

DESIGNING AND APPLICATION OF CONCEPT MAPPING BASED E-LEARNING OF STATISTICS AND LOGICS FOR CONTINUING PROFESSIONAL DEVELOPMENT

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Abstract- Nowadays, the application of learning management systems (LMSs) such as WebCT, Blackboard, and Moodle has been popular and successfully used in e-education systems. In recent years, notable attention is paid to characteristics such as learning styles and designing proper contents. Conceptual maps that are developed Computers-based provide significant visual tools yet simple, clear, and precise for presentation of concepts and relations between information in short period of time. This causes that learners visualize relationships between concepts through mental model quickly and without explanation. The article is the results of a research which researchers tried to design a model for e-learning contents for the statics course.

Keywords: E-Learning, Conceptual Map, Continuing Professional Development, Statistics Education, Logics Education, Content Management System.

I. INTRODUCTION

In computer science, as in any other science, several new ideas, concepts and paradigms emerged overtime [1]. This science in education has created a new paradigm in the field of teaching and learning, virtual learning or e-learning provided learning style in every field for each anytime and anywhere [2]. Within the past two decades, the world discovered that the axis of development and economic progress, is not industrial strength, but information technology is the power. Learning society requires a continuous learning. Information strength also depends on creating of an information society and learning society [3].

The purpose of learning is to encourage learner autonomy and self-directed learning, independent and knows [4]. A concept map consists of a core and Relationships, nodes in a sense, is a phrase or question that be related to other nodes by the relationship. Relationships lines between the core may represent a similar relationship (the two concepts are synonymous). The relationship of clear (characterize the hierarchy) and composition (representative sections and components).

But the next problem is the lack of digital use of concept maps. Lanpyr in their study integrated digital concept mapping with learning management system (open source IV). He believes academics and experts did not take action in this case. However, the use of very simple of this type of integration in smart boards between teachers is expanding [5]. Based on the characteristics and potential of e-learning, concept maps are used in this system [6]. Knowledge Network Organizing Tool (KNOT) provides multi-purpose use of concept maps for comparing semantic relations between concepts [7].

Research at Cornell University in the U.S. have examined the patterns of learning, the results show that most students spend much of their time learning to be inefficient. Concept mapping can be an effective way to increase meaningful learning of learners [8]. Vaynstayn and Meyer quoting summarizing, organization and concept mapping can be a useful strategy. It helps the learner in analyzing text structure. This model encourages polyhedral conceptualization of the concept and presentation of multiple perspectives. The use of concept maps in various stages of training from design and preparation of content and curriculum to implementation and evaluations can be used [9].

Some learning materials in statistics course are difficult. Research, "an interactive conceptual map for statistics" show that, learners focus more on the details that prevent them sees the "big picture" that causes to lose the main program. But concept maps provide a big picture to maintain their relationship with the main concepts of the course. Therefore, in this study he represented concept maps which are generated by computers and they evaluated narrative diagram very successfully [10]. It seems that conceptual map is suitable for editing e-learning content as mentioned to special features such as for professors and experts to provide interactive, simple, clear and precise presentation of the concepts in a relatively short period of time, quickly mental imagery and without textual description and low volume, flexibility in content interaction with content. The proposal to integrate e-learning model with concept maps and learning management system is presented.

II. PURPOSE AND RESEARCH QUESTIONS

The purpose of this research is to design and implementation of e-learning is based on concept maps for continuing professional development (CPD), to achieve this goal; following questions must be answered:

1. Is the design of e-learning elements suitable for this course?
2. The design of electronic content based on concept map is suitable for this course?
3. Is the design facilitator elements of users' activities appropriate in this course?
4. How is the amount of teacher's skills in virtual communication?
5. How is the amount of assessment the usefulness of holding this course (E-CPD) by professors?

III. METHODOLOGY

Current study is non-experimental in view of the application goal and the control of variables is performed in Statistical population teachers of Payame Noor. In this study, using cluster random sampling from 31 provinces in the country (Iran) and its units that include provinces of East Azarbaijan and Kurdistan and Esfahan then to proportional of this number of teachers in these provinces, questionnaires were sent and 240 questionnaires are sent and a total of 152 questionnaires were returned that were given the frequency and percent in Table 1.

