote on Database Management System(DBMS) in supporting Information technology in the sector of Education. *International Journal of Science and Research.*6(5).

[3] Ananthi Sheshasayee., Nazreen Bee, M.(2017).Educational Datamining for Educational Applications.*Conference proceedings in the National Conference on Smart Innovation System and Technology.*

[4] Anupama Chodha. (2018).Efficient clustering algorithm in Educational data mining. *Conference Proceeding in the International Conference, India Com -2018.*

[5] Eileen O'Donnel.,&Liam O'Donnel. (2018). Challenges in developing adaptive educational hypermedia systems.*Encyclopedia of Information Science and Technology*.Information Resource Management Association Fourth Edition

[6] Guy Harrison. (2015).*Next Generation Databases.No SQL and Bigdata.* New York: Apress Media.

[7] Kirkwood, A.,& Price, L.(2016).*Technology-Enabled Learning-Implementation Handbook.Burnaby: col*. Retrieved from http://oasis.col.org/handle/1599/2363.

[8] Rai.P.K.,&Pramod Singh. (2015).Studies and Analysis of Popular Database Models.*International Journal of Computer Science and Mobile Computing,*4(5),834-838.

[9] Raji.N.S.,&Kaur.R.(2019). Academic achievement in relation to metacognition skills among college-going students. *The Asian Journal of Psychology and Education.*62(1-8). 8 -13.