

The Need of an Integrated Framework for the Implementation of Blended Problem-Based Learning

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Abstract

Since the performances of Malaysian students in Programme for International Student Assessment (PISA) and Trends in Mathematics and Science Study (TIMSS) are found to be lower compared to other participating countries worldwide, the importance of cultivating higher order thinking skills (HOTS) has been highlighted in the National Education Blueprint. The shift from conventional to blended learning, with the integration of face-to-face and online learning offers promising opportunities in realizing the aspirations of the National Education Blueprint. The current study is aimed to propose an integrated framework of blended problem-based learning (blended PBL) in promoting HOTS among Malaysian students. This study employed comparison constant analysis in understanding the possibilities of success of this approach in promoting HOTS. A total of 219 articles published from 2009 to 2014 were selected from: (a) SpringerLink, (b) ScienceDirect, and (c) Taylor & Francis Online. The analyses of 30 articles were carried out based on criterion set for this study in developing the integrated blended PBL framework. In short, the findings of this current study exemplified that blended PBL is effective in promoting HOTS in Malaysian context.

Keywords: problem based learning, blended problem based learning, comparison constant analysis, integrated framework of blended problem based learning

1. Introduction

The performance of Malaysia in the *Programme for International Student Assessment* (PISA) 2012 which tested the students' abilities to apply scientific knowledge in real life situation, indicated that Malaysia was still in the lower quarter; ranked 53th out of 65 countries (OECD, 2014). Similarly, in the *Trends in Mathematics and Science Study* (TIMSS) test, for Science subject, Malaysia's performance was still lower and ranked 30th out of 40 participating countries (Martin et al., 2011). In this test, most questions assessed students' higher order thinking skills (HOTS), where 65% of the questions focussed on the thinking skills of applying and reasoning, and the remaining questions were focussing on lower order thinking skills of knowing (Martin et al., 2011).

The scenario above reflects that Malaysian students are still struggling in mastering HOTS. A study by Kiong, Heong, and Jailani (2010) manifested that the majority of the Malaysian secondary students were still considered as poor in HOTS. One of the influential factors is limited exposure and practice to HOTS in current teaching and learning settings in Malaysia (Ministry of Education Malaysia, 2012). The current practice of teaching applies conventional teaching approach, which is teacher-centred classroom (Nor-Fardia et al., 2012). The major drawback of this approach is students are not actively involved in knowledge construction process. Instead, they are exposed to rote-memorization and thus, are ineffective in cultivating higher order thinking skills (Tan, 2014).

2. Background of Problem

Resnick (1987) describes higher order thinking skills (HOTS) as skills that are complex, unstructured, multi disciplinary, reflective and deal with uncertainties. In addition, Lewis and Smith (1993) explicate that HOTS require active linking of new and prerequisite knowledge, which will be further improvised as a new set of knowledge in aiding problem solving skills. The aforementioned definitions are in line with Malaysian Examination Syndicate's assertion that HOTS require active reasoning and reflection of new and prerequisite knowledge in constructing relevant ideas and solutions to a problem (Malaysian Examination Syndicate, 2013).

Consequently, to develop students' HOTS, the teaching should focus on developing four higher order skills,

which are applying, analyzing, evaluating and creating, as explained in Revised Bloom's Taxonomy (Krathwohl, 2002). These four domains require students to utilize their knowledge gained from the lower order thinking skills, which are remembering and understanding, in a different situation (Dwyer, Hogan, & Stewart, 2014).

In realizing the aspiration to inculcate HOTS among Malaysian students, the Ministry of Education Malaysia has highlighted seven initiatives to reform education system, and one of them is the revamp in teaching pedagogy in schools (Ministry of Education Malaysia, 2012). To achieve this vision, an explicit teaching of HOTS (Avargil, Herscovitz, & Dori, 2013; Barak & Dori, 2009) with real-world experiences (Lam et al., 2013; Sellar & Lingard, 2013) is found to be effective in improvising the mastery of HOTS among Malaysian students.