Table 1. Frequency of selected samples

Variable	Frequency	Percent	Validity percent
Kurdistan	62	40/8	40/8
East Azarbaijan	54	35/5	35/5
Esfahan	36	23/7	23/7
total	152	100	100

To determine the suitability of virtual learning models in view of (content- interactive environment and interactive activities of teachers), two questionnaires were developed to collect information. Those include professor's demographic questionnaire and a survey questionnaire. Questionnaire has been based on Likert type rating scale and Gutman range. The questionnaire included 73 closed-ended questions and 4 open-ended questions according to the research model for this study included 8 questions in three areas of e-content.

E-learning model design consists of 12 questions and preparation of facilitator elements for users consisted of 15 questions , in addition to those, 12 questions to determine software and virtual communication skills ,18 questions about their attitude toward the course or program ,8 questions about the evaluation usefulness of an e-learning environment is prepared. To determine the validity of content validity_method and for calculating the reliability coefficients of questionnaire results, Cronbach's Alpha was used. Therefore, the calculated rate is equal to 0.96, which indicates the high reliability of results.

For data analysis SPSS software is used. To compute normal distribution of scores, Kolmogrov-Smirnov was used for the test and to analysis the difference between

the mean of variables t-student test was used. Also to detect the relationship between demographic and survey questionnaire components, Pearson's correlation test was used.

IV. STAGES OF RESEARCH

This study is done in three that is described in the following steps:

1. Modeling of e-learning environment;
2. Execution of course program;
3. Evaluation of participant teacher's viewpoints from the course.

A. Modeling of E-Learning Environment

In order to model the e-learning environment, "Moodle" learning management system software was applied. Since this system provides virtual classroom for social participation of users such as chat, discussion, commenting [11]. Stressing creating the group concept maps is more important than individual activities [12]. Therefore a website based on these facts was developed [13]. This website has features such as interactive technology and telecommunications tools, gives the possibility of dialogue and discussion (chat and forums) in addition to information about Learner society that they can share ideas with a group.

Also upload or download tools the files (course materials) are designed in order to build a common knowledge and to allow to integrate content. The role of educator, is facilitator teaching and learning process was provided by supporting systems including course guide, control room and "contact us "and evaluation feedback. Figure1 shows the home page including courses which provide access to each course. Figures 2 and 3 show how to design topic outline of instructional and statistics courses.

B. Modeling of E-Content

This model's E- Content is based on concept map that interactive-based. Electronic content designed, of logic, deduction and four forms and the condition of its production and of statistics, was t-student teaching in addition to knowledge teachers with the concept map approach and design of multimedia teaching, class course instruction was designed that includes acquaintance with concept maps in teaching, meaningful learning and multimedia instructional design principles. Each of courses after the design was uploaded to website. Figure 4 shows conceptual map diagram which is drawn using Cmap software.

To motivate the improvement of education and to decrease despair in users, mental scaffolding were required to create. In addition, showing the prepared pattern of conceptual map in each course main concepts was indicated and the related actions according to this principle accelerate the drawing. Figure 5 shows the T-test concept map Training text and designing that using the basic concepts and verb interface. Along mental scaffolding, the following charts provide to have users a clear picture of what they want to do.

