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### **Fostering Individual Learning in Facebook Environment Associating with Learning Style**

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#### **ABSTRACT**

This study investigates the potential of individual problem-based learning, in interaction with active and reflective learning style in a social network environment to promote students' academic success in terms of recalling and retention of knowledge. Individual problem-based learning is a constructivist learning approach which is different than traditional individual learning approach which students just need to memorise all the facts that the teacher taught. Individual problem-based learning is one learning strategy that requires students to be responsible for their own learning and solve all problems by themselves. The learning style employed in this study is based on Felder-Silverman's Index of Learning Styles, which only involved one dimension: active-reflective learning style. The statistical procedures employed in the study were descriptive statistic and one-way ANOVA. Although the analysis of the data showed that there is no significant difference between the individual problem-based learning and learning style, the descriptive statistic indicated that reflective learners do benefit from this learning strategy.

*Keywords:* Individual Problem-based Learning, Learning Style, Retention

#### **1. Introduction**

The purpose of the present study was to examine individual learning in the nature of Facebook environment and explore the learning style factor that influences the individual learning achievement. It is a known fact that learning process differs from one person to another. One might prefer to learn alone than joining group activities and others might prefer group work. This scenario would often happen in a class where everyone comes from different cultural backgrounds and has different educational experiences. However, teachers only teach the way according what they have learned (Sitt-Gohdes, 2001), and most of the time, the objectivist method is often used in school especially in Malaysia (Kong, 2006; Tan & Mohd Yusof, 2013). The mundane routine might have caused frustration of certain number of students and thus, the lack of interest in learning. Since the teaching method is more to "chalk and talk", the learning process has become more to individual learning.

Individual learning is known to be a lifelong process (Smolarczyk & Hauer, 2014) and in a behaviourist teaching manner, most students are likely to learn on their own. However, individual learning could also be in constructivist manner if the teaching approaches were problem-based approaches. Problem-based learning (PBL) has been known for its practicality and experiential learning as students learn by solving problem on their own (Barrows & Tamblyn, 1980); thus, make them more responsible for their learning (Hmelo-Silver, 2004). In this study, the focus is on individual problem-based learning (iPBL), matching with students' learning style based on one of the dimensions in Felder & Silverman (1988)'s Index of Learning Styles, i.e. active-reflective learning style in a social network environment.

One of the most important school's aim and also the student's aim is to achieve academic success. If student could afford to remember or retain knowledge they have learned, it would be easier for them to achieve better results in the public examination which is always at the end of their semester or final year of their schooling. In Malaysia, the final public examination is known as *Sijil Pelajaran Malaysia (SPM)* which is in the final year of their high school. Retention of what they have learned in the previous year is very crucial as the examination also test on previous year syllabus. In most of the school settings, the culture of learning is still oriented towards individualistic approach (Johnson, Johnson & Smith, 1998). According to Boud & Felletti (1991), PBL approaches help students to retain their knowledge longer than students in the traditional class. Therefore, the benefits of the combination of individual learning and problem-based learning must be explored to see how it would help students to retain more knowledge.

## 2. Problem-based Learning and Learning Style in FB environment

Problem-based learning is often categorised as student-centred approach which learning is provoked by oneself or in group. In many studies, one of the emphasized characteristic of PBL is bias towards collaborative learning (Barrow, 1996; de Gallow, 2003; Hmelo-Silver, 2004). In PBL, students work in groups to identify their problems and then engage in self-directed learning (SDL). Eventually they would come in group to present their newly gained knowledge and solve the problem together (Barrows, 2000; Hmelo-Silver, 2004; Torp & Sage, 2002). In most PBL literature, the term SDL is widely used (Loyens, Magda & Rikers, 2008). Foo & Raja Maznah (2010) defined SDL as learner's ability to manage his or her own learning process. But Knowles (1975) illustrated SDL as a process where individual goes through the learning process, with or without the help from others. Knowles (1990) further explained that learning does not occur in isolation but involves others such as teachers, peers and tutors. Therefore, the term "self" in SDL is very ambiguous. The reason iPBL term is used in this study, is to avoid the misconception of SDL and focus more on individual concept, which brings out the meaning of "without the help of others" when it comes to learning. Figure 1 and Figure 2 shows the difference between SDL process and iPBL process.

