

The Overview of Problem Solving Skill through Online Social Networking Platform

Diyana Jamari¹

annanadzri@gmail.com¹

Department of Educational Sciences, Mathematics and Creative Multimedia, Faculty of Education, Universiti Teknologi Malaysia, Malaysia

Norasykin Mohd Zaid², Hasnah Mohammed³, Zaleha Abdullah⁴, Baharuddin Aris⁵
norasykin@utm.my², m-hasnah@utm.my³, zac@utm.my⁴, bba@utm.my⁵

Department of Educational Sciences, Mathematics and Creative Multimedia, Faculty of Education, Universiti Teknologi Malaysia, Malaysia^{2,3,4,5}

Abstract

Problem-solving skill is one of the 21st century skills needed by students to be competitive in the future working world. However, international assessment results have shown Malaysian students are still weak in problem solving and many graduates face problems securing a job due to a lack of problem-solving skill which is highly sought after by industries. Although problem-solving skills can be learned, enhanced, studied and mastered, these skills are still not sufficiently exposed and trained to students at the moment. Realizing the huge potential of social networking sites (SNS) that may serve as a promising learning platform, this paper discusses the potential of using Facebook as an informal alternative learning tool to enhance problem-solving skills among school students. The popularity and familiarity of Facebook may attract students to participate actively in discussions and encourage peer collaborations in online social problem solving environment; hence, helping to improve students' problem-solving skill.

Keywords: Problem solving, Facebook, Social Networking Site, Social Media

1.0 Introduction

Education transformation towards 21st century learning emphasizes on producing students with critical, creative and innovative thinking as well as proficient in solving problems (Tan & Ng, 2012; Evren *et al.*, 2012). Ministry of Higher Education has listed problem-solving skill as one of seven generic skills need to be mastered by students during their years in the university before going into the working world (Kuldass *et al.*, 2015; Shakir, 2009). Individual competence and credibility will not only be determine based on education achievement but also on the ability of their problem-solving skill as independent employee (Osman, 2010). However, the scenario in school setting is different. The core of student's performance assessment focuses mainly on the intellectual aspect while less account noted on the growth and development of other skills or potentials (Ali, 2008). Aware of the problems related to exam-oriented practice that emphasized on student good grades, major reorganization of primary and secondary school education was executed. Now grading system is no longer focused solely on achievement. The launched of Malaysia Education Blueprint 2013-2025 (PPPM) rationalized that students must not only be knowledgeable but also to master the skills that will enable them to compete in the future (Ministry of Education, 2012). This is in line with Learning In the 21st century framework that list problem-solving skill as one of the skills, needed to survive and successful in modern working world (Ramos *et al.*, 2013; Greiff *et al.*, 2014).

A study conducted in the United states assessing problem-solving skill among the candidates in job interviews found that these graduated candidates were still lacking in problem-solving skill and they seems unprepared to start a career (Minners, 2012). The same

scenario was seen in Malaysia and has been reported by the local researchers (Kuldas *et al.*, 2015; Shakir, 2009). Despite knowing the importance of problem-solving skill, it is still inadequately trained to students even at the tertiary level, while less exposure during school years has caused skill performance to decrease below the targeted proficiency level (Kuldas *et al.*, 2015). Latest Programme for International Student Assessment, PISA result on problem-solving skill domain has become an eye opener as Malaysian students found less competent in problem-solving and ranked below the average score of OECD standard. (Organisation for Economic Cooperation and Development, 2014). Therefore, there is a need to inculcate problem-solving skill in the early age.

Students' low competency of problem-solving skill is largely attributed to cumulative years of rote learning strategy (Gotwals & Songer, 2013; Shakir, 2009) which is inadequate to stimulate students' thinking thus, failed to develop analytical skill and inquisitive mind. Years of teacher-centric approach and exam oriented mode in school has created a personal trait that will be hard to undo during their four years of tertiary education (Shakir, 2009). This teaching approach usually occur in one way communication, lack of student peer interaction, less focus given to skill development and only cater to lower elements in revised Bloom Taxonomy (to memorize, to understand, and to apply) (Krathwohl, 2002). Memorizing facts for the sake of exam has become a norm and this memory end up being a short term memory as it happen in a less meaningful way (Hanapi & Nordin, 2014; Umar, 2011). Although high order thinking skills (HOTS which includes problem-solving) are laid across the curriculum, it is often synonymously related with calculation subject such as Mathematics and Physics. Unaware of the presence of problem-solving in other subject, students did not know the use of this skill is actually beyond school context and can be extended to solve everyday life problem. Despite of being presented in multiple different way, characteristics of problems and steps to solve the problem remains the same.