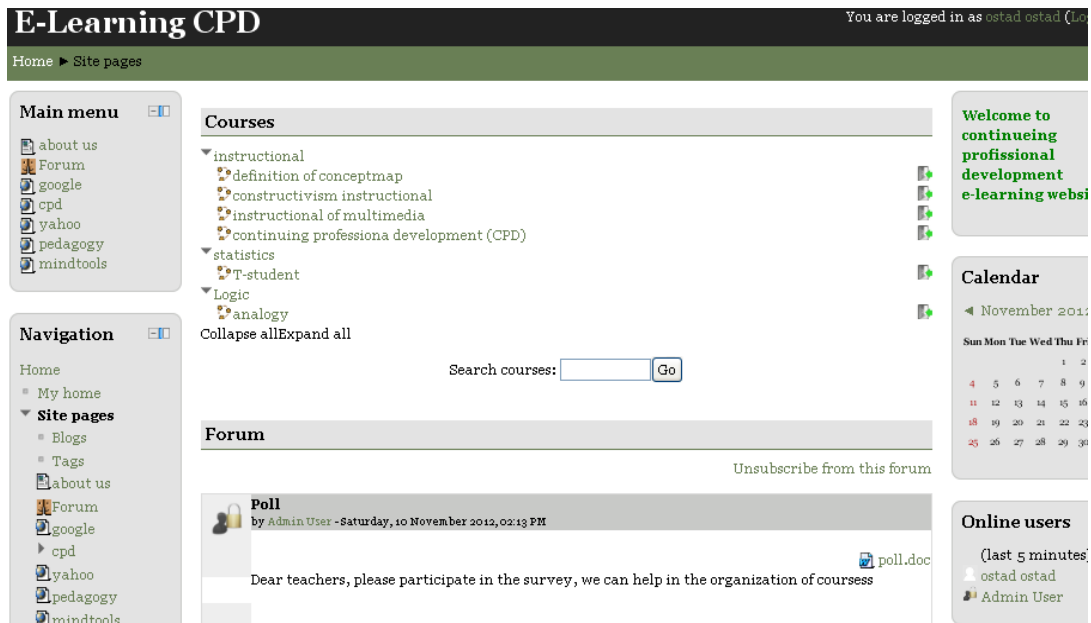


Figure 1. Home page and including courses

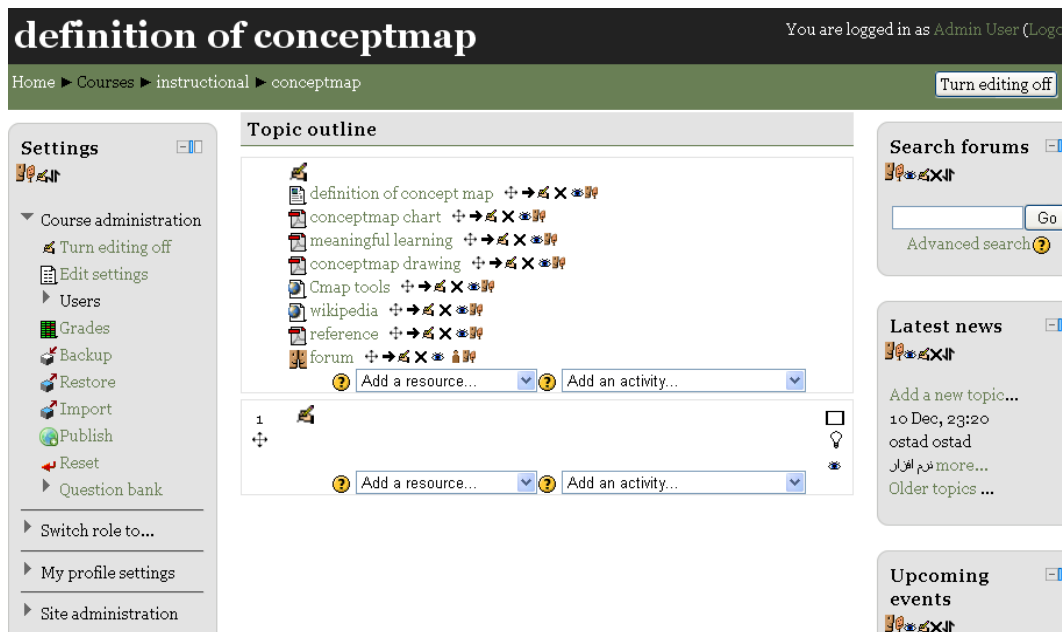


Figure 2. Definition of concept map page

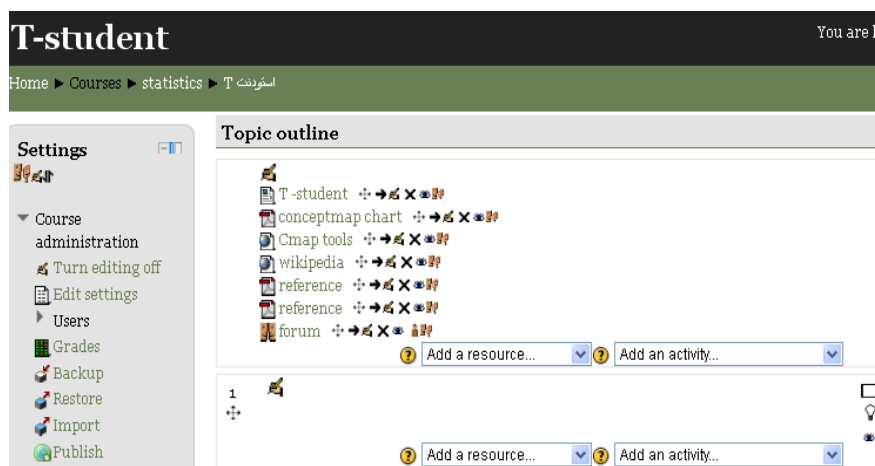


Figure 3. T-student teaching

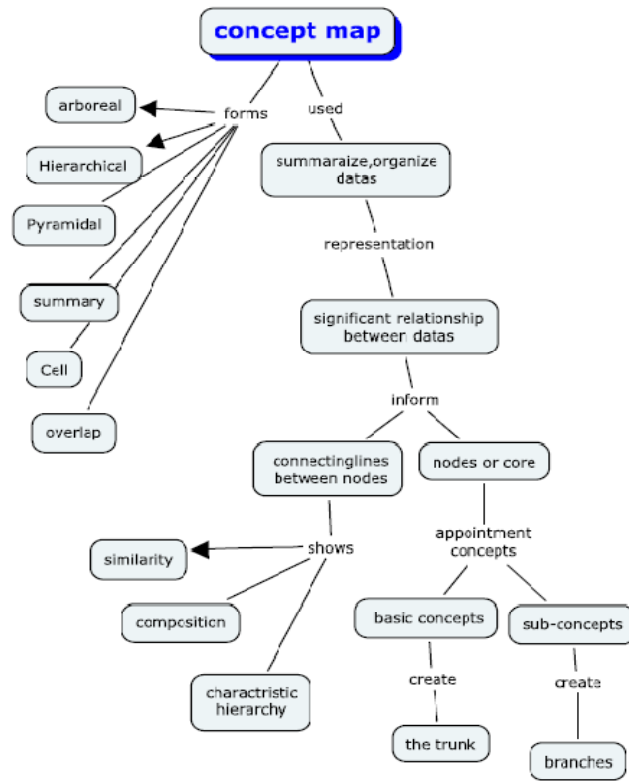


Figure 4. Instruction Conceptual map through concept mapping diagram

Figure 5. T-test concept map training text

C. Modeling of Activities for Users

Work related to logic and statistics using concept map and also training concept map approach in teaching. Activities of teachers are as follows:

- Construction of knowledge through collaborative actions: To facilitate the construction of knowledge Moodle learning management system was used. In these systems, content development tools, upload and download of files and remote communication tools (forum, E-mail) are built to create an interactive learning community that provides the ability to build collective knowledge. To upload or download tools of training files creates diversity; user is encouraged to interact with

content. In this case "Add a resource" provided activities such as content development and create files and folders. Figure 8 shows the design of courses and activities for teachers. Embedded links provides scientific interactions with Web resources for user, and also search information

- Thinking and reflection: Embedded patterns in the form of graphs, through link between the concepts provided possibility for mental visualization, intellectual appearance.

- Interactions: Teachers participated with three types of interactions, namely interactions with each other, interaction with content and interaction with learning resources.

