

Assessment of Implementation of Student-Centered Learning (SCL) at University College of Engineering & Technology Malaysia (U-Tec): Students' Perception

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Abstract - The process of teaching and learning had been given a serious attention towards equipping the engineering lecturer with the pedagogical knowledge at U-Tec. This paper is to study the effectiveness of Student-Centered Learning (SCL) implementation among the lecturers from the students' perspective across engineering disciplines inclusive civil, mechanical, chemical, electrical and computer science. The engineering lecturers have to attend pedagogical course conducted by the Academic Staff Development Centre (ASDC) to learn the educational theory and practices related to SCL environment. They also have to do micro-teaching to apply the methods and techniques of doing SCL. They were also observed by ASDC staff in the real classroom about the SCL implementation. The data were collected through questionnaire and was analysed. From the findings, the SCL implementation is still not satisfactory and there is still room for improvement in the near future.

1. Introduction

No particular approach has been declared the best strategy in teaching (Abdullah, 2004). A great deal of strategies has been carried out giving the best instruction in the process of teaching and learning by shifting from teacher-centered to student-centered learning (Zahariah, 2004). Nowadays, the emphases of educational values in engineering fields have been given a due consideration. Continuous improvement of teaching styles is vital in ensuring the success of student-centered learning exercise at U-Tec among engineering lecturers.

According to Stephen Donohoe et al (2002), the objective of student-centered approach was to minimize the input of the lecturers and maximize the input of the students. Thus, in order to encourage this lecturers are exposed to myriad of techniques of doing student-centered learning. Initially, the lecturers felt uncomfortable with this teaching strategy and gradually they try to adapt and vary the approach from

time to time to maximize students' involvement in the process of teaching and learning.

One element of SCL is problem-based learning (PBL). The use of PBL in Malaysia is still at the initial stage (Zaitun et al, 2004). According to A. Salleh et al (2004), PBL has helped influencing students' learning through an interactive SCL mode. The lecturers who use the PBL technique will give a real picture of problems to students to assist students' learning.

2. Research Methodology

Research design used in this case study is quantitative. One set of questionnaires is distributed to engineering lecturers for predetermined engineering subjects. There were 391 students participated in this study from year 1 to year 3 from 5 faculties. The faculties are Faculty of Chemical & Natural Resources Engineering (FCNRE), Faculty of Civil & Environmental Engineering (FCEE), Faculty of Computer System & Software Engineering (FCSSE), Faculty of Electrical & Electronic Engineering (FEEE), and Faculty of Mechanical (FM).

Refer Table 1.

Table 1: Number of students according to faculties.

| Faculty | Year of study | | | No: of students |
|---------|---------------|-----|----|-----------------|
| | 1 | 2 | 3 | |
| FCNRE | 52 | 45 | - | 97 |
| FCEE | - | 52 | - | 52 |
| FCSSE | - | - | 48 | 48 |
| FEEE | 52 | - | 46 | 98 |
| FM | 52 | 44 | - | 96 |
| Total | 156 | 141 | 94 | 391 |

There were 30 questions in the questionnaire about the teaching method by the lecturer. The questions revolve around the set induction, audio-visual aids, problem-based learning, questioning techniques, soft skills (social skills) and basic teaching skills. All of these are some elements of SCL approach that has been introduced in the pedagogy course. For this study, problem-based learning was taken into account. This approach was tested to gauge whether the lecturers have adopted the SCL technique in the teaching and learning process in the classroom from students' perspective. There were 4 scales used in the questionnaire as an indicator for students for every questions i.e scale 1 for Never, scale 2 for Seldom (once a week), scale 3 for sometimes (2-3 times a week), and scale 4 for (every lecture). Students were required to read the statements and give sincere response.

In this study, the engineering subjects involved were fluid mechanics (FCNRE), soil mechanics (FCEE), digital electronic (FEEE), operating system (FCSSE), chemistry for engineers (FCNRE), analogue III (FEEE), thermodynamic (FM) and engineering materials (FM). Number of students who involved in this study in every subject is shown in Table 2.