Problem-based learning (PBL) is a potential teaching and learning approach in improving students' HOTS. This approach employs real-world experiences with complex (Wirkala & Kuhn, 2011) and unstructured convulsion (Brownell, 2004), which has infinite solutions to a specified problem (Hmelo-Silver, 2004). It is believed that this approach encourages HOTS such as critical thinking (Rissi, 2010). In a direct contrast, the conventional teaching is geared to rote-memorization and comprehension rather than prompting the discussed problem at the beginning of the lesson as in PBL (Hung, 2009). Very differently, in PBL context, the discussed problem will lead to a conflict in students' mind that later ignite inquiry among students.

In addition, PBL necessitates students to actively participate in collaborative and self-directed learning (Yew & Schmidt, 2012) in seeking relevant information, and making responsible justification (Davies, de Graff, & Kolmos, 2011) and reflection (Hmelo-Silver, 2004) based on their findings throughout the learning process. Through the completion of the task, students will be exposed to HOTS, which will later benefit their academic performance. However, a number of research has discovered that the implementation of PBL was not effective (Kirschner, Sweller, & Clark, 2006; Koh et al., 2008) and at the same time unable to cultivate HOTS. The main contributing factor is the difficulties in implementing collaborative and self-directed learning during PBL process. As the result, students' academic performances will be affected and thus, HOTS will not be supremely achieved.

In implementing PBL in collaborative learning, students' active participation and involvement with the emphasize of the concept of interdependence in learning (Yeung, 2010), accountability (Carbonell et al., 2013) and interpersonal skills (Davies et al., 2011) are highly required in solving a problem in the teaching and learning session. Nevertheless, a robust of literature has proven that collaborative learning in PBL is less effective (Dolmans et al., 2001; Hung, 2011). The contributing factors to this condition are different learning pace, uneven contribution and poor communication skills among students. In addition, the limitations in self-directed learning have resulted the students' inability to plan their learning strategy and evaluate the learning resources (Yew & Schmidt, 2009).

Realizing the fact that PBL has a number of glitches in its implementation, the integration of technology, which is blended PBL, is potentially effective (Vardi & Ciccarelli, 2008). In this manner, the blended PBL and hybrid learning interchangeably support each other, as both approaches integrate face-to-face learning and online learning (Delialioglu & Yildirim, 2007) as the medium to cultivate HOTS (An, 2013). Most researchers similarly defined blended PBL as teaching approach that integrates face-to-face and online learning platform (Donnelly, 2013). In short, blended PBL is an enriched version of traditional PBL (face-to-face) with integration of online learning (Woltering et al., 2009).

Thus, the blended learning offers advantages in term of flexibility (Oliver & Stallings, 2014; Taylor, Francis, & Shannon, 2013), facilitation (Lau, Lam, & Zhou, 2010) and communication skills (Kashefi, Zaleha, & Yudariah, 2012). A study in the Malaysian context by Alias and Saleh (2007) has exemplified that blended or hybrid PBL is potentially effective in enhancing students' achievement and HOTS. Since the blended PBL offers practical alternatives to the traditional PBL, it is relevant to implement blended PBL in Malaysian classroom. To concern, there was limited framework that has been specifically developed for the implementation of blended PBL in fostering HOTS especially in the school context in the current body of literature. Realizing the potentials of blended PBL to improve the current PBL approach, it is relevant to purpose a framework that can address its opportunities and challenges in integrating it. It is believed that this framework will serve as a relevant reference point in developing HOTS in Malaysian classroom.

3. Methods

3.1 Research Procedure

The current study employs constant comparison analysis in developing blended PBL integrated framework. This approach offers advantages such as in: (a) understanding multiple meanings from data, (b) enabling researcher to analyse data systematically; and (c) assisting researches to construct the themes based on the retrieved data

(Strauss & Corbin, 1998). Figure 1 illustrated the steps being used in order to analyse the literature.