2.0 Problem and Problem Solving

There are many definition regarding the word problem. It can be defined as a matter that prevent a person to achieve goal for which there are no clear rules or routine to solve or complete it (Mayer, 2003). Kantowski (1980) identify problem as a condition confronted by individual and known idea will not guarantee a solution as relevant knowledge need to be applied or manipulate to solve the problem. Jonassens' (2004) idea on problem definition was the entity between a goal state and a current state. Thus, it can be understand that problem lies between present or current conditions aiming to reach goal or wanted future state. Even though with the absence of specific solutions, knowledge or idea can be manipulated and applied to reach that aim.

As for problem-solving, Economic Co-operation and Development, OECD (2014) define problem-solving as the capacity of individuals to engage in cognitive processes, to understand and solve problems based on situations that have no clear solutions. This is in line with Polyas' (1973) problem-solving definition which is to find an unknown way out of a difficulty or to overcome the obstacle. This definition then refine by Anderson (1980) by adding sequence of cognitive operations that help to direct the process to reach goal.

Problem differs in terms of its form or appearance, knowledge needed to uncover the solution, and the processes involved to solve them. Based on these characteristics, Jonassen (2004) has listed four type of problem in terms of: structuredness, complexity, dynamicity, and domain specificity or abstractness (Table 1). Problem can be stated in two categories, namely in the form of ill-defined or well defined (Hardin, 2003). The term well-defined and ill-defined problem are used interchangeably with routine and non-routine problem. A well-defined problem are characterized having one specific goal or answer to achieve with limited number of steps to solve it. In contrast with ill-defined problem, the later type of problem is expressed

in complex form often have more than one solution. The difference between this two is based on the complexity and cognitive levels needed to solve it. Complex ill-defined problems involve more cognitive operations than simpler ones (Jonassen, 2004).

Table 1 Problem Structures

Problem variation	Descriptions
Structuredness	<u>Well-structured/ well defined/routine/simple</u>
<ul style="list-style-type: none"> • in terms of structured or form 	<ul style="list-style-type: none"> • application of a limited and known concepts, rules, and principles • well-defined initial state, a known goal state or solution • elements of the problem presented • knowable, comprehensible solutions • solved in schools and universities
	<u>Ill-structured/ ill defined/wicked problem/non routine/complex</u>
	<ul style="list-style-type: none"> • encounter every day and in professional practice • solutions are neither predictable nor convergent • interdisciplinary, concepts and principles from a multiple domain. • possess aspects that are unknown with possess multiple solutions or methods or often no solutions at all • require learners to make judgments and express personal opinions or beliefs about the problem
Complexity	<u>Simple</u>
<ul style="list-style-type: none"> • degree of connectivity, of number of functions, or variables involved 	<ul style="list-style-type: none"> • factors are stable over time
	<u>Complex</u>
	<ul style="list-style-type: none"> • task environment and its factors change over time • the solver must continuously adapt his or her understanding of the problem while searching for new solutions, because the old solutions may no longer be viable
Dynamicity	<u>Static</u>
	<ul style="list-style-type: none"> • the factors are stable over time • usually well-structured
	<u>Dynamic</u>
	<ul style="list-style-type: none"> • task environment and its factors change over time • complex problems , ill-structured
Domain (Context) Specificity/ Abstractness	<ul style="list-style-type: none"> • rely on cognitive operations specific to that domain • learn through the development of pragmatic reasoning rather than results from solving that kind of problem

Complex thought processes often involve abstract content. Students need to apply the knowledge into new situations and be able to use their new skills to develop knowledge, create new products or ideas and then assess the quality of their thinking. An ill-defined problem usually presented in open ended, complex and abstract manner compared to a well-defined problem. Therefore, HOTS and a little bit of creativity might be required to solve it (Anderson & Krathwohl, 2001). In the revised Bloom Taxonomy, to memorize, to understand, and to apply are categorized as low thinking skill while analyzing, evaluating and creating categorized as higher order thinking skills (HOTS) (Krathwohl, 2002). HOTS is required in the process of solving a problem because it act as basic skills that contributes to analytical thinking which includes thinking critically and logically (Jonassen, 2004). Critical thinking includes the ability

to make comparison, understanding equation, capability to make judgments and decisions based on specific justifications that forms a logical framework to bridge gap between the odds and the probabilities that are relevant in the process of solving problems (Anderson & Krathwohl, 2001). Creativity too play a role in solving problems as the divergence of creative thinking helps to imagine a range of ideas in searching of possible solution (Anderson & Krathwohl, 2001). After all, problem solving is to make sense of the problem, and to come up with the most appropriate solution after reasoning and judging process of the problem situation and its surrounding. Well-defined problem are often closed ended, involves facts, does not require creativity to solve or deep thought because the answer is fixed and specific (Jonassen, 2004).