Table 2: Number of students according to the subjects.

| Faculty | Year of study | | | No: of stdns |
|---------------------------------|---------------|-----|----|--------------|
| | 1 | 2 | 3 | |
| Fluid Mechanics (FCNRE) | - | 45 | - | 45 |
| Soil Mechanics (FCEE) | - | 52 | - | 52 |
| Basic Digital Electronic (FEEE) | 52 | - | - | 52 |
| Operating System (FCSSE) | - | - | 48 | 48 |
| Chemistry for Engineers (FCNRE) | 52 | - | - | 52 |
| Analogue III (FEEE) | - | - | 46 | 46 |
| Thermodynamic (FM) | - | 44 | - | 44 |
| Engineering Materials (FM) | 52 | - | - | 52 |
| Total | 156 | 141 | 94 | 391 |

Prior to this study, all engineering lecturers have to go for the Pedagogy Course organized by ASDC. They are exposed to the teaching and learning strategy that best support the student-centered learning environment. Since, most of the engineering lecturers do not come from educational background; they also have to do micro-teaching. This mock teaching

consists of 10-15 other lecturers acted as students. The selected lecturer would choose any topic and simulate the teaching and learning process as in the real classroom to practice SCL strategy. Normally, the micro-teaching is part of the curriculum in educational diploma or degree. Thus, it is of great importance of having the micro-teaching in implementing the SCL exercise. The lecturers also were observed in the classroom by ASDC staff to make sure the SCL exercise is implemented and comments were given in order to improve the SCL strategy in the classroom.

3. Data Analysis

3.1 Mean Score of SCL

The mean score of SCL implementation from the students' perspective at U-Tec is 3.0829 which means "sometimes" or 2-3 times a week. However, this mean score is still considered as unsatisfactory and should be enhanced. It means that the strategy of SCL must be fully implemented. From 5 faculties, FCNRE scored high mean score that is 3.2534 and FCSSE scored the lowest mean score that is 2.7514. This mean score showed that the lecturers are still not comfortable in using the SCL method in the teaching and learning process. The mean score for the other faculties are shown in Table 3.

Table 3: Mean score of SCL assessment according to each faculty

| Faculty | Mean | No: | Std deviation |
|---------|--------|-----|---------------|
| FCNRE | 3.2534 | 87 | 0.2739 |
| FCEE | 3.0394 | 46 | 0.3334 |
| FCSSE | 2.7514 | 40 | 0.4097 |
| FEEE | 3.1025 | 90 | 0.3747 |
| FKM | 3.0666 | 83 | 0.3170 |
| Total | 3.0829 | 346 | 0.3644 |

From Table 3, it is obvious that the faculties which took part seriously in the pedagogy course scored high mean score. It is also evident that the FCNRE who is active holding in-house training on SCL got the highest mean score.

3.2 Mean Score of PBL for each faculty

One element of SCL in this study is problem-based learning (PBL). Engineering students should be exposed to teaching and learning process that emphasizes problem-based learning. It is found that through this study, overall mean score for PBL alone is 2.8157. This indicated that lecturers' effort in integrating PBL element is still not very encouraging and has to be improved. No faculties reaching mean score of 3 as shown in Table 4.

Table 4: Mean score of PBL according to each faculty

| Faculties | Mean | N | Std. Deviation |
|-----------|--------|-----|----------------|
| FCNRE | 2.9783 | 92 | 0.4591 |
| FCEE | 2.8516 | 52 | 0.4205 |
| FCSSE | 2.4921 | 45 | 0.5298 |
| FEED | 2.8189 | 97 | 0.4444 |
| FM | 2.7880 | 93 | 0.4934 |
| Total | 2.8157 | 379 | 0.4857 |

Overall, this showed that the lecturers are still lack of skill in using PBL approach. The FCNRE who got high mean score of SCL also tally with the mean score for PBL.

3.3 Mean Score of PBL for each subject

The mean scores for PBL between subjects are shown in Table 5.

Table 5: Mean score of PBL according to subjects

| Subjects | Mean | No: | Std. Deviation |
|---------------------------------|--------|-----|----------------|
| Fluid Mechanics (FCNRE) | 2.8538 | 43 | 0.5267 |
| Soil Mechanics (FCEE) | 2.8516 | 52 | 0.4205 |
| Basic Digital Electronic (FEED) | 2.7003 | 51 | 0.4240 |
| Operating System (FCSSE) | 2.4921 | 45 | 0.5298 |
| Chemistry for Engineers (FCNRE) | 3.0875 | 49 | 0.3617 |
| Analogue III (FEED) | 2.9503 | 46 | 0.4335 |
| Thermodynamic (FM) | 2.8439 | 43 | 0.5478 |
| Engineering Materials (FM) | 2.7400 | 50 | 0.4412 |
| Total | 2.8157 | 379 | 0.4857 |

From Table 5, the mean score for Chemistry for Engineers subject is 3.0875. Other subjects scored below than 3. This means that lecturers are still not comfortable using PBL approach in the classroom as the one of the strategy in the process of teaching and learning.