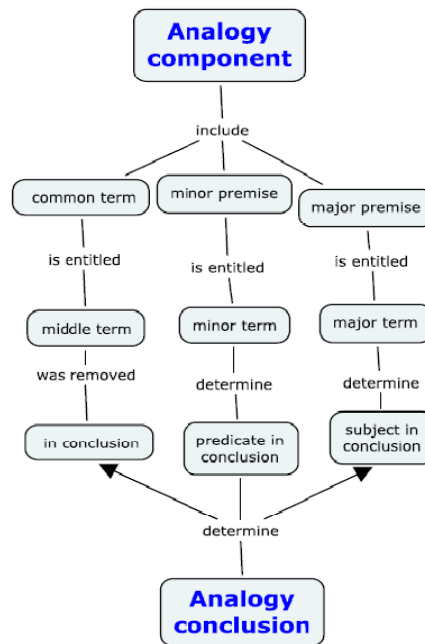


Figure 6. Concept map analogy

D. Execution of Course Program

Instruction and guidance had been provided for training thus: the first, users (teachers) visit to website [14] which was developed by researchers. Users' access to class lessons quickly, user account: with user "ostad" and password "1390" was provided. After entering the home page and course training classes, at first entering training curriculum class and selected course and get familiar with concept mapping.

This class had been designed the describing shape and form of a concept map training. Then teachers were asked to choose their favorite courses after installing the software on their systems. And another look through this approach represents the concepts. The course was held over the internet and it is online. To further encourage and motivate users (Teachers) support system includes Course Guide, control room and contact us and design feedback in assessment, is provided. Also to show the prepared pattern concepts maps for each of the courses can be encouraged in drawing concepts mapping. For Thinking and reflection on the charts also indicate some keywords and linking words had been laid the teachers to draw a new conceptual model by mental showers.

E. Evaluation of Participant Teacher's Viewpoints from the Course

Teachers were asked immediately at the end of the "Evaluation Period" to respond questions regarding the effectiveness of the course and the nature of its educational activities.

V. RESEARCH FINDING

The findings of this study are in line with each question that is as follow:

The first question: the design of e-learning elements is suitable for this course?

The answer based on participating teachers views, the average equal to 74.17 and the coefficient of curvature

equal to $sk=-0.373$ indicate the design of virtual learning element is appropriate for this course. In the process of using the t-test with a hypothetical mean of 50 ($p<0.001$, $t=17.480$) indicates the effectiveness of plan.

The second question: The design of electronic content based on concept map is suitable for this course? The answer, based on participant teachers the average equal to 67.96 and the coefficient of curvature $sk=-.44$ indicates proper design of electronic content of conceptual map. In the process of using the t-test with a hypothetical mean of 50 ($p<0.001$, $t=13.135$) indicates the effectiveness of the content in design this course.

The third question: Is the design facilitator elements of users' activities appropriate in this course? The answer based on Participating teachers views average equal to 58.60 and the coefficient of curvature equal to $sk=-.68$ indicate that this course is appropriate. In the process of using the t-test with a hypothetical mean of 50 ($p<0.001$, $t=5.003$) indicates the effectiveness prepared elements in design.

The fourth question: How is the amount of teacher's skills in virtual communication? The answer based on participating teachers views, the average is 65.74 and the coefficient of curvature equal to $sk=-0.560$ implies that this course is appropriate. In the process of using the t-test with a hypothetical mean of 50 ($p<0.001$, $t=7.018$) indicates teacher's skills is appropriate.

The fifth question: how is the amount of assessment the usefulness of holding this course (E-CPD) by professors?

The answer based on participating teachers average equal 79.47 and coefficient of curvature $sk=-0.281$ indicates this course is appropriate. The process of using the t-test with a hypothetical mean 50 ($p<0.001$, $t=23.290$) indicates this course is appropriate.