Different scenarios seen in school as learning were categorized according to the hierarchy right from simple to complex stage with less emphasis on the formation of critical thinking and problem solving skills (Zohar & Dori, 2003). Teaching and learning process that gives too much focus on dense learning contents and only expose to closed ended routine problems will not help to increase students' thinking ability (Shute & Wang, 2015). Open ended questions were less practiced in teaching and learning than low and medium level routines questions that are often repeated in class as these two has the most similarities with the exam format (Johari *et al.*, 2014). This has resulted students' to memorize and do drill practice to ensure maximum correct answers compared to the option to analyze and synthesize of what is being learned during the exam (Hanapi & Nordin, 2014; Umar, 2011).

Low and medium level questions are not helping to develop problem-solving skills in students (Johari *et al.*, 2014). In the examinations, open ended section of the paper represent complex, non-routine, ill-defined problems. It has multiple logic solutions that should be easy for the students to answers however, low quality and less critical answers was observed. This indirectly portray student weakness in thinking skills (Malaysian Examination Syndicate, 2014). Students' poor understanding on subject matter has reduced their ability to think critically and this inhibit them give good logical answers (Hanapi & Nordin, 2014). Problems that people encounter in life is in the form of ill-structured but matter content that is being taught at every level of schooling years are well-structured problems (Jonassen, 2004). If this learning pattern continues, there is doubt that students will not able to apply or manipulate the knowledge they learnt to solve problem in the context of everyday life. Therefore, different teaching approach or strategy need to be employ in order to help the student practise their thinking and at the same time improve their problem-solving ability.

3.0 Teaching of Problem Solving Skill

Skill cannot be built in a short period (Noor Azean *et al.*, 2006). No age limit or growth development phase identified to be the most appropriate time for students to start learning thinking skills and problem solving (Silva, 2009). Thus, the idea that mentioned students should be taught simple facts and procedure before exposed to critical thinking and problem solving are no longer relevant (Silva, 2009). As problem-solving skill are not well planned and explicitly taught in class, students learn these skills indirectly through teaching and learning of other subject and activities in schools. It is assumed that by giving some exposure of these skills during learning, student will be able to form and develop problem solving skills on their own in line with their increasing age (Mayer & Wittrock, 2006). However, this assumption is partially inaccurate because problem-solving skills is a skill that need be learned, improved, assessed and controlled (Greiff *et al.*, 2014). Different cognitive skills are required to solve well-structured than ill-structured problems (Jonassen, 2004). Thus, approach used to teach certain type of problems may not be appropriate and effective for other problems due to its characteristics. Jonassen (2004) in his book mentioned that maybe some very ill-structured problems cannot be taught at all as it need to be experienced and dealt with using general

intelligence and world knowledge. Learning and acquiring of skill requires proactive involvement of students in classes, co-curricular and various informal activities (Noor Azean *et al.*, 2006). Therefore, passive teaching and learning environment is uncondusive and insufficient to produce educational practices that help to inculcate or improve problem-solving skill.

Based on constructivist theory, students will adjust new information with the existing knowledge in order to create new knowledge through active student-centered involvement while teacher act as a facilitator during the process. Vygotsky's Social development theory of constructivism stipulates that learning takes place in the presence of social interaction which will help the students to achieve or accomplished learning with the assistance of more knowledgeable individual who can be a teacher, a friend or the computer in a phase called zone of proximal development (ZPD) (Wang, 2015). Thus, teaching and learning activities began to shift from teacher-centered to student-centered approach which involves more interaction in active and collaborative manner (Kivunja, 2014). This kind of approach is suggested for inculcating problem solving skill (Aka *et al.*, 2010) as students are given space for open discussion, chance to communicate and to voice their opinions, flexibility to move around to do activities within the group and to be responsible for their own learning. These theory has been the basic for quite a number of teaching strategy and activities that can be practice to help enhance problem-solving skills. Example of a few learning strategies are problem-based learning (PBL), project-based learning (PrBL), collaborative problem solving, case studies (Kivunja, 2014).

