REINFORCING DISTANCE EDUCATION THROUGH E-LEARNING AND E-ASSESSMENT PRACTICES USING ICT

Professor Dr. S. K. Rajesh Kanna
Department Of Mechanical Engineering , Rajalakshmi Institute Of Technology, Anna university
rajeshkanna.s.k@ritchennai.edu.in

Assistant Professor Dr. S. P. Vikram
Department Of Mechanical Engineering , Rajalakshmi Institute Of Technology, Anna university
vikram.p.s@ritchennai.edu.in

ABSTRACT
Assessment is an essential fundamental aspect to be carried out in all the distance learning centers, to identify the level of learners understanding and thereby the teaching methodologies can be enhanced to attain the desired outcome. Especially in distance education, learners and teachers contact are minimal, level of learning by the learners will vary and recent researchers proved that these voids can be filled with e-learning techniques. So, this research is to identify the challenges in e-distance education and reinforcing those using information and communication tools and has been experimented for the analytical subjects with four instructors and 45 students in mechanical engineering under graduate discipline. The three modules of this research are formulation of e-learning concept maps, types of e-assessment methods and solution methodologies for the better online distance education learning environments. The research concludes with recommendations synthesizing the better results and enhanced learning for the e-distance education.
Keywords: distance education; online learning; e-learning; online assessment; assessment challenges;

1.INTRODUCTION

Revolution in the communication and internet of things opens an era for online learning in distance education. Distance education university students are interested in taking online courses by utilizing Information and Communication Tools (ICT) for better understanding compared to the subjects thought in traditional ways (Ravichandran & Arulchelvan, 2017). Because enormous recourses starting from scratch history till the latest research developments are available in the internet. Now-a-days researchers believed that the education directly and indirectly helps in the development of a country and e-learning enrolments in a country continue to grow at a much faster rate (Allen & Seaman, 2010). More widely, the success of the e-learning depends on the delivery formats and become the most significant aspect of transnational higher education (Walsh, 2009). The delivery plan should be formulated such a way that should be suitable for all categories of the learners starting from slow learners till the researchers. In addition, the delivery plan should not provide misperception of the topics to the learners, as the learners studying through distance education, i.e. it requires synchronous communication (Boulos et al., 2005). As this new mode of learning becomes more prevalent and more effective in sharing the knowledge (Mapopa William Sanga., 2017), on the other hand, it is a challenging task to design and teaching the online courses, as the learners is physically far away from the instructor (John & Kwaku, 2017). Thus a necessity arises to develop an effective methodology and test the performance. The main objective of this research is to develop a concept map based e-learning module for the design of gears, identifying the challenges with e-learning, instructors and learners and finally enhancing the methodology based on the feedback. Thereby highlighting effective practices in the e-learning environment and empirically tested for the performance.

The area of focus that deserves special attention and entire performance of all the modules depends on the assessment of student learning (Moore & Anderson, 2003). This encompasses, how the instructors assess the student progress in online, how the grades are distributed among the students, graded activities for different courses, correction methodology, identifying level of understanding, assessing the course outcomes, comparing the attainment level, analysing the mapping of course outcome with programme outcome, effective feedback methodology and exploring the possible strategies to address these challenges. The purpose of this research is to explore such challenges and enhance the practices among a group of instructors teaching design course through online. Neumann et al., 2002 made a conceptual analysis on multi-disciplinary subjects. In recent years, implementing e-learning is more in higher education universities, so in this research, experimentation had carried out for under graduate mechanical students at an engineering college in India. Booth et al., 2013, developed the effective system for assessing the learner's performance through online for the students from vocational group.
In Phase one, syllabi for the subject 'Design of Machine Elements' has been considered for experimenting online course and four instructors at doctorate levels were reviewed in order to discover the types of teaching methodology being used for teaching through online. For online teaching and learning technique, Moodles (a

web based online platform for learning) have been used in this research and the assessment of student learning also done with the same platform. The subject has been taught using concept map approach. In the second phase, assessments have been done under the following categories for the distance education learners: (1) assignments, (2) online discussion (Gilbert & Dabbagh, 2005) (Baker, 2011), (3) application implementation, (4) quizzes (Yang & Tsai, 2010) and (5) examinations (Muilenburg & Berge, 2000). Phase 2 consisted of a focused group of 45 students. In the third phase, assessment reports have been analyzed by the department assessment and mentor board. The pitfalls and the impact of challenges such as communications, language, pre-requisite subject knowledge, workload, time management issues, collection of assignments and feedback had been analyzed and effective practices in online assessment had been suggested based on the feedback. The works carried out in this area of research are given in the following section.

