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Student-Centered Learning in a First Year Undergraduate Course

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Abstract. Student-centered learning (SCL) may or may not be the ideal choice of learning method in certain parts of the world depending on many factors including the different learning cultures. This study discusses some of the factors that could have influenced students' responses towards SCL in an undergraduate mathematics course in Malaysia. The student factor discussed in this study is learning habits and preferences whereas the contextual factors are mathematics content or topic, time of intervention and the teacher. The study found that students generally responded positively towards SCL because it is more fun and provides opportunities for sharing of ideas, among other factors. However, when it came to assessment the students preferred the traditional form of assessment instead of being assessed in a SCL environment. This is primarily because they feel it is easier to score in the former but in the latter other group members contribute towards a student's score as well.

Keywords: contextual factors; group work; student-centered assessment; student factor

Introduction

Student-centered learning (SCL) has also been known as learner-centered education (e.g., Schweisfurth, 2011), independent learning (e.g., Vale, Davies, Weaven & Hooley, 2010) and student-centered team-based learning (e.g., Zain, Rasidi & Abidin, 2012). Dating back to as early as 1905, some of the proponents of SCL are Hayward, Dewey, Froebel, Piaget and Knowles (Yusoff, Karim, Othman, Mohin & Rahman, 2013). Among others, SCL involves students collaborating in groups, making connections between ideas and use of scaffolding activities for mathematical learning (Vale et al., 2010).

SCL subscribes to the constructivist pedagogy where the teacher does not transmit knowledge to the students but the students construct the knowledge themselves (Baeten, Kyndt, Struyven & Dochy, 2010; Zain et al., 2012). The teacher's role in a SCL environment is as a facilitator and a resource person (McLean & Gibbs, 2010; Yusoff et al., 2013). As such, the responsibility and

power shifts from the teacher, in the traditional teaching environment, to the student, in the student-centered learning environment (McLean & Gibbs, 2010; Wright, 2011).

In a SCL environment, learning is an active process that induces deep learning and understanding through increased responsibility, accountability and autonomy on the students' part (Baeten et al., 2010; Farrell & McAvinia, 2012). Instead of being passive listeners and submissive recipients of knowledge, students acquire knowledge by actively participating and getting involved in the learning process. Given that the students have a bigger role to play in a SCL environment compared to the traditional environment, better interaction and interdependence between the teacher and the students need to be fostered. However, the teacher's role is not to be undermined. On the contrary, the teacher has a more important role to play than before in view of the interconnectedness of SCL and good teaching (Farrell & McAvinia, 2012).

The motive of assessing students in a SCL environment is to identify their learning gaps and potential areas of development in order to enhance their learning particularly through feedback approaches (Noonan & O'Neill, 2012). Written assignments, portfolios and reflective journals provide better insights into the students' actual learning instead of scores on tests and multiple choice instruments that perhaps only superficially reflect a student's depth of knowledge and understanding. Logs, projects and group work are other tools that can be used to assess SCL.

An important element in a SCL environment is learning through doing and actively participating in the learning activities as opposed to learning by being passive recipients of knowledge. Working collaboratively with peers is another important element because it creates an atmosphere for participation and involvement in the lessons, and provides opportunities for sharing ideas and opinions. Learning through doing and collaborating has been found to increase students' motivation and confidence in learning mathematics besides making the mathematics learned meaningful to them (Yusoff et al., 2013; Zain et al., 2012).

Conversely, lack of engagement and involvement from the students will result in an unsuccessful SCL as well as lack of guidance and motivation from the teacher as the facilitator in a SCL environment. Baeten et al. (2010) categorized factors that influence the success of a SCL into contextual factors (e.g., assessment and institutional characteristics), perceived contextual factors (e.g., clarity of goals and relevance to professional practice) and student factors (e.g., educational experiences and preferences for teaching methods).

Implementation Of SCL In An Undergraduate Course

SCL has not escaped educationalists' criticism as well as its implementation is not without challenges. This study attempts to identify some of the challenges and questions to be considered when implementing SCL in an undergraduate course. The study involves thirteen undergraduate students in a Calculus

course. The mode of SCL chosen is group work and this was implemented two times in the semester. The first group work involved the topic Functional Models and was conducted in the third week of fourteen weeks of lessons. Meanwhile, the second group work involved the topic Integration and was conducted in week twelve.