Previous studies proved these problem based strategies yield good promising result in improving problem-solving skill among the students. Sivakkumar and Muhammad Sukri (2014) states that teaching quality and appropriate time provision are the factors that influence effective teaching. Teaching quality refers to teacher's ability to use clear and understandable language, systematic presentation, and relevant examples including good teaching material that helps to explain a concept or skill in a way that can be easily understood, repeated and practiced by students. Most of these teaching strategy applies open ended structure problem in an authentic real life situations to solve non-routine problem. The ability to solve non-routine and open ended form of problems will potentially boost students' confidence to solve real life cases and scenarios (Kivunja, 2014) because the same criteria exist between those two (Douglas *et al.*, 2012). This will give insights to the students on how the problem exists in the context of everyday life. However, most of it were applied in classroom setting within formal learning activities in school.

Teachers' initiatives to improve their teaching by adopting new teaching strategy and new technology available are expected as technology is one of the elements mentioned in the 21st Century Learning framework (Greiff *et al.*, 2014). Integration of suitable online technology to cater the needs and preference of the student will be able to help teachers to deliver their teaching effectively. Student will be attracted and motivated to take part in the activities planned. Previous online medium studies involving problem-solving skill and activities were e-learning, online forum, blog and social networking site (Noor Hidayah & Zaidatun, 2014). Just like classroom learning, online learning too involves psychological processes such as thinking, remembering, interpreting and problem-solving (Castle & McGuire, 2010). Therefore, online learning able to meet both requirements of quality and time as specified by Sivakkumar and Muhammad Sukri (2014) in providing effective teaching.

4.0 Online Platform to Inculcate Problem-Solving Skill

The emerging of internet technology plays a big role by providing opportunities to increase the utilisation of technological tools in education. One of it is learning activity via online platform. With the advent of internet, classroom activities which is previously restricted

formally within school walls now can be done online freely through multiple online platforms. The difference is only in terms of online learning affordance regarding space and time. Online learning become more flexible as it can occur at any time with or without teacher appearance in a more subtle informal manner. This method is increasingly popular and has widespread particularly among students in higher education institutions. Collaboration among peers will encourage students to share ideas, voice out their opinions and to justify reasons (Shahizah & Zaidatun, 2014). Thus, the application of online discussion activities helps to improve problem-solving skills as well as critical thinking in informal learning environment. The same process will occur whether it is done face to face or via online so consideration should be given to explore the opportunity and possibility of the internet to promote learning at any time in any day. However, it still requires planning to avoid deviation from the original purpose. Student-centered online learning concept was known to shape the student to become responsible learner, aid in fostering communication skill and proactive attitude, groom students to become independent thinker as well as helps to educate the students regarding ethics and integrity in the process of learning (Rafiza, 2013).

Social interaction and engagement does contribute to ensure the occurrence of learning activities as learning does not happen on its own all the time regardless in online or face to face instruction (Kamaruzzaman & Rouhullah, 2009). Problem-solving is a skill that can be taught with methods that practise active student-centered approach (Aka *et al.*, 2010) thus, online discussion can be an effective platform for teachers or peers who are expert to scaffold those who needs help in completing assignments or to solve task problem given (Shahizah & Zaidatun, 2014). This is aligned with Vygotskys' Social Constructivism Theory (Wang, 2015). Online discussion and scaffolding activities can be more interactive and lively as students are not constrained by the structure of formal education. Flexible environment provides opportunity for students to gain knowledge. Student is unaware that they themselves become part of an active learning process due to or multilateral communication online compared to the rigid structure of passive one-way communication that usually occurs in traditional classroom. Social support that goes hand in hand with the activities and interactions will reduce negative elements that interfere with learning. Criticism and argument were accepted positively and seen as part of discussion in learning process (Gillet *et al.*, 2008).

With the rise of internet, increase number of students found preference to information and communication technologies as learning tools outside of school. Online social media platform has the potential to be use as tool in informal learning environment to enhance problem solving skill. Informal learning also known as occasional learning is a spontaneous form of learning (Erjavec, 2013) that act as a supplementary to formal class teaching in school. This platform enables students to stay connected and continue communicate and learn at any time despite being in different location. Thus, applying social media in the formal academic context within informal setting will surely attract the students' participation to interact. At the same time this will generate excitement and boost their motivation to actively involve as their preferred mediator is being used as the communication tool (Erjavec, 2013).