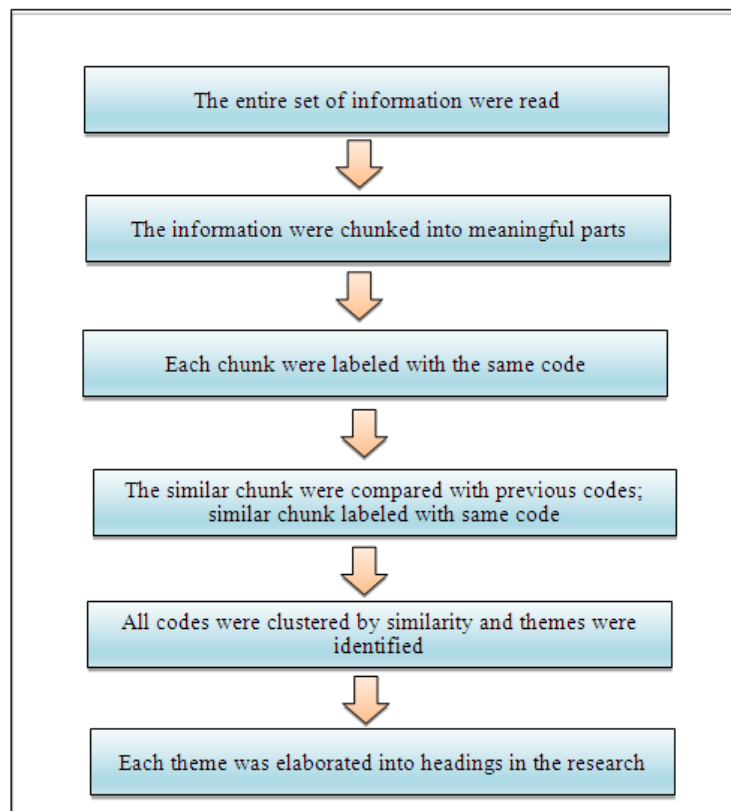


Figure 1. Adopted from Onwuegbuzie, Leech, and Collins (2012)

3.2 Sampling Procedure

The selected articles were systematically chosen from three online databases: (a) SpringerLink; (b) ScienceDirect; and (c) Taylor & Francis Online. The keywords search used were “PBL Learning Process”, “PBL online”, “Blended Learning”, “Blended PBL”, “Higher order thinking skills”. The search was also limited to empirical studies that were published in 2009 to 2014. By using these criterions, 291 articles were retrieved. Only 30 relevant articles, were reviewed based on the additional criterion such as: (a) the document presented the instructional intervention employed throughout the research exclude for review papers, (b) revealed the drawbacks of the PBL implementation; and (c) showed the benefits and the need of blended learning or blended PBL.

4. Result

In previous sections, it is established that blended PBL is potentially effective to overcome learning problems in both collaborative and self-directed learning settings. Thus, a specified framework is designed as in Figure 2.0 to represent learning process in blended PBL. Figure 2 illustrates the integration of technology in collaborative learning and self-directed learning through blended PBL in developing HOTS. Collaborative learning is conducted through online learning platform and face-to-face learning as discussed earlier. Besides, self-directed learning is directed via online learning platform with a major emphasis on facilitation in the term of scaffolding concept in enhancing students’ ability at planning and evaluating learning resources.