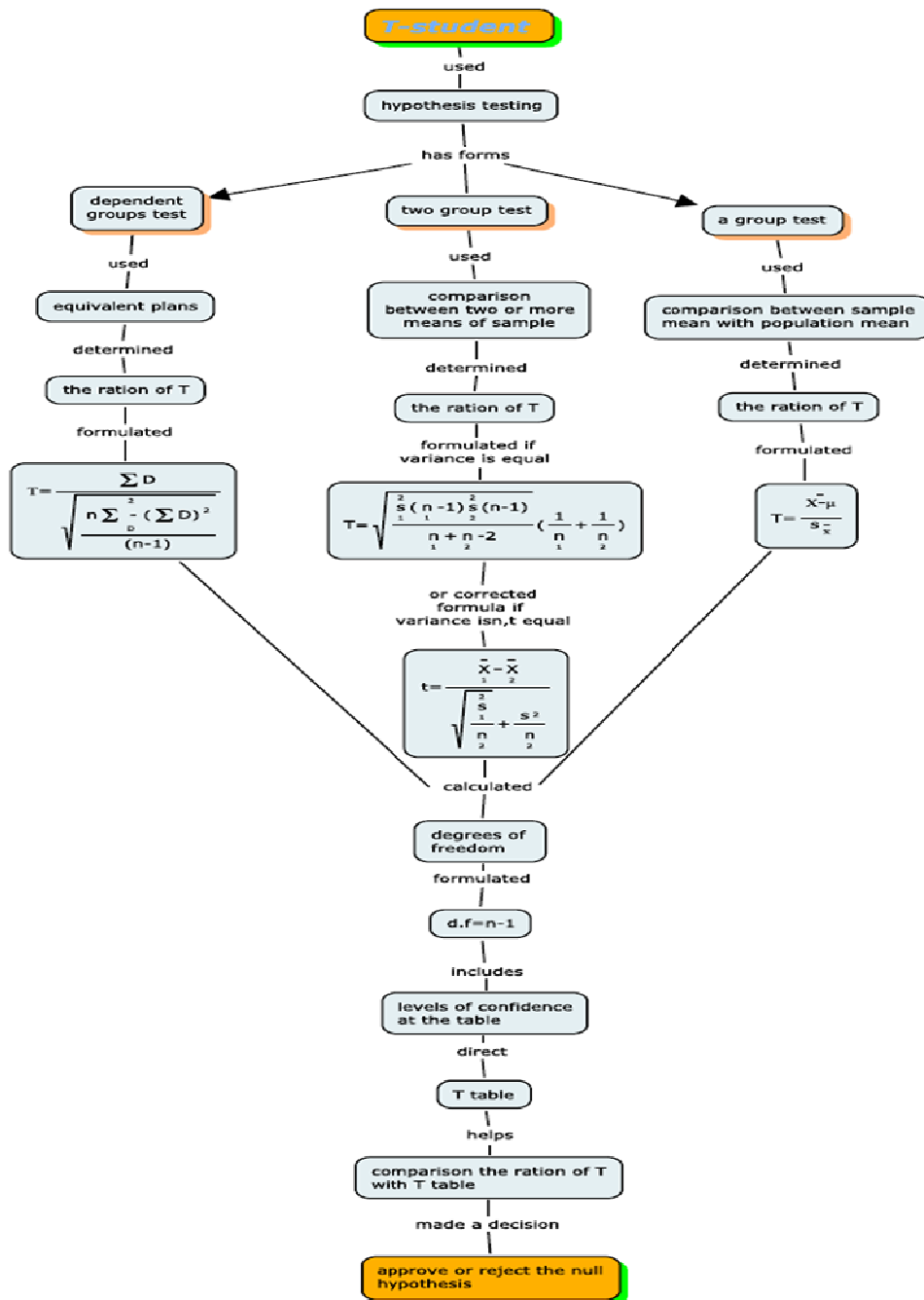


Figure 7. Concept map T-student

Topic outline

- T-student
- conceptmap chart
- Cmap tools
- wikipedia
- reference
- reference
- forum

Figure 8. User activity to build collaborative knowledge

Is there relationship between the evaluation of usefulness of presented courses and teaching experience? The answer is based on a correlation test ($p=0.001$, $r=-0.466$). So it can be concluded that there is a meaningful correlation between the satisfaction of the teachers of virtual learning and teaching experience, and also relationship between these two variables is negative.