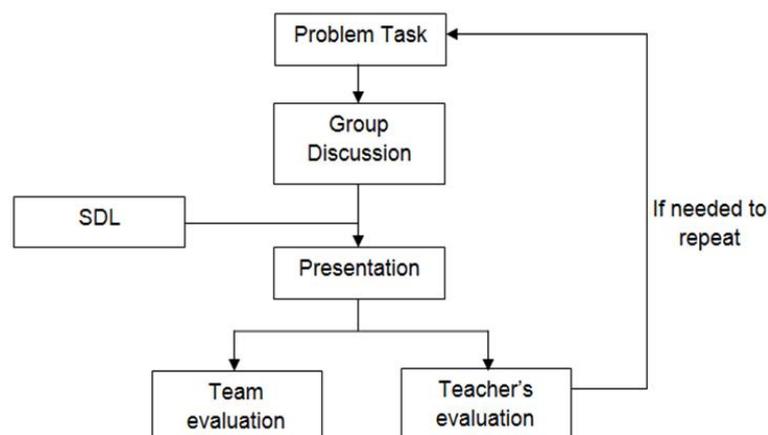
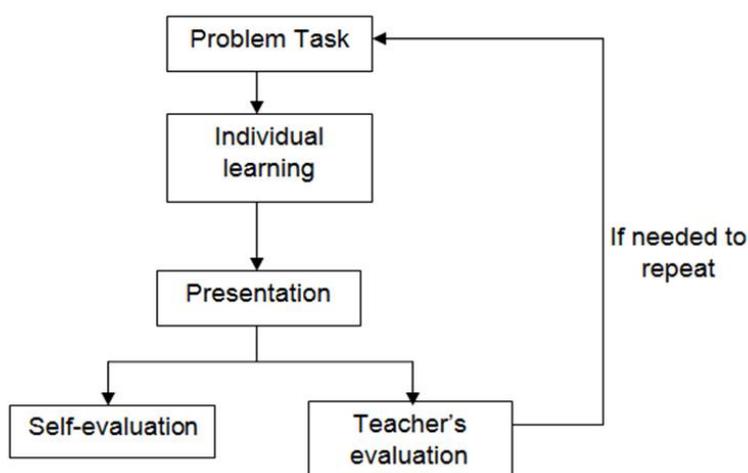


Figure 1: The SDL flowchart (Loyen et al., 2008)



**Figure 2: The proposed iPBL flowchart**

The main difference between SDL flowchart and iPBL flowchart is that, iPBL process starts from defining the problem by oneself whereas SDL flowchart shows the students have to gather to define the problem task and then seek information individually to solve the problem. In iPBL, we can define the term as one-man problem-solving method because only one individual is involved throughout the learning process. The individual learning in the chart refers to getting information from online resources, self-analysing the content to apply to the problem without consulting peers or any person.

One assumption is made during this study. iPBL could be easily matched with students' learning style, as the learning process is fully the individual's responsibility. Therefore, whatever the student's learning preference is, iPBL could be the learning strategy that support and enhance learning. Taber (2000) asserted that learning is effective when students are aware of their study habit. Therefore, letting students to know their learning style is essential and it is also crucial for teachers to understand their students' learning style in order to create a meaningful instructional content to accommodate the students' need. Felder (1996) suggested a good learning style model is a balance of all dimensions being used to meet the required learning needs of all students in a class. Felder & Soloman (1998) formulated a learning style model based on Felder & Silverman's Index of Learning Style (ILS), of which consisted of four dimensions of learning styles: active-reflective, sequential-global, visual-verbal and sensing-intuitive. Felder & Spurlin (2005) mentioned that learning style model is used as a guideline for instructors or teachers to create a balanced course instruction and it is not an instrument to predict students' academic performance or capabilities. In this study, only one dimension of the ILS is used, which is the active-reflective learning style. Felder & Silverman (1988) categorised active learner as one who prefers to work in group and reflective learner as one who prefers to work alone. In ILS, students' preference for one pole of a given dimension could be mild, moderate or strong. Therefore, some students might be active learners in one situation and reflective learners in another situation. Mohd Jafre, Abbas, Helan & Kiranjit Kaur (2011) found that in Malaysia, most students possessed multiple learning styles. Hence, in this study, only students with strong preference of the one pole would be chosen.

Nowadays, Facebook (FB) has been gaining popularity and most of the FB users are frequently login on a daily basis to maintain their social connections (Ellison, Steinfield & Lampe, 2007). Solvie & Kloek (2007) supported the idea that social network could actually

be used to engage students with different learning styles in a constructivist environment and Miller (2002) also noted that it is the role of the teacher to design an instructional content within the social network context to encourage student's individual learning in a constructivist environment. While people may think that social network site encourages social interaction, there are many studies that find social network also encourages social isolation (Marche, 2012; Turkle, 2011). Ross, Orr, Sisic, Arseneault, Simmering & Orr (2009) conducted a study that shows student's personality characteristics should be taken into consideration when using social network sites. Amichai-Hamburger, Wainpel & Fox (2002) categorised personality characteristics into introvert and extrovert. An extrovert is a person who prefers company and work in group whereas an introvert is a quiet, reflective person who does not enjoy large social events and prefers to be alone (Eysenck & Eysenck, 1975). Similarly, these characteristics are coincided with the active-reflective learning style in this study. Ross et. al. (2009) reported that introverts are more comfortable using the social network whereas extroverts can adapt to both online and offline. Hence, the assumption that iPBL strategy in social network could be better for reflective learners than active learners.