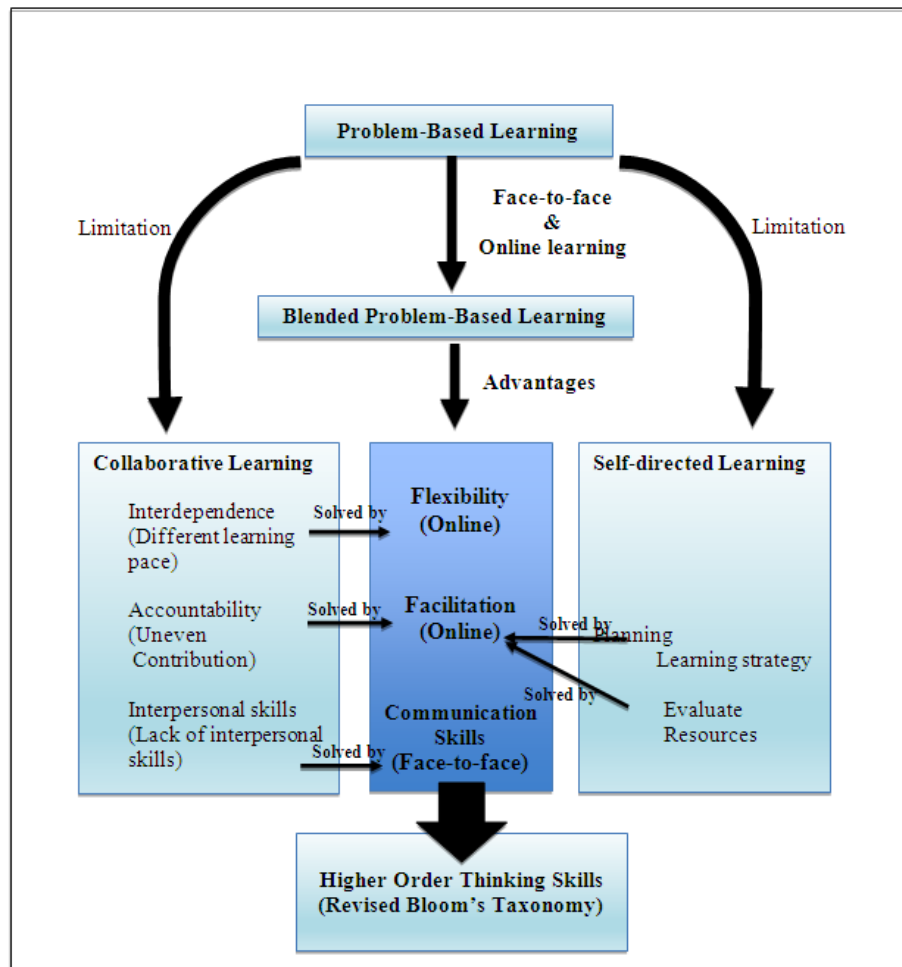


Figure 2. The integrated framework of blended problem-based learning

5. Discussion

5.1 Collaborative Learning for Blended PBL

Interdependence is one of the major concepts being emphasized in collaborative learning (Vijayaratnam, 2012). Students are mutually dependent on each other in their heterogeneous group to solve the given problem, through discussion. Typically, the different mastery level or learning pace among students is one of the major challenges in the heterogeneous group settings, and thus directly influences the development of HOTS (Ramli & Zaharatul, 2011). Due to that, the tension might arise, as the advanced students tend to predominate the discussion of the assigned tasks. This parameter renders the weak students to be passive and tend to be the 'followers' of the activity. This condition is contradictory to the concept of active learning (Nargundkar, Samaddar, & Mukhopadhyay, 2014) as proposed in PBL, and eventually hinders the acquisition of HOTS. As an alternative, blended PBL seems to be an ideal solution. Online learning in blended PBL emphasizes on the concept of flexibility which allows ample 'space' and 'freedom' to participate in the learning process (Mccall, 2010; Qiu & McDougall, 2013). Therefore, the students with poor mastery skills will have an ample time and space in understanding the content of the lesson. As the result, the development of HOTS is achievable. Vijayaratnam (2012) supported that active participation of students in learning encourages the mastery of multiple thinking skills, especially reflective thinking in learning.

On the other hand, collaborative learning process in PBL yields a problem in group's accountability in completing learning task. Shukor et al. (2014) stated that collaborative learning requires proper planning to ensure effective interaction during collaborative learning process. Uneven contribution might occur when the assigned tasks were not fully completed, limited contributions obtained during group discussion, and the difficulties to reach a consensus of the discussion (Hung, 2011). The relative contribution to the aforementioned

problems is the large classroom size and limited facilitation during the lessons (Tan & Muhammad, 2013). As the result, all students do not experience the experiential learning (Hmelo-Silver, 2004) as there might be several important learning steps skipped due to poor contribution of the group members. Therefore, the students will not achieve HOTS, which is emphasized in PBL.

