International Education Studies
www.ccsenet.org/journal.html
Vol. 1, No. 4
November 2008

Implementation of Continuous-Grouped-Self-Learning (CGSL) System in Engineering Education

M. A. M. Azau, A. F. Abas, M. I. Saripan, W. A. Wan Adnan, N. K. Noordin, A. Ismail, M. Mokhtar, K. Samsudin, S. Mashohor, M. F. A. Rasid, R. S. A. Raja Abdullah & F. Arif
Department of Computer and Communication Systems Engineering
Faculty of Engineering
Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia
Tel: 60-3-8946-4357 Fax: 60-3-86567127
E-mail: mdazrin@eng.upm.edu.my

Abstract

This paper presents a new method in engineering education called a continuous-grouped-self-learning (CGSL) system. In general, based on feedbacks acquired from the student at the end of the implementation, students better understanding and appreciation to the courses been taught. Out of 60 students 71.7% admitted that this learning system has improved their study style and knowledge acquisition, which then agreed to be implemented in future. The observation shows that this system increases the appreciation to the knowledge better than conventional method. Apart from that the system also produced better students in term of responsibility, self-confidence, competitiveness, group work, and knowledge sharing. This is realized with the implementation of mock teaching assessment.

Keywords: Continuous-grouped-self-learning, Group work, Mock teaching, Engineering education

1. Introduction

In recent years, teaching delivery methods have been shifted from a teacher centered learning to students centered learning. While the knowledge is expanding exponentially and dynamically in every second (Fujio, 2006), it is impossible for the tutors and the lecturers to deliver the lesson in the traditional manner anymore. The traditional teaching method places the burden of conveying the knowledge to the lecturers, tutors and laboratory instructors. More often than not, the students have the expectation that they will receive all the information and knowledge from the lecturers. Unfortunately, it happens that this approach limits the students' appreciation to the knowledge. However, leaping into the new millennium many academic institutions have adopted a modified students-lecturers role approach not only to enhance the knowledge delivery but also developing the students' soft-skills. Instead of the lecturers give the talks; the students now take the responsibility to enrich amongst themselves (Otung, 2001; Costa 2007; Ellis, 2007; Berry, 2003). Self-learning is a motivating self-enrichments teaching method. In conventional method, the students are being spoon-fed in lectures and tutorials whilst the exams are paper-based oriented. In this paper we propose an innovative self-learning system namely Continuous-Group-Self-Learning (CGSL) system. In this system, while the lecturer provides a minimal input (i.e fundamental concepts) to the students, they are subjected to explore and expand knowledge by acquiring the information in non-conventional way.

2. Working Principle

The working principle of CGSL system is summarized in Figure 1. This system comprises four important elements, which are lectures, group-tutorials, tests and course evaluation by students.

In the lectures, the lecturer delivers the fundamental knowledge and concepts to approach problems to the students. The information given should be sufficient enough to encourage the students to explore the knowledge themselves. Most of the time, the understanding of the knowledge implementation leads to knowledge appreciation. Apart from that, the lecturer may also suggest the information resources to the student. In this teaching approach, the roles of the lecturer and the tutor are as the guides in finding correct, useful and valid information to avoid misleading information being shared. In order to motivate the students to explore the knowledge, this system divides the students into smaller groups. This way, the study groups are unofficially formed where the student can help each other not only to find but to share the knowledge as well. The group work is a crucial factor that will decide the system's success. Therefore, methods to assure the students help each other have to be introduced.

2.1 Delivery Method

The information harvested is then delivered by the student during the weekly tutorial sessions, which are conducted as series of presentations to provide continuous learning. Question and answer sessions are part of the assessment. The students were grouped into five (similar as study-group) and divided into two classes, which took place not more than 60 minutes per class. To motivate the success of group-work, important pushing-factors are identified. The assessments are done in group rather than individually. The group member consists of the mixture of smart and weak students in which the smarter students are expected to help out the weaker ones to understand the problems assigned. On the other hand, the weaker students shall work hard to ensure they could stand at par with the rest of the group members and to contribute in the assessment. .

This way, the information is shared efficiently in the group, and consequently reduces the knowledge gap between the students. Continuous assessments from one week to another also encourage the students to practice continuous knowledge harvesting. Another important factor that can improve group work is by competition. Our tutorial is organized in such a way that the students feel that they are competing to deliver the best out of themselves. Each group has to compete in each tutorial and the winner will be receiving an incentive in terms of bonus mark. Besides from the correct answer, the group can also obtain extra marks from good questions asked in the Q and A session, which encourage students to critically induce good questions and communicate. Apart from the knowledge, we believe that this system also enable confidence gain leveling among the students.