3.4 ANOVA for SCL assessment

In order to know whether there is a significant difference between the mean score of SCL assessment among faculties in table 3, an analysis of variance was computed as shown in Table 6.

Table 6: ANOVA: Overall standing

| | | Sum of Squares | df | Mean Square | F (degree of freedom) | Sig. |
|---|----------------|----------------|-----|-------------|-----------------------|-------|
| F | Between Groups | 7.069 | 4 | 1.767 | 15.557 | 0.000 |
| U | Within Groups | 38.736 | 341 | 0.114 | - | - |
| Y | Total | 45.805 | 345 | - | - | - |

Based on Table 6, it is found that there is a significant difference in means for the whole SCL implementation between 5 faculties ($p < 0.05$). The significant difference is due to the effort and initiative of the lecturer in doing SCL techniques. Refer Table 3. FCNRE (mean = 3.2534) is much committed in applying SCL technique but it is still unsatisfactory and has to be improved. FCSSE (mean 2.75) is lacking in applying SCL technique (falls on the category of seldom). The other faculties performed a little higher in the SCL implementation compared to FCSSE.

3.5 ANOVA for each faculty

In order to know whether there is a significant difference between the mean score of PBL among faculties in Table 4, an analysis of variance was computed as shown in Table 7.

Table 7: ANOVA: Comparison between PBL technique and faculties

| | | Sum of Squares | df | Mean Square | F | Sig. |
|---|----------------|----------------|-----|-------------|-------|-------|
| F | Between Groups | 7.284 | 4 | 1.821 | 8.315 | 0.000 |
| U | Within Groups | 81.901 | 374 | 0.219 | - | - |
| Y | Total | 89.185 | 378 | - | - | - |

From the analysis in Table 7, there is a significant difference ($p < 0.05$) among faculties in the implementation of PBL technique.

3.6 ANOVA for each subject

In order to know whether there is a significant difference between the mean score of PBL among all subjects in Table 5, an analysis of variance was computed as shown in Table 8.

Table 8: ANOVA: Comparison between PBL technique and subjects

| | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---------|----------------------|-----|----------------|-------|-------|
| F | Between | 10.295 | 4 | 1.471 | 6.917 | 0.000 |
| A | Groups | | | | | |
| C | | | | | | |
| U | Within | 78.890 | 371 | 0.213 | - | - |
| L | Groups | | | | | |
| T | | | | | | |
| Y | Total | 89.185 | 378 | - | - | - |

From Table 8, it is found that, there is also a significant difference ($p < 0.05$) in the implementation of PBL technique among the lecturers who teach their respective subjects.

4. Summary

The SCL implementation at U-Tec is still not reaching the desired result but there is still room for improvement in terms of its adoption and implementation in the classroom. Thus, intensive training and workshop on pedagogy must be conducted constantly besides the time constraint faced by ASDC to organize a pedagogy course. Besides that, the lecturers' attitude and mindset must be tuned to the SCL environment and think positively so that they would not resist to the continuous effort by the ASDC staff to train them in improving the teaching skills and practices. From the aspect of implementation, the lecturers' must be given a chance to gradually improve in the content mastery and skills of applying SCL in the subject taught.

Future research may be conducted on the same procedure to gauge whether the lecturers are applying other SCL techniques. Besides that, it is possible in the future research may concentrate on the development of student-centered teaching through the use of ICT such as web development or CD-ROM that incorporate the student-centered approach or other learning theory on a particular subject or topic.

Various method of SCL may be adopted in the teaching and learning process. The need of student-centered approach in the process of learning must also be paralleled with the student-centered teaching. This means that the lecturers must be well-versed in adopting SCL approach in particular subject. It is obvious that, student-centered strategy will produce

not only good result but equipping students with other skills such as being independent and responsible for his or her study besides promoting life-long learning. Although, the lecturers are facing a bit difficulty in adjusting and adapting to a new teaching approach but seeing the benefit of this teaching strategy lies ahead, the lecturers are willing to go for in-house pedagogy training which is conducted by ASDC from time to time.

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