The study gathers some baseline data from students' feedback after the two SCL sessions. In particular, students' feedback on both sets of group work was obtained by asking them to fill up a simple questionnaire with a Yes/No answer. The questions on the questionnaire attempted to find out:

(1) if the students enjoyed the SCL session.
(2) if group work helped the students to understand the topic.
(3) if group work had motivated the students to learn mathematics.
(4) if by working in groups, students are able to remember important mathematical concepts.
(5) if the students are able to provide input and share ideas in their groups.
(6) if working in groups had built the students' confidence in doing mathematics.
(7) if the students preferred the student-centered assessment to traditional quizzes/tests.

Table 1: Percentages of responses

	Group Work 1 (%)	Group Work 2 (%)
Enjoy	84.6	53.8
Understand	76.9	69.2
Motivation	69.2	46.2
Remember	61.5	53.8
Ideas	92.3	92.3
Confidence	38.5	61.5
Assessment	23.1	30.8

Table 1 displays the descriptive analysis of the results of the feedback using SPSS. Although the analysis is relatively simple, the results shed light on the dynamics of the undergraduate students in this course that influenced the implementation of SCL. Overall, the table shows that with the exception of motivation element in the second group work and the confidence element in the first group work, more than 50% of the students displayed positive feelings with regards to the group work. However, in general there is a decline in the percentages from the first group work to the second group work. Moreover, despite the students' positive feedback on the SCL, they preferred being assessed in the traditional form of assessment compared to the SCL assessment.

In detail, the table shows that:

(1) more than half of the class *enjoyed* the session whereby the percentage is higher for the first group work.

(2) more than half of the class feel that the group work helped them *understand* the topic whereby the percentage is higher for the first group work.
(3) more than half of the class feel that the first group work *motivated* their learning but less than 50% feel that the second group work motivated their learning.
(4) more than half of the class agree that they are able to *remember* important concepts by working in groups whereby the percentage is higher for the first group work.
(5) more than 90% agree that they are able to *provide input and share ideas* in their groups both for the first and second group work.
(6) less than 50% feel that the first group work built their *confidence* in doing mathematics but more than 50% feel that the second group work built their confidence in doing mathematics.
(7) both times, less than half the class preferred the student-centered assessment to quizzes/tests.

Discussion Of Results

SCL has been found to be an effective learning approach that develops better study skills among the students such as the higher order thinking skills and the creative thinking skills (Zain et al., 2012). In addition, there is increased motivation and confidence among the students as they find SCL to be a more interesting and exciting learning approach. Similarly, students in this study agreed that the group work motivated them to learn mathematics and built their confidence in doing mathematics but the percentages differed for the first group work and the second group work. Although the students seem to be less motivated in the second group work, their confidence level was higher than the first time they worked in groups.

Furthermore, students in this undergraduate course still preferred the traditional form of assessment compared to the student-centered assessment despite the positive feedback given on the SCL. In the following paragraphs, the paper discusses some student and contextual factors as described by Baeten et al. (2010) that are believed to have contributed towards students' responses to the questionnaire.

Learning habits and preferences

Habit is a strong factor in influencing one's action and the way one reacts towards a new circumstance. Students who have been successful in a traditional teacher-empowered classroom environment may exhibit initial resistance to SCL as suggested by some researchers (e.g., Wright, 2011). Their past experience is probably telling them that they will only do well in the former type of teaching approach. In fact, being so comfortable and accustomed to the 'old way of learning', these students' initial reaction to SCL is a sense of loss because now they are expected to learn on their own without someone telling them the facts, and the correct methods and techniques.

The students in this course need to obtain certain grades that will allow them to continue their degree abroad. In addition, five of the thirteen students in this study i.e. 38.46% are government sponsored students that is they have obtained exceptionally good results in their year eleven public examination in Malaysia. As these students have been subjected to eleven years of teacher-centered teaching and have found it to be highly successful, they would automatically exhibit initial rejection towards SCL for fear of not doing well in their assessment as suggested by the percentages of responses in Table 1. As one student commented,

> *I enjoyed the sessions but the fact that it carries marks and that it will not work if everyone doesn't cooperate, I don't know…*

Content

Baeten et al. (2010) believed that content of the course or the discipline of study has an influence on students' approach to SCL. In particular, they found that past studies generally argue that students are able to exhibit deep approaches to learning in the arts and social sciences related subjects compared to the science and engineering subjects although studies contradicting this fact exist. Functions is a relatively easier topic as perceived by students compared to Integration and this may have contributed towards the lower percentages of responses for the second group work.