2.2 Assessments and Evaluations

The tests, on the other hand, are done in two series, on the 5th and 10th week out of 14 weeks in a semester (Quality Assurance Unit, 2006). The test comprises group presentations where the question set is given impromptu with short but reasonable period of time to solve. The students are assessed by at least two examiners, who ask questions that dig out actual comprehension of the students. The students will take the role of the lecturer and solve the problem and they will take turn to utter out the solution. This method is known as Mock-Teaching-Oriented-Assessment (MTOA). MTOA has been used as reported in (Angelo, 1993; Shaeiwitz, 1998; Sage, 2000). This type of assessment provides the examiner clearer picture on the students understanding to the subject. In conventional writing examination, the lecturer may wrongly judge the ability of the student due to the bad handwriting, misleading question that results misleading answer, plagiarism, and the students' health condition. Using MTOA, which assesses the student on one-to-one basis, the marks given are reflecting the actual ability of the student more accurately.

Lastly in order to observe the effectiveness of the method; students evaluations to this method are done at least twice in a semester. The question set focuses on how the students perspective about the method and how much the method has improved their knowledge in the subject. We also ask the students' opinion on how to improve CGSL system. All these information will be analyzed and used to improve the system from one semester to another.

3. Results and Discussion

The response and observation on the implementation of Continuous-Grouped-Self-Learning (CGSL) in two engineering subjects, namely Electronics Circuit and Devices (ECC 3104); and Engineering Mathematics (ECC 3002) are reported. 60 students took part in experimenting the teaching approach in which 20 of them are from Electronics Circuit and Devices course and the rest are from Engineering Mathematics course.

As depicted in Figure 2, from 20 students who enrolled Electronics Circuit and Devices course, referring to scale 1 to 5 (bad to excellent), 46.7% found that the approach is at the level of excellent and very good (scale 5 and 4) for the lecture, while 53.3% felt the approach is at the level of good (scale 3). For tutorial and test, 60% agreed that the approach is at the level of 4 and 5, while 40% think the approach is only at level 3. None of the students opposed CGSL implementation.

For Engineering Mathematics students, 64.5% acknowledged that the lecture is best to be presented using CGSL (level 4 and 5). For the tutorial, 95.6 % reached agreement that it is best to be carried out using this approach (level 4 and 5) and 71.2% preferred (level 4 and 5) the test to be conducted this method. The percentages of disagreement to this teaching method are relatively low with 15.6% for lecture, 2.2% for tutorial and 8.9% for the test as shown in Figure 3.

Given a chance, in overall, 71.7% of the students agreed that they will implement this approach in the future while 15 % found that this approach could be implemented with some modifications. The remaining 13.3% felt that the approach is not suitable to be implemented as portrays in Figure 4.

4. Conclusions

The proposed CGSL approach envisions bridging the knowledge gap amongst students in the hope that knowledge is shared and evenly distributed. At the end of the course, the students developed the sense of responsibility not only to themselves but to the others as well. This approach makes the students appreciate the knowledge better and constructs a dynamic continuous learning environment that leads to the idea of engineers as problem solvers. A part from that,

confidence level of the student increases and the more importantly the students are able to present their work in better ways. The approach has shifted the paradigm from self-centered-spoon-fed-learning and paper-based-oriented-examination to Continuous-Grouped-Self-Learning (CGSL) with Mock-Teaching-Oriented-Assessment (MTOA).

References

Angelo, T. A. & Cross. K. P. (1993). "Classroom Assessment Techniques. A Handbook for College Teachers" 2nd ed., Jossey-Bass, San Francisco.

Barry, W. B. (1988). "A spiral model of software development and enhancement", *IEEE Computer*, May, 61-72.

Berry F. C., DiPiazza P. S. & Sauer S. L. (2003). "The Future of Electrical and Computer Engineering Education", *IEEE Transactions on Education*, Vol. 46, No. 4, pp: 467-476.

Costa L. R. J., Honkala M. & Lehtovuori A. (2007). "Applying the Problem-Based Learning Approach to Teach Elementary Circuit Analysis", *IEEE Transactions on Educations*, Vol. 50, Issue 1, pp:41 – 48.

Ellis H. J. C. (2007). "An Assessment of a Self-Directed Learning Approach in a Graduate Web Application Design and Development Course", *IEEE Transactions on Education*, Vol. 50, Issue 1, pp:55 – 60.

Fujio Y. (2006). "Pratical IT Education. Deepening of Technology, Expansions of Work, and Development into Headwaters: A systematic Effort to Achieve Higher Levels", *Issues in Informing Science and Information Technology*, Vol. 3, pp:244-252.

Kolb, D. A. (1984). " Experiential learning", *Englewood Cliffs*. NJ: Prentice Hall.

Otung I.E. (2001). "Reassessing the mathematics content of engineering education", *Engineering Science and Education Journal*, Vol. 10, Issue 4, pp:130 – 138.

Sage A. P. (2000). "Systems Engineering Education", *IEEE Transactions on Systems, Man, and Cybernetics—Part C: Applications and Reviews*, Vol. 30, No. 2, pp: 164-174.