### 3. Problem Statement

Constructivist teaching is seldom practised in Malaysia due to time constraint (Koo, 2008) and heavy workload (Koh, 2004; Lim & Hwa, 2007). Likewise, learning styles too have not been stressed in the local educational setting (Mohd Jafre et al., 2011). In short, the teachers do not factor in students' learning preference when they create the instructional content. This scenario eventually leads to the failure of the teachers to promote students' achievement (Mohd Jafre et al., 2011). Problem-based learning is an approach that Malaysian Ministry of Education has been trying to impose in the teaching and learning of sciences and mathematics since 2003. However, during preliminary investigation, some teachers commented that the constructivist teaching strategy as very ideal, but inapplicable as they need to finish the syllabus on time to prepare students for the public examination. Besides, the objectivist teaching method has been reducing the students' interest to learn, especially when students are confined in a school surrounding. Learning environment should not be in school compound only but places where students find comforting. In Malaysia, the 2013 Industry Performance Report published by the Malaysian Communications and Multimedia Commission (MCMC) mentioned that 15.6 million Malaysians are active Facebook users ([www.themalaysianinsider.com](http://www.themalaysianinsider.com), 2014). These social network technologies can be used as a tool to bridge the gap between teachers and students in order to enhance teaching and promote learning. Nielsen (2010) also showed that one of the most likely places that students are spending their time is on FB. Therefore, FB could be seen as a constitution of a powerful information resource for education. However, in Malaysian schools, FB has become a blocked site for students, as the social network site is viewed as a distraction from class work and preventing students to concentrate on their learning. So, this study hopes to find ways to make use of the popular social network site to promote learning and motivate students to learn on their own or at their own pace.

### 4. Methodology

This study was conducted in two national secondary schools in Malaysia. The two schools chosen for this study were similar in terms of academic achievement and school culture. There were 65 Form Four Science stream students participated in this study. Chemical Formulae and Equation chapter in Chemistry is chosen as one particular topic to be studied because Chemistry has been seen as a complicated and complex subject by students (Muth &

Guzman, 2000) and the mole concept has long been termed as “incomprehensible” to most of the students (Friedel & Maloney, 1992). At the first stage, students were given a demographic questionnaire to investigate the frequency of using social network and they were to complete the Felder & Soloman’s ILS questionnaire to identify their learning style. Students were also given pre-test as a baseline test to find out their homogeneity of students’ achievement in Chemistry. At the second stage, students were asked to create a new FB account without adding anyone except their Chemistry teacher as their friend. This was to ensure students’ privacy was under controlled and students would have to do their assignment on their own without any help from friends. All instructional contents involving the Chemical Formulae and Equation topic were uploaded in the FB. Students were to learn those instructional materials on their own with minimal guidance from teacher. Assignments in the FB would be evaluated by their teacher once the students had finished. From the evaluation of the assignment, the teacher could easily identify if the students did their work on their own or got help from others. The topic would not be taught in school as a control for the study. Hence, students could only go through the chapter in FB. After finishing that chapter, a post-test was administered. Then, one month later, those students had to sit for the retention test. The results of all the tests are compiled into a table using descriptive statistic and ANOVA.

### 5. Analysis of Data and Discussion

After all the questionnaire and test scores were collected, the data was analysed by using descriptive statistic and one-way analysis of variance (ANOVA). Firstly, the students were divided according to their learning style based on the ILS questionnaire. Secondly, ANOVA was conducted to ensure that the equivalence of the students for the learning style groups in terms of prior knowledge. Pre-test as a baseline test was analysed as shown in Table 1.

Table 1: ANOVA of pre-test scores by learning style

		<b>Sum of Squares</b>	<b>df</b>	<b>Mean Square</b>	<b>F</b>	<b>Sig.</b>
Pre-test	Between groups	40.132	1	40.132	.265	.609
	Within groups	9557.652	63	151.709		
	Total	9597.785	64			

Table 1 shows that there was no significant difference in terms of prior knowledge between active learners and reflective learners ( $F = 0.265$ ,  $p = 0.609$ ). Thus, it can be concluded that the students from the two groups (active-reflective) were homogenous in terms of their prior knowledge.

Table 2 presents the means and standard deviations of all the test scores for the iPBL treatment towards active-reflective learners. The results show that out of the 65 participants, 53.8% were active learners and 46.4% were reflective learners.