Time Of Intervention

Students in this study responded more positively to SCL at the beginning of the semester and less favorably towards the end of the semester despite having more time to interact with each other and to get familiarized with the course. Two factors could have contributed to this. One is the content of the group work as mentioned above. Second factor is the apprehension of not doing well in the assessment as the final examination approaches and each student are aware of how well or how badly they have done in other assessments. In fact, a student who preferred the traditional form of assessment wrote that,

> *…it would be easier to score marks.*

Teacher

The success of SCL relies heavily on the students' ability to work in groups which in turn is dependent on the individual student's personality and social skills. Froyd and Simpson (2010) argue that students often lack the skills to work in groups and thus asking them to do so will trigger initial resistance. It is important then that the teacher creates meaningful activities at appropriate level of difficulty and strives to create a supportive learning environment for the students.

During both group works in this study, there was minimal involvement from the teacher. As the practice of SCL is relatively new to the teacher and the learning institution in concern, the teacher may not have the necessary skills to facilitate such group works. It is imperative that the teacher is equipped with the skills and the expertise that is needed in a SCL environment prior to its

implementation because although, the students have greater autonomy in a SCL environment, the role of the teacher as the mediator is crucial.

Conclusion

Wright (2011) lists some of the benefits of SCL in the higher education to be helping students to become empowered, confident and self-motivated. SCL also helps students to develop study skills such as time management, communication, critical thinking and problem solving skills. Likewise, this study shows that students in the undergraduate Calculus course responded positively towards SCL. One of the students mentioned,

…it is less stressful, quite fun.

Since SCL allows active interaction and sharing of ideas (Zain et al., 2012), the students are more involved and engaged in their learning. It was also observed that besides working with their own group members, the students conferred with members from other groups. In other words, there were also inter-group discussions, similar to the the observation made in the study by Zain et al. (2012).

The student factor discussed in this paper is learning habits and preferences. However, it is important to point out that this factor is most likely to be intertwined with other student factors mentioned by Baeten et al. (2010) such as individual student's personality, social style and coping strategies that would have contributed to the overall group dynamics. The importance of these factors is reflected in this student's statement,

> *Whether or not one enjoys/benefits from this kind of session, really depends on the group that he/she is in. Initially I thought it doesn't matter but a lot of things are at stake.*

Apart from the student factors listed by Baeten et al. (2010), another factor that is crucial in the learning process is the students' belief system and perhaps future studies can look into how to change the students' belief system to embrace SCL more optimistically especially in the developing countries.

Further, one the contextual factors mentioned by Baeten et al. (2010) is the duration of intervention. In addition, this study looks at the time of intervention which is equally important because it makes a difference whether the SCL is conducted in the beginning or the end of the semester and in which semester of a student's undergraduate program. The other two contextual factors discussed in this paper are content and teacher. Although, the secondary school mathematics curriculum in Malaysia is designed to develop problem solving and mathematical thinking skills in the students, among others, the teachers' practices are still largely teacher-centered as suggested by Zakaria, Chin and Daud (2010). As such, the teachers' mind set and belief system need to be changed as well to ensure SCL can be implemented successfully at the higher levels of education. The teacher should be able to become a participant and co-

learner in the SCL and have the expertise to create more meaningful assessments that are able to assess students' higher order thinking skills (Powell, 2013).

The results of this study is in agreement to the argument made by Schweisfurth (2011) that the implementation of SCL may not be as successful in the developing countries due to the different learning cultures. The study included all the developing countries and some impoverished areas in the more developed countries. Among others, the study quotes Altinyelken (2010) who found that Ugandan English teachers prefer the teacher-centered teaching due to lack of skills in the English language.

More importantly, Schweisfurth (2011) points out about the '*culturally appropriate distance*' between the teacher and the students in some of these countries that serve as a barrier to SCL. In Malaysia, teachers are seen as authoritative figures as with the parents, religious leaders and the rulers. Although in general the present day students are more vocal and the teachers too are more aware to the morphing culture and influences of the outside world, the need to score good grades to be able to further their study abroad is a stronger determinant in their choice of learning for this particular group of students.

Then questionnaire used in this study has a Cronbach alpha value of 0.731 and 0.590 for the first and second data sets respectively. The low Cronbach alpha value that is lower than 0.70 could be due to low number of items in the questionnaire (Tavakol & Dennick, 2011) or the small sample size (Yurgudúl, 2008). Future work with respect to this study will be to develop a more detailed questionnaire with Likert-type responses and to have structured interviews with selected students to gain a better insight to students' feedback on the SCL approaches. The developed questionnaire will be tested for validity and reliability. In addition, a larger sample size will be taken for the quantitative analysis.

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