2. LITERATURE REVIEW
Various forms of researches are ongoing in the area of e-learning and e-assessment and in this section, some of the related research work have been discussed.

2.1 ASSESSMENT CHALLENGES IN ONLINE LEARNING
Snyder, 1971 is the first researcher who coined the term "the hidden curriculum" to describe how students infer and the ways in which their learning were assessed. Joughin, 2010 analyzed the learning and assessment methods and concluded that the existing traditional way of studying and learning was limited. Bloxham and Boyd, 2007 continue the research on learning and assessment to find value and generativity in the nation. Generally, in online/distance learning, face-to-face interaction is less and even available, it will be a difficult task to answer/satisfy all the learners (Gibbs & Simpson, 2005). Also instructors have been particularly challenged to convey their intentions as desired to make the students to achieve the targeted learning objectives. Hannafin et al., 2003 found that the online-based approaches of teaching and learning render difficulty in observational and participatory assessments. Oncu & Cakir, 2011 observed the challenges in e-learning and its assessment for the online instructors, because of the non-existence of direct contact with the learners. Beebe et al., 2010 reiterate an online environment with time management, student responsibility, structure of the online courses, its complexity and assessment. Kim et al., 2008 and Robles et al, 2002 identified the authentic assessment activities for online learning. Kennedy et al., 2000 and Simonson et al., 2006 concentrated on the academic integrity. Meyer, 2006, Vonderwell et al., 2007 and Naismith et al., 2011 conducted experiments in identifying the challenges involved in assessing online discussions and associated collaborations. Biglan, 1973 analyzed the characteristics of the subject in different areas.

2.2 ASSESSMENT METHODS IN ONLINE LEARNING
Three different types of assessments are 'Assessment by Learning', 'Assessment of Learning' and 'Assessment for Learning'. Very few researches have been carried out in the types, attainment and distribution of assessments to attain the outcomes. Swan, 2001 experimented 73 online courses having discussion forums, written assignments, mini projects, quizzes and final examinations and found that the online discussion and tests or quizzes having more impact compared to other methods. Followed to that, Arend et al, 2007 conducted 60 online courses having online discussion, exams, written assignments, experimental assignments, problem assignments, quizzes, journals, projects, and presentations. Gaytan & McEwen, 2007 conducted research with the online instructors to identify best assessment methods to make the e-learning more effective for the learners and having methods like projects, portfolios, self-assessments, peer evaluations, peer evaluations with feedback, timed tests and quizzes, and asynchronous discussion. Effective practices and feedback from the online instructors will help to enhance and reinforce the framework for studying and practicing e-learning. Therefore, this research concentrates on the formulation of material using concept maps, methods of assessment (Suskie, 2009) and feedback based enhancement. Kalyani and Rajaram, 2017 conducted experimentation on e-learning for the VLSI subject.

3. E-LEARNING METHODOLOGY
The objectives of this research have been achieved in three phases. First phase is the formulation of the e-learning concept maps for analytical subjects, in focus, for the subject Design of machine elements for under graduate mechanical engineering students. In the second phases, different types of online assessment tools have been used to assess the learner's level of understanding and those assessment methods are assignments, written assignment, online discussion, application implementation, quizzes and examinations. Third phase is the feedback-based enhancement by satisfying the e-learning constraints.
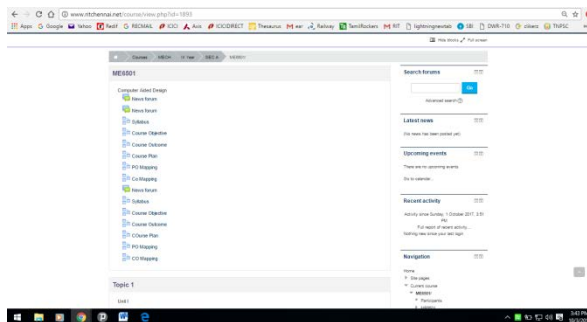
Figure 1: Moodle platform for gear Design

3.1 CONCEPT MAP FORMULATION

The study was carried out in an engineering college in India with the mechanical engineering department students and instructors. All the courses were offered on chalk and board as the major teaching method along with the animations and presentations. In phase I, instructors, mentors and advisory/assessment board were reviewed the course syllabi in order to discover the types of assessment being used to attain the course outcome through e-learning. The courses have been developed in the Moodle environment and the sample image of the Moodle platform for the course is shown in the Figure 1.