Alternatively, blended PBL is practical to facilitate and monitor students' participations especially with the integration of log book as log recorder tool (Mohd et al., 2013). The logbook functions as a beneficial tool to help teachers to monitor students' progression from time to time. Indirectly, the concept of soft scaffolding can be applied, where teachers can take further actions to maximize the learning output during the PBL process. Thus, an overall and active participation is achievable, and the experiential learning can be implemented successfully.

Moreover, poor interpersonal skills might interfere the learning process in PBL classroom (Hung, 2011). The interpersonal skills are crucial to help students to actively participate in learning, and to achieve meaningful learning. Ineffective interpersonal skills are caused by lack of trust among group members, poor motivation to work together as a team and individualism among members of the group (Hung, 2011). As a solution, the asynchronous online discussion platform in blended PBL allows every member to actively participate regardless of his or her interpersonal skills and proficiency (Qiu & McDougall, 2013). By using face-to-face interaction, both students and teacher are able to observe and understand the emotion level and react accordingly. Thus, the process of developing HOTS will be more efficient as the combination of online learning and face-to-face interaction synergize blended PBL in dealing with the differences in students' interpersonal skills.

5.2 Using Self-Directed Learning for Blended Problem-Based Learning

Blended PBL, which focuses on self-directed learning offers a potential alternative in developing HOTS. Choi, Lindquist and Song (2014) proposed a positive relationship between self-directed learning and mastery of HOTS. Through the integration of self-directed learning, with or without facilitation (Maggi, 2004), students are required to analyze the learning expectations, set up learning objectives, carefully select learning sources and inputs, critically utilize appropriate learning strategies and independently analyze their learning outcomes (Knowles, 1975). Indirectly, the self-directed learning allows an ample room for students to plan, adapt and evaluate their own learning. Number of studies has exemplified that students were still struggling to utilize the self-directed learning in PBL (Malan, Ndlovu, & Engelbrecht, 2014).

A study by Yew and Schmidt (2009) found students' mastery level in evaluating resources was poor. This might be due to the fact that the students were still affected by the conventional teaching practices, where the learning resources were mostly provided by their teachers. The students might struggle to evaluate and select reliable and valid resources. However, the blended PBL offers an alternative to this condition, where the teacher can constantly facilitate students in the form of scaffolding during material selections. In self-directed learning, scaffolding will be decreased over the time, depending on their needs and ability to perform the tasks independently. For instance, teachers can provide links on the learning platform in guiding students and conditioning them to the concept of PBL. Students, on the other hand, are free to choose the information based on the suggested links. This autonomy is seen to be relevant to the concept of self-directed learning in PBL (Wijnia et al., 2014).

In addition, the concept of scaffolding allows students to plan their learning. Yew and Schmidt (2009) supported that planning their own learning is important and can be developed in PBL. This learning skill is relevant in helping students to design their learning strategies in realizing the learning objectives. In doing so, the teachers can simply provide graphic organizers in the form of worksheet on the online platform in guiding them to organize and evaluate the gathered information systematically (Choo, 2012). The teachers are also encouraged to prompt questions online based on the learning strategies and planning for fostering students to reflect and evaluate their learning (Yew & Schmidt, 2009).

6. Conclusion

In conclusion, the proposed blended PBL framework is potentially effective in dealing with drawbacks and challenges of collaborative and self-directed learning settings. The integration of online learning platform and face-to-face learning offers an ideal alternative to achieve deep learning and thus, improves the mastery of HOTS. It is hoped that the implementation of blended PBL helps to prepare and shape the current teaching and learning settings to cater the needs of 21st century learning.

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