VI. CONCLUSIONS

The suitability of e-learning model from viewpoints of participant teachers was based on the results of the survey poll components. Appropriate use of technology for learning, in and out buttons design, the availability of lessons classes, appropriate courses design page, appropriate classroom and forum, mail or email, layout links, and facility design for users activities including appropriate classroom. The amount of teacher's interaction is in course with each other.

The use of internet recourses by teachers lead to promote specialty knowledge by presented material. These components are designed to indicate the suitability of facilities for activities of teachers that make satisfactory academic activities in this environment and teachers also believed that multimedia classroom management is appropriate. Suitability of auxiliary techniques such as (contact us), contact page suitability, guide page suitability to the user, suitable as a site page or on the cover, these components were considered good. While components: use of forum, somewhat had lower scores.

For the explanations of this paradox can be said that it is true that teachers have a good assessment of interactive facilities such as the forum but the findings indicate that teachers use this facility relatively seldom. Given the level of teachers skills in virtual communication such as forum, etc, have a good assessment, therefore low use of these facilities cannot be attributed to lack of teachers' skills. Perhaps this is due to the density of teachers working [14].

Findings also cited lack of specialty Continuing Professional Development in the use of advanced technologies is the orientation of faculty members toward directed and passive teaching and learning however that may be offered online. A research recommended using blended learning (blend online and face-to-face interactions) for covering the weaknesses because there is an emotional interaction [15]. Computer games are the best way to bring practical training to classical theoretical education these days [16]. In addition to this issues, may be noted side finding which suggests a negative relationship between teacher satisfaction of virtual learning and teaching experience and also evaluation the usefulness of e-learning and other factors which might be need to separate research.

Research also involved the following factors in satisfaction such as: taking advantage of the experience and knowledge, to share ideas and projects to each other and the role of facilitator elements such preparation and scaffolding several different ways in critical situation and ongoing feedback with timely advice [17].

Teo and Gay emphasis on the use of e-learning and software designs that result in attractive and satisfaction the use of concept maps in e-learning are somewhat inconsistent [18]. In another analysis on the findings can imply the most important satisfaction factor called the content provided based on a concept map.

The components of the survey implies this finding including appropriate presentation of materials, providing meaningful learning, and providing opportunities for reflection, rate of understanding the complexity through the links between the concepts, the role of graphs in mental visualization, suitable layout Links, having academic aspect, appropriateness of the lesson feedback, suitable evaluation ways for the multimedia environment. Analysis of research data on sharing knowledge and flexibility in making concepts maps agrees with the results of this project [19]. Also findings results show that curriculum-based concept mapping is useful, that the result of this pattern is consistent [20].

Four findings indicate satisfaction of teachers from establishing e-learning for specialty continuing Professional Development. This also can be cited six findings that assess the usefulness of this type of training by the teachers. It can be said that teachers (professors) believe to maintain and enhance their performance they need to new knowledge and skills, to update with scientific growth with increasing developments and also research and educational skills and new examination techniques.

The results showed that: 1- The models are suitable for the e-learning according to participating teachers. 2- The design of educational content and design elements to facilitate the activities of users (learner) in this model was also found suitable. 3- Evaluation of the usefulness of e-learning environment was considered positive.

The suggestions are:

1. According to the satisfaction of the experts of establishing electronic continuing education courses and also suitability of electronic content of concept maps is recommended for continuous training and particularly for whom in service.
2. Study would be done to evaluate the suitability of this model in educational organizations such as in education.

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REFERENCES

- [1] N.M. Tabatabaei, S.R. Mortezaeei, "Review of Multi-Agent Systems (MAS), a New Tool for the Control and Management of Modern Power Systems", International Journal on Technical and Physical Problems of Engineering (IJTPE), Issue 1, Vol. 1, No. 1, pp. 27-31, December 2009.
- [2] OCLC E-Learning Task Force, "Libraries and the Enhancement of E-Learning", OCLC Online Computer Library Center, Ohio, Retrieved June 25, 2004.