In the Moodle platform, the complete materials and the problem solving procedures have been uploaded by the instructors and verified by the mentors. The students can enroll the course through online. Once the students completed the course provided in the Moodle platform, then to summarize/review the learning, concept map have been formulated. The sample concept map developed for the course is given in the Figure 2.
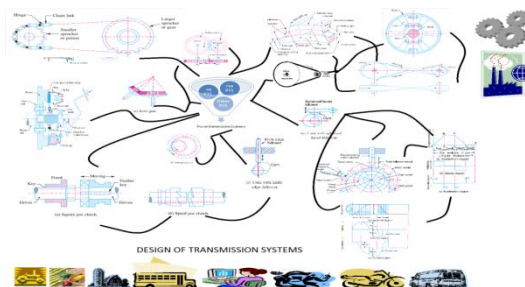

Figure 2: Concept map for gear Design

In Figure 2, the types of gears, its nomenclature, design procedure, applications are given in graphical way with links for details having videos, animations, question forum, etc. So that the student can navigates to any stage for clear understanding and clarification in the taught course.

3.2 ASSESSMENT TOOLS

For assessment of the learners, in this research, it has been categorized as direct assessment and indirect assessment. In direct assessment, the learners understanding have been assessed by giving tutorials, assignments, and examinations (Kerka & Wonacott, 2000). In indirect assessment, the learners understanding have been assessed by giving presentation, field work, quiz and online discussion.

3.3 FEEDBACK AND ENHANCEMENT PHASE

In the feedback phase, three types of feedback such as written feedback, online feedback and brainstorming have been obtained from learners and instructors. The obtained feedbacks have been summarized to the assessment and advisory board for further enhancement. The written and online feedbacks consist of course exit survey, course outcome survey and course committee survey obtained from the learners. In brainstorming, interviews have been conducted with the online instructors about the challenges faced and the remedial practices to be followed for effective e-learning and assessment. The summarized result of the obtained feedback for the e-learning course is shown in the Figure 3.
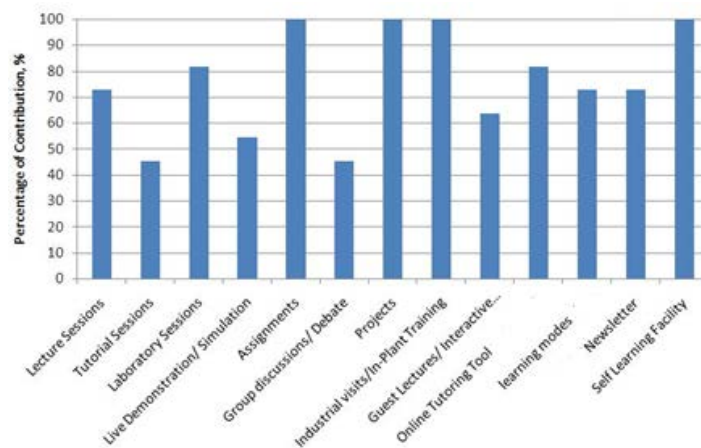
Figure 3: Summary of the Feedback

4. RESULTS AND DISCUSSION

Based on the implementation, the challenges faced by the learners and the instructors and the enhancement tools given by the assessment / advisory committee is given as follows.

1.   Physical distance between instructor and student.

In order to reduce the challenges in face to face contact, several telephone conference calls, open discussion forums and online chatting sessions with instructors of online courses can be arranged periodically.

2.   Challenges in creating and deploying assessments for the online courses

The assessments can be done for the following parameters

Remember &Knowledge: Every online session should start with pre requisite topics. The ICT tools used are quizzes, one word question and answers, procedures to solve the problem, design data book reference page numbers, animations, application videos, etc.

Comprehension: Every online session should ends with summary and assessment of the session attainment. The ICT tools used are exploring the need and use, quizzes, one word question and answers, animations, application videos, etc.

Application: Every completion of a topic in the e-learning courses closes by assessing the understanding level. The ICT tools used are the identifying the need and answering five levels of what if and why not questionnaires through the same Moodle web portal.

Analysis: Examination assessment, assignments, and tutorial questions should be such a way to conduct an analysis in the selected topic. For example, if the number of gear teeth's are in odd number, is it possible to manufacture?, which machine can be used ?, is it obey the standardization rules?, etc.

Synthesis: The designed gear should optimal based on the application i.e. maximizing the efficiency, reducing the size and weight by satisfying the constraints. The tutorial problems and the assignments problems have been formulated with multiple objectives and conflicting constraints.