A survey conducted by Rafuel Agency Digital Millennial Teen Explorer on 684 teenagers aged 16-19 years found Facebook, YouTube, Twitter and Instagram are the most frequently used (Hutchinson, 2015; Robinson, 2015). These teenagers spent longer time chatting, updating status and uploading pictures in these media while online. Table 2 below shows the differences between all four media. Based on the differences in Table 2 and the survey findings reported (Hutchinson, 2015), Facebook status can be written in a long post compared to Twitter that is limited to 140 characters per post. These limitations has cause to choose the words wisely so understandable post can be convey to the reader. This feature shows Twitter is suitable for disseminating information compared to a discussion platform. Instagram less suitable and difficult to be manipulated for learning purpose. Image and video displays in

Instagram and YouTube are much related to visual aspect, thus best suited to promoting goods for the purposes of online business and how-to videos. Both Facebook and Twitter able to display link to a website or other media however, this feature is not possible within Instagram. This is important because students might need to share information from other page or website for reference during discussion and the use of hashtag is seem inadequate and appropriate in this matter. Therefore, Facebook considered to have the potential to be use in learning compared to YouTube, Twitter and Instagram. Facebook offer good platform for academic discussion plus it can be done in a special group separately. Users are not required to be in each other friend lists to be in the same group for specific purpose. This help to inhibit unwanted personal conflict, thus able to serve longer engagement span to its user.

Table 2 Differences of social media preferred by the teenagers

	Facebook	YouTube	Twitter	Instagram
Type	Social networking website	Video sharing	Microblogging	Image sharing apps
share	Text, images, links, video, audio and chats.	Video	Text, links	Image and video
Text limit	Long posts	Medium posts	Short posts	Medium
Engagement span	Longer	Longer	Shorter	Shorter
Benefits	<ul style="list-style-type: none"> • user friendly • good platform for storytelling and long conversations. • sharing of information • chatting apps • mobile • finding old lost contact friend or relative • business • entertainment 	<ul style="list-style-type: none"> • ease of use • unlimited video can be uploaded in most format • embed videos on websites, blogs • allows viewers to provide comments • wide variety of videos • mobile 	<ul style="list-style-type: none"> • great for grabbing people's attention and share quick thoughts • generate traffic to your website and blog • mobile 	<ul style="list-style-type: none"> • good for people who don't need a full blog to publish lengthy posts • to publish quick multimedia posts • unlimited number of followers • can be link to other media • interacting • business • mobile
Downsides	<ul style="list-style-type: none"> • potentially addictive • hampering productivity • exposed to malware, viruses and identity theft • antisocial behaviour 	<ul style="list-style-type: none"> • inappropriate video • large bandwidth needed that cause slow internet connection • copyright infringement issues 	<ul style="list-style-type: none"> • difficult to build relationships with followers • need enticing content as people normally scrolling through quickly and only clicking the 	<ul style="list-style-type: none"> • incompatible with Windows mobile , BlackBerry or Linux user • users' privacy and security issues wasting time on it. • use to spy on others

- place a strain on relationships

ones that stand out the most.

- user's privacy and security issues

5.0 Facebook as Teaching and Learning Tool

Facebook is a social networking site that allows its user to use their personal profile to share personal information, pictures and video with the other user online. It is also used for communicating, trace and connect with old and new friends, sharing news, dissemination of information, play online games and to create or be a member of certain group. Generally, communication occurs through private messages, chatting, and tagging names on pictures or by leaving a message on a friend's profile wall. Compared to other similar social networking site, Facebook is more popular among those between 18 to 25 years, whom is likely to be a student in tertiary education (Petrović, 2012). Studies conducted in the US and UK found that more than 90% of the students in this category do have at least one Facebook account (Hew, 2010). At the end of 2006, Facebook has allowed user at the age of 13 to register an account on Facebook and this has led to an increase in the number of users among school students (Petrović, 2012; Wilson *et al.*, 2012). Generally, the purpose and criteria of social media is the same, namely to interact but type and nature of different social networking site will determine the type of activities will take place online (Salvation & Nor Azura, 2014). For example, Tribe.net and LinkedIn are business oriented sites for entrepreneurs discuss business ideas and strategies while Match.com related to those looking for potential romantic partners. However, popularity and flexibility of Facebook plus various apps that has high attraction towards students offers an opportunity to be manipulated toward learning if handled properly.

Hew (2010) in his study has listed nine use of Facebook. User normally use this medium to keep in touch with friends or family, finding new friends or connections, to express personal thoughts and feelings. Some use it just for fun while a few use it to gain popularity and acknowledgment. Another motive mentioned is the use of Facebook for learning purpose as it allow learners to approach learning from their personal perspectives and learning style (Kivunja, 2014). Studies agreed that learning activities such as interaction, collaboration, and active participation, sharing of information and resources as well as critical thinking that occurs online is the criteria that approves potential of Facebook to serve as a tool that aid learning (Petrović, 2012; Leng *et al.*, 2011; Mazman & Usluel, 2010; Selwyn, 2007).