Shaeiwitz, J. A. (1998). Classroom Assessment," *J. Engr. Educ*., Vol 87, No 2, pp179-183.

Quality Assurance Unit. (2006). "A Guide t Putra 3Q Outcome-Based Teaching and Learning", Faculty of Engineering, Universiti Putra Malaysia.

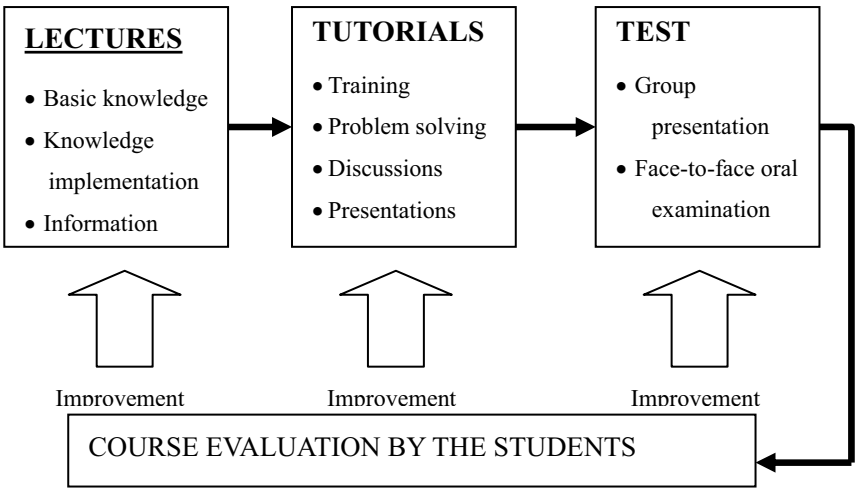

Figure 1. CGSL Working Principles

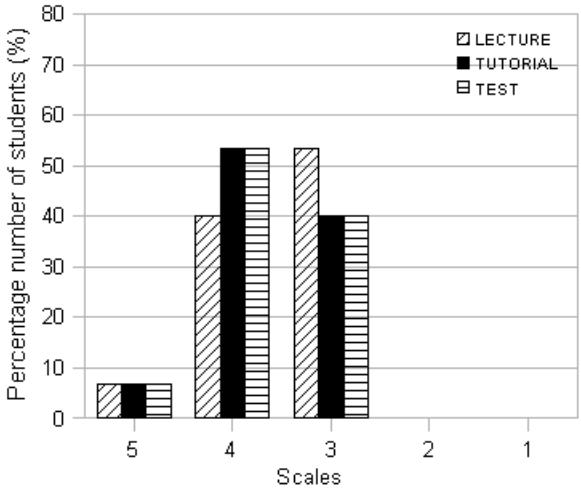

Figure 2. Students' evaluation of CGSL implementation on ECC 3104

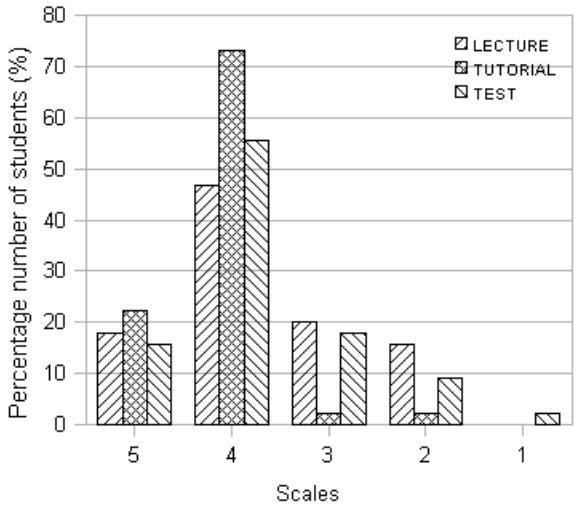

Figure 3. Students' evaluation of CGSL implementation on ECC 3002

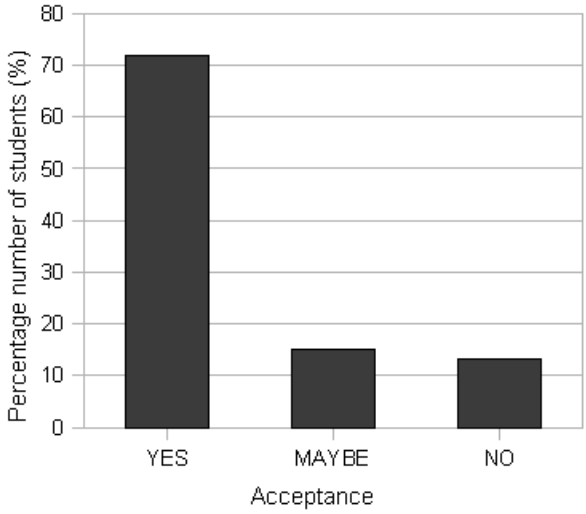

Figure 4. Overall students' acceptance to CGSL system