Evaluation: once the learner submitted the online assignments, the Moodle portal compares the learners answer and the actual answer, then allots the mark for that question. If needed, option provided to the learners to do re-assignments to get higher grades.

3.   Feedback Sessions for reinforcing the session

Feedback modules have been created at the end of every session and the learners have to answer the question. Thereby the forth coming topics can be enhanced to the learners need. Some of the sample questions are as follows. What assessment practices have you used online that have been particularly effective? How has your online teaching impacted your assessment practices in your F2F classes?, etc

4.   E-learning Assessment techniques

The five categories of assessment experimented in this research are as follows:

1) *Written assignment:* This large category encompasses written assignments.

2) *Online discussion:* Assessments based on the discussion activity in the forum.

3) Projects: This is a special type of written assignment requiring students to collect data real time applications.
4)Test/quiz/exam: For   experimentation, internal assessment exams have been conducted with 10 multiple-choice or short answer questions, 10 brief questions and 2 design problems. The quiz questions have been formulated with multiple-choice questions.
5) Presentation: The learners have to present their understanding in the presentation and to deliver the same in the online environment.

The most frequently used assessment methods by the instructors are the written assignments and examinations as it is more formal than the online discussions. For online discussion, instructor have to post some questions and quires, sometimes, students have to assigned into small groups and no hard exist for assessing the grade for their discussion. Workload and time management for the instructor will be increased for the first time and the same material can be enhanced digitally for the forthcoming learners. When assignments in these classes involved complex and multi-step skills, then for effective practice, tutorials will be conducted in the specified time with the guidelines from the instructors. Further e-tutorial also provided to the learners as prerequisite to solve the online tutorial problems. The major challenges faced in the assessments are the formulation of the rubrics by highlighting the important features, communicating target performance, simplify instructors grading, etc. once the rubric have been formulated along with the check list for each activity, it guides the learners properly and the target can be achieved (Kalaivani et al, 2017).

5. CONCLUSION

This research had been conducted in three phases. In Phase one, with reference to the syllabi, e-learning course material had formulated based on concept mapping. In the phase two, different types of assessment methods had formulated and given to the learners. Gaining a sense for the level of contribution of each type made to the overall course grade. In Phase Three, four of the course instructors participated in either a focus group or a one-on-one interview to discuss assessment challenges they faced along with the feedback sessions in moving their courses in an effective way. Practices to address those challenges are identified with the mentor and the assessment committee. Finally, an examination with thinking and decision-making questions results in effective learning environment.

REFERENCES

Allen, I. E., & Seaman, J. (2010). Class   differences: Online education in the   United States, 2010.

Arend, B. (2007). Course assessment practices   and student learning strategies in online   courses. Journal of Asynchronous   Learning Networks, 11(4), 3-13.

Baker, D. L. (2011). Designing and orchestrating online discussions. MERLOT Journal of online Learning and Teaching, 7(3), 401-411.

Beebe, R., Vonderwell, S., & Boboc, M. (2010).Emerging patterns in transferring assessment practices from F2F to online environments. Electronic Journal of e-Learning, 8(1), 1 -12.

Biglan, A. (1973). The characteristics of subject matter in different academic areas. Journal of Applied Psychology, 57(3), 195-203. doi:10.1037/h0034701

Bloxham, S., & Boyd, P. (2007). Developing effective assessment in higher education: A practical guide. Maidenhead, UK: Open University Press.

Booth, R., Clayton, B., Hartcher, R., Hungar, S., Hyde, P., & Wilson, P. (2003). The development of quality online assessment in vocational education and training: Vol. 1. Adelaide, Australia: Australian National Training Authority.

Boulos, M. N. K., Taylor, A. D., & Breton, A. (2005). A synchronous communication experiment within an online distance learning program: A case study. Telemedicine and e-Health, 11(5), 583-593.

Gaytan, J., & McEwen, B. C. (2007). Effective online instructional and assessment strategies. The American Journal of Distance Education, 21(3), 117-132. doi:10.1080/08923640701341653

Gibbs, G., & Simpson, C. (2004-2005). Conditions under which assessment supports students' learning. Learning and Teaching in Higher Education, 1, 3-31.

Gilbert, P. K., & Dabbagh, N. (2005). How to structure online discussions for meaningful discourse: A case study. British Journal of Educational Technology, 36(1), 5-18. doi:10.1111/j.1467-8535.2005.00434.x

Hannafin, M., Oliver, K., Hill, J. R., Glazer, E., & Sharma, P. (2003). Cognitive and learning factors in web-based distance learning environments.