Integration of new technologies in learning has brought significant changes in the learning process as a whole. Many studies mentioned about the positive impact on learning through Facebook (Kirschner & Karpinski, 2010). Facebook enhanced students' motivation, engagement, foster positive attitude (Kabilan *et al.*, 2010; West *et al.*, 2009), improves writing (Petrović, 2012), help in developing interpersonal skills and able to act as platform to practice critical thinking (Lampe *et al.*, 2008). These findings enhanced positive possibility of using this media as a tool to assist pedagogy (Petrović, 2012). Learning Management Systems (LMS) was widely accepted by the student previously. However, its lack of social connectivity tools and personal profile spaces has been outshine by the Facebook as student demands learning through interaction multilateral, prefer autonomy in terms of material and source selection and connectivity in learning (Mazman & Usluel, 2010).

Facebook is also useful for introvert students who do not feel comfortable to ask questions or express opinions in class. Students who are shy can use Facebook to communicate directly with the teacher without being concerned about the views of others in the class (Erjavec, 2013; Hew, 2010; Bosch, 2009). A study by Selwyn (2007) clearly showed good social support encourage student not only to responds to things regarding formal education but

also to respond on other informal educational matter such as on social issues, dilemmas and frustrations faced during school years or campus life. Facebook usage is not limited to the purpose of discussion for class projects and assignments. Lecturers were found prefer to disseminate information through Facebook as it is easier to use and there is a high probability that the information will rapidly reach the students (Hew, 2010; Bosch, 2009). It has been utilised as source of quick information such as to find location of the lecture hall and topics to be discussed for the day.

Although many studies confirming the potential of social media for use in education, there are some researchers who argue otherwise. A study in the UK found that 50% of respondent agreed that social media was associated with negative effects and are not relevant for use in education. Basis of this argument was on the purpose of social media creation which was meant for chatting and socializing online. Henderson (2013) raised concern on psychological problems called Social Media Anxiety Disorder that is starting to increase among the society all around the world. Studies done by Akyildiz and Argan (2012) and Hamat *et al.* (2012) found that spending longer time interacting online did not contribute to academic achievement (Hargittai & Hsieh, 2010). Socializing online has negative impact on student achievement because the time that should be used for learning was wasted for non-academic activities that can affect learning. However, this statement was opposed by Salvation and Nor Azura (2014) and Mazman and Usluel (2010). The amount of time spent by students on this medium also contributes to the probability that it can be manipulated for education purpose (Mazman & Usluel, 2010). Salvation and Nor Azura (2014) argued that measuring the intensity of time spent on social media only will not provide concrete evidence that Facebook affect learning negatively because time consumption does not impact directly on student achievement. Instead, study regarding time spent online should be pair up with the purposes of using this mediator for correlations. Student who use Facebook for a long period with the purpose to discuss educational matters with peers and teacher found has improved the students' performance similar to discussion that happen face-to-face in class (Salvation & Nor Azura, 2014).

Higher time spent in Facebook is also contributed by the fact that checking on Facebook has become part of students' routine activities (Petrović, 2012). Thus, informal learning through Facebook become so much easier to apply. With the emergence of wide variety of mobile gadgets, informal learning via social media remain unnoticeable even though interaction and feedback from peers and teachers regarding school matters does occur. Facebook helps to create a closer relationship between teachers and students in a less formal way. Students found comfortable spending longer time communicating online than they were with the teachers in class (Fogg Phillips *et al.*, 2011). Student acceptance of teacher as interaction partner will reduce the communication gap between them (Schwartz, 2010), which in turn could give significant impact on the instruction and guidance provided via social networks (Selwyn, 2009).

Although educational oriented social media such as Edmodo exists, the impact is not comparable with Facebook. Facebook is not confined to formal education elements that can make students uninterested in participating. Even though it existence was based on social interaction, Kivunja (2014) argued it serves as a mean that facilitate active learning that is highly sought by the new millennia learner which also termed as "Digital Natives" (Prensky, 2001) or "Net Generation" (Tapscott, 2009). Even those who declared Facebook only suitable for socializing somehow admit of using it for informal learning purpose (Madge *et al.*, 2009). Teachers should take advantage of Facebook popularity among the students to try different pedagogical approach via Facebook as there is no constrain of formal education structures that

disable them to do so (Hew, 2011). This interaction allows teachers to compare and analyze the appropriate teaching methods and activities that is suitable to fit the students' preference and at the same time able to reach targeted learning objectives (Roblyer *et al.*, 2010; Hew, 2011).