[3] I. Ebrahimzadeh, "Fundamentals and Principles Distance Education", Academic Monographs, Payame Noor University, Tehran, Iran 2006.

[4] M. Derrick, "Creating Environments Conducive for Lifelong Learning", R.S. Caraffarella and L. Jackson (Editors), New Directions for Adult and Continuing Education, Vol. 100, pp. 5-17, 2003.

[5] M., Laanpere, K. Kikkas, H. Poldoja, "Pedagogical Foundations of IVA Learning Management System", E-Learning in Higher Education, pp. 143-155, Rudolf Trainer University Publishing, Linz, 2005, www.ist-world.org.

[6] C.B. Teo, R.K.L. Gay, "Concept Map Approach to E-Learning", J. Nall and R. Robson (Editors), World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education, pp. 2160-2165, Chesapeake, VA, AACE, 2004, www.editlib.org/p/11205.

[7] R. Clariana, R. Koul, K. Albright, "Using Pathfinder Knot Analytic Tools for Comparing and Combining Concept Maps", 2006, www.personal.psu.edu/rbc4/CMC_2006.htm.

[8] P.A. Okebukola, O.J. Jegede, "Cognitive Preference and Learning Model as Determinants of Meaningful Learning through Concept Mapping", Science Education, Vol. 71, pp. 232-241, 1989.

[9] J. Marangos, "The Effectiveness of Collaborative Problem Solving: Tutorials in Introductory Microeconomics", Economic Papers, Vol. 19, pp. 33-41, 2000.

[10] M.A. Bulmer, "Narrated Concept Map for Statistics", B. Phillips, 6th International Conference of Teaching Statistics, Cape Town, South Africa, 7-12 July, 2002, www.stat.auckland.ac.nz/~iase/publications/1/5a2_bulm.pdf.

[11] X. Gomez, B. Beatty, "Moodle Usage as a Constructivist Tool", 2006, http://itec.sfsu.edu/wp/860wp/F06_860_gomez_moodle.pdf.

[12] W.M. Roth, "Student Views of Collaborative Concept Mapping: An Emancipatory Research Project", Science Education, Vol. 78, pp. 1-34, 1994.

[13] www.learningsystem.ir.

[14] A.H., Littlejohn, "Improving Continuing Professional Development in the Use of ICT", Journal of Computer Assisted Learning, Vol. 18, No. 2, pp. 166-174, 2002.

[15] A.H. Littlejohn, "The Effectiveness of Resources, Tools and Support Services Used by Practitioners in Designing and Delivering E-Learning Activities: Final Report", 2004, [www.jisc.ac.uk/uploaded_documents/Final_report_\(final\)](http://www.jisc.ac.uk/uploaded_documents/Final_report_(final)).

[16] A. Tizkar Sadabadi, "Composition of a Game Based Simulation for Software Development Process", International Journal on Technical and Physical Problems of Engineering (IJTPE), Issue 2, Vol. 2, No. 1, pp. 73-78, March 2010.

[17] M.T. Price, "Participant Perceptions of the Importance of Situated Learning Designing in the Delivery of On-Line Training", M.Sc. Thesis, Athabasca University, Alberta, April 2005.

[18] C.B. Teo, R.K.L. Gay, "Concept Map Provision for E-Learning", International Journal of Instructional Technology and Distance Learning, Vol. 3, No. 7, pp. 17-32, 2006.

[19] D.L. Maguitman, A. Reichherzer, T. Cannas, A. Carvalho, Marco. Arguedas, T. Eskridge, "Towards Automatic Concept Map Based Query Formation", First International Conference on Concept Mapping, Pamplona, Spain, 2004.

[20] E. Fathi Azar, J. Msrabady, "Effective Presentation of Personal Fabrication and Construction Group Concept Mapping as a Teaching Strategy", Journal of Educational Innovation, No. 13, pp. 11-31, Tehran, Iran, 2005.

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