John K. Edumadze & Kwaku Anhwere Barfi (July 2017).Perceptions Of Senior High School Students Towards E-Learning Platform In Some Selected Senior High Schools In Cape Coast Metropolis. The Online Journal Of Distance Educaion and E-Learning ,Contents 2017 Vol 5 Issue 3.

Joughin, G. (2010). The hidden curriculum revisited: A critical review of research into the influence of summative assessment on learning. Assessment and Evaluation in Higher Education, 35(3),335-345. doi:10.1080/02602930903221493

Kalaivani P, Mohamed Mansoor Roomi S and Annalakshmi M (2017). A Comprehensive Frame Work For Learning Events. The Online Journal of Distance Education and e-learning, Contents July 2017 Vol 5 , Issue 3

Kalyani K & Rajaram S (July 2017). The Standard E-Learning Techniques On VLSI Design. The Online Journal Of Distance Education, Contents 2017 Vol 5 Issue 3

Kennedy, K., Nowak, S., Raghuraman, R., Thomas, J., & Davis, S. F. (2000). Academic dishonesty and distance learning: Student and faculty views. College Student Journal, 34(2), 309-314.

Kerka, S., &Wonacott, M. E. (2000). Assessing learners online: Practitioner file. Columbus, OH: ERIC Clearinghouse on Adult, Career, and Vocational Education. Retrieved from ERIC database.

Kim, N., Smith, M. J., &Maeng, K. (2008). Assessment in online distance education: A comparison of three online programs at a university. Online Journal of Distance Learning Administration, 11(1).

Mapopa William Sanga (July,2017). Closing Gap between Learning and Use:Operationalizing The Situated Cognition Construct To Create Authentic Online Learning Contexts. The Online Journal Of Distance Education and E-Learning, Contents 2017 Vol 5 Issue 3.

Meyer, K. A. (2006). The method (and madness) of evaluating online discussions. Journal of Asynchronous Learning Networks, 10(4), 83-97.

Moore M. G. & Anderson W. G. (Eds.), Handbook of distance education, 2003.

Muilenburg, L., & Berge, Z. L. (2000). A framework for designing questions for online learning.

Naismith, L., Lee, B.-H., & Pilkington, R. M. (2011). Collaborative learning with a wiki: Differences in perceived usefulness in two contexts of use. Journal of Computer Assisted Learning, 27(3), 228-242. doi:10.1111/j.1365-2729.2010.00393.x

Neumann, R., Parry, S., &Becher, T. (2002). Teaching and learning in their disciplinary contexts: A conceptual analysis. Studies in Higher Education, 27(4), 405-417.

Oncu, S., &Cakir, H. (2011). Research in online learning environments: Priorities and methodologies. Computers & Education, 57(1), 1098-1108. doi:10.1016/j.compedu.2010.12.009

Ravichandran.K & Arulchelvan.S (July 2017). A Study On The Impact Of E-Content News Among The Audience Of Tamil Nadu .The Online Journal Of Distance Education and E-Learning, Contents 2017 Vol 5 Issue 3.

Robles, M., &Braathen, S. (2002). Online assessment techniques. Delta Pi Epsilon Journal, 44(1), 39-49.

Simonson, M., Smaldino, S. E., Albright, M., &Zvacek, S. (2006). Teaching and learning at a distance: Foundations of distance education (3rd ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Snyder, B. R. (1971). The hidden curriculum. New York, NY: Alfred A. Knopf.

Suskie, L. (2009). Assessing student learning: A common sense guide(2nd ed.). San Francisco, CA:Jossey-Bass.

Swan, K. (2001). Virtual interaction: Design factors affecting student satisfaction and perceived learning in asynchronous online courses. Distance Education, 22(2), 306-331.doi:10.1080/0158791010220208

Vonderwell, S., Liang, X., & Alderman, K. (2007). Asynchronous discussion and assessment in online learning. Journal of Research on Technology in Education, 39(3), 309-328. Retrieved from ERIC database. (EJ768879)

Walsh, P. (2009). Global trends in higher education, adult and distance learning. Oslo, Norway: International Council for Open and Distance Education.

Yang, Y. F., & Tsai, C.-C. (2010). Conceptions of and approaches to learning through online peer assessment. Learning and Instruction, 20(1), 72-83. doi:10.1016/j.learninstruc.2009.01.003.