Assessments can be made not only in the pedagogical aspects. Students' performance can also be observed by changes in attitude, behaviour and by the way student think or argue after undergoing specific activity with the Facebook as learning tool (Roblyer *et al.*, 2010). Facebook purpose as learning space has been obscure by fun social interaction even though the topic discussed related to academic and learning (Manca & Ranierit, 2013). Frequent use of Facebook for online learning makes students feel comfortable and less burden as they are not pressure to learn. Learners tend to do better and persist in educational settings when they feel a strong sense of social belonging and connectedness (Erjavec, 2013).

6.0 Conclusion

Teaching and learning process that focus on nurturing skill that involves thinking should not be tied only to rote learning (Gotwals & Songer, 2013). Problem-solving skill require the learner to communicate effectively and apply knowledge with the aim of achieving the goals which indirectly contribute to improving argumentative skill and decision-making skill (Kim & Tan, 2013). Obviously, students' difficulty to solve problem should be dealt with appropriate approaches and strategies that can foster students' way of thinking thus enhancing the skill to solve problem which is in line with the needs of the working world in the future (Overton *et al.*, 2013).

Social media can be linked to learning by providing a promising learning platform for collaborative interaction between students and teachers (Towner & Munoz, 2011). Integrating social media as supplementary to existing teaching practices create an informal learning environment that can improve the delivery of learning and provide opportunities to embed skill learning (Mazman & Usluel, 2010). Facebook is a good user friendly medium not only for communication but for a broader engagement in the process of learning due to its affordance and reach. Introverts and students with low confidence level is given a personal space and pace to join and respond to the discussion thus, creating a meaningful learning experience. Some use it for socializing purposes while others manipulate it as alternative learning strategies to complement classroom teaching and learning activities. Activities that involves exchange of ideas, discussion, sharing materials and information to assist the learning process in turn can have positive effect on performance and development of students' problem-solving skill (Leng *et al.*, 2011; Griffith & Liyanage, 2008).

Acknowledgments

The authors would like to thanks the Universiti Teknologi Malaysia (UTM) and Ministry of Higher Education (MoHE) Malaysia for their support in making this project possible. This work was supported by the Research University Grant (R.J130000.7831.4F468) initiated by UTM and MoHE.

References

- Akyildiz, M. & Argan, M. (2012). Using Online Social Networking: Students' purposes of Facebook Usage at the University of Turkey. *Journal of Technology Research*, 3, 1-11.
- Ali, Z. (2008). Pelaksanaan Pentaksiran Kerja Kursus Kemahiran Hidup Bersepadu Di Sekolah Menengah Luar Bandar Daerah Kuantan, Pahang. Universiti Teknologi Malaysia, Skudai.
- Anderson, L.W. & Krathwohl, D.R. (2001). *A taxonomy for learning, teaching and assessing. A Revision o Bloom's Taxonomy of Educational Objectives*. New York: Longman Print.