Table 2: Means and Standard Deviations of the pre-test, post-test and retention test

<b>Treatment Group</b>		<b>Pre-test</b>	<b>Post-test</b>	<b>Retention</b>
Active	N	35	35	35
	M	65.54	73.40	71.51
	SD	11.991	10.645	11.179
Reflective	N	30	30	30
	M	63.97	78.57	78.93
	SD	12.689	11.398	11.730

As shown in Table 2, active learners displayed slightly better mean score than reflective learners in the pre-test (Active:  $M = 65.54$ ,  $SD = 11.991$ ; Reflective:  $M = 63.97$ ;  $SD = 12.689$ ). However, in the post-test, reflective learners ( $M = 78.57$ ,  $SD = 11.398$ ) achieved better results than active learners ( $M = 73.40$ ;  $SD = 10.645$ ) and in the retention test, the performance of reflective learners was still ahead of active learners (Active:  $M = 71.51$ ,  $SD = 11.179$ ; Reflective:  $M = 78.93$ ,  $SD = 11.730$ ). Hence, by first looking at the descriptive statistic results, we can hold the view that iPBL probably might be a good learning strategy for those reflective learners, as they are able to perform better in the post-test and also able to remember or retain information better than active learners. To further examine the effectiveness of the learning strategy towards learning style, a one-way between subjects ANOVA was conducted to compare the significance for the effect of iPBL strategy on the achievement of active-reflective learners as illustrated in Table 3.

Table 3: ANOVA on the effects of iPBL strategy towards active-reflective learners

		<b>Sum of Squares</b>	<b>df</b>	<b>Mean Square</b>	<b>F</b>	<b>Sig.</b>
Post-test	Between Groups	431.218	1	431.218	3.565	.064
	Within Groups	7619.767	63	120.949		
	Total	8050.985	64			
Retention	Between Groups	889.144	1	889.144	6.799	.011
	Within Groups	8238.610	63	130.772		
	Total	9127.754	64			

Based on the Table 3, there was no significant effect of iPBL strategy on post-test [ $F(1, 63) = 3.565$ ,  $p = 0.064$ ], but the results for retention test [ $F(1, 63) = 6.799$ ,  $p = 0.011$ ] revealed a significant difference between active learners and reflective learners. These results suggest that iPBL might not have any impact on the achievement in a short term period, but in long term, iPBL strategy has more contribution in retention of knowledge. This result is consistent with the findings by Kirschner, Paas & Kirschner (2009). Kirschner et al. (2009) affirmed that individual learning is superior to group learning when it comes to retention. Furthermore, in a PBL environment where learners were given the responsibility of their own learning process, they are physically and mentally interacting with the instructional contents and manipulating to suit their personal preferences which would lead to successful retention of the information.

By looking at the means and standard deviations of post-test and retention test, it should be noted that reflective learners did show much more improvement than active learners. At the beginning, active learners have higher score in the pre-test than reflective learners, however, the post-test and retention mean score showed that reflective learners have performed better than active learners. The findings here indicated that iPBL strategy resulted better in reflective learners. This finding is also supported by Felder (1996) which stated that reflective learners function effectively and introspectively in an individual environment. Even though FB, as a well-known social network, is used as a teaching and learning platform, the "social" term here did not really encourage social interaction. On the other hand, FB could be seen as a comfort space for those who are introverts to learn better (Amichai-Hamburger, Wainpel & Fox, 2002). Most of the time, introverts are likely to be reflective learners. Ross et al. (2009) reported that introverts are more motivated to use FB to interact with others than in the real world. Therefore, iPBL strategy could possibly work well in the social network environment. In short, the results are consistent with the earlier assumption in this study.

## 6. Conclusion

One conclusion we can make is that time could tell how well the learning strategy could improve students' memory. In this study, the quantitative results showed that the use of iPBL had a positive effect on active and reflective learners. Although by comparing the descriptive statistics between active learners and reflective learners, whereby reflective learners showed more improvement than active learners, active learners were still in a positive gain score mode in the post-test. Nevertheless, the reflective learners are more capable of remembering the information than the active learner which is shown in the retention test's mean score with the help of iPBL strategy. Kirschner et al. (2009) ascertained that individual learning is much better than group learning when the performance is measured on retention problems. Thus, we can conclude that individual learning, especially in PBL environment, does promote retention in this study.

In summary, this study showed that individual problem-based learning benefits the reflective learners more than active learners in learning and retaining knowledge. Also, social network site like Facebook does help reflective learners as they could study comfortably behind the computer without having to communicate face-to-face with others, which could make them feel uneasy and distracted.

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