- Bosch, T. E. (2009). Using Online Social Networking for Teaching and Learning: Facebook Use at the University of Cape Town. *South African Journal for Communication Theory and Research*, 35 (2), 185–200.
- Castle, S. R., & McGuire, C. (2010). An analysis of student self-assessment of online, blended, and face-to-face learning environments: Implications for sustainable education delivery. *International Education Studies*, 3 (3), 36.
- Çimer, A. (2012). What makes biology learning difficult and effective: Students' views. *Educational Research and Reviews*, 7 (3), 61-71.
- De Bortoli, L., & Macaskill, G. (2014). Thinking it through: Australian students' skills in creative problem solving. Victoria: Australian Council for Educational Research. <http://research.acer.edu.au/cgi/viewcontent.cgi?article=1018&context=ozpisa>
- Douglas, E. P., Ljungberg, K. L., McNeill, N. J., Malcolm, Z. T., & Therriault, D. J. (2012). Moving Beyond Formulas and Fixations: Solving Open- Ended Engineering Problems. *European Journal of Engineering Education*, 37 (6), 627-651.
- Evren, A., Bati, K., & Yilmaz, S. (2012). The Effect of using v-diagrams in Science and Technology Laboratory Teaching on Preservice Teachers' Critical Thinking Dispositions. *Procedia-Social and Behavioral Sciences*, 46, 2267-2272.
- Fogg Phillips, L., Baird, D., Fogg, M.A., & B. J. (2011). Facebook for Educators. (online) <http://facebookforeducators.org/wpcontent/uploads/2011/05/Facebook-for-Educators.May-15.pdf>.
- Greiff, S., Holt, D.V., & Funke, J. (2013). Perspectives on Problem Solving in Educational Assessment: Analytical, Interactive, and Collaborative Problem Solving. *The Journal of Problem Solving*, 5 (2), 71-91.
- Greiff, S., Wüstenberg, S., Csapó, B., Demetriou, A., Hautamäki, J., Graesser, A.C. & Martin, R. (2014). Domain-general problem solving skills and education in the 21st century. *Educational Research Review*, 13, 74-83.
- Griffith, S. & Liyanage, L. (2008). An introduction to the potential of social networking sites in education. *Proceedings of the Emerging Technologies Conference, University of Wollongong*, 18-21.
- Hamat, A., Embi, M. A., & Hassan, H. A. (2012). The use of social networking sites among Malaysian university students. *International Education Studies*, 5 (3), 56.
- Hanapi, Z., & Nordin, M. S. (2014). Unemployment among Malaysia Graduates: Graduates' Attributes, Lecturers' Competency and Quality of Education. *Procedia-Social and Behavioral Sciences*, 112, 1056-1063.
- Hew, K. F. (2011). Students' and teachers' use of Facebook. *Computers in Human Behavior*, 27, 662–676.
- Hutchinson, A. (2015). Facebook, Instagram, Snapchat Most Popular Networks Among Millennial Teens [Report]. (online) <http://www.socialmediatoday.com/social-business/adhutchinson/2015-08-12/facebook-instagram-snapchat-most-popular-networks-among> (6 December 2015).
- Kabilan, M. K. Ahmad, N., & Abidin, M. J. Z. (2010). Facebook: An online environment for learning of English in institutions of higher education? *The Internet and Higher Education*, 13 (4), 179–187.
- Kamaruzaman, J. & Rouhollah, K. (2009). Preliminary Study on the Role of Social Presence in Blended Learning Environment in Higher Education. *International Education Studies*, 2 (4), 79.
- Kantowski, M. G. (1980). Some thoughts on teaching for problem solving. In S. Krulik & R. Reys (Eds.), *Problem solving in school mathematics: 1980 yearbook* (pp. 195-203). Reston, VA: National Council of Teachers of Mathematics.

- Kim, M., & Tan H.T (2013). A Collaborative Problem-Solving Process through Environmental Field Studies. *International Journal of Science Education*, 35 (3), 357-387.
- Kirschner, P. A., & Karpinski, A. C. (2010). Facebook?? and academic performance. *Computer and Human Behaviour*, 26, 1237–1245.
- Kivunja, C. (2014). Theoretical perspectives of how Digital Natives learn. *International Journal of Higher Education*, 3 (1), 94.
- Krathwohl, D. R. (2002). A revision of Bloom's Taxonomy: An overview. *Theory Into Practice*, 41 (4), 212-218.
- Kuldass, S., Hashim, S., Ismail, H. N., & Samsudin, M. A. (2015). The Need for an Academic Resilience Approach to Cognitive Task Performance of Malaysian Students in Secondary Schools and Higher Education. *Pertanika Journal of Social Sciences & Humanities*, 23 (3).
- Lampe, C., Ellison, N., & Steinfeld, C. (2008). Changes in use and perception of Facebook. *In Proceedings of the ACM conference on computer supported cooperative work*, New York, 721–730.
- Leng, G. S., Lada, S., Muhammad, M. Z., Ibrahim, A. A. H. A., & Amboala, T. (2011). An exploration of social networking sites (SNS) adoption in Malaysia using technology acceptance model (TAM), theory of planned behavior (TPB) and intrinsic motivation. *Journal of Internet Banking and Commerce*, 16 (2), 1-27.
- Madge, C., Meek, J., Wellens, J., & Hooley, T. (2009). Facebook, social integration and informal learning at university: 'It is more for socialising and talking to friends about work than for actually doing work'. *Learning, Media and Technology*, 34, 141–155.
- Malaysian Examinations Syndicate (LPM). (2014). Kupasan Mutu Jawapan Biologi Kertas 2 Peperiksaan SPM Tahun 2013. (atas talian) http://apps2.moe.gov.my/lponline/v1/index.php?option=com_content&view=article&id=65:kmj-spm-2013&catid=25&Itemid=120&lang=en
- Manca, S. & Ranierit, M. (2013). Is it a tool suitable for learning? A critical review of the literature on Facebook as a technology-enhanced learning environment. *Journal of Computer Assisted Learning*, 29, 487-504.
- Mayer, R. E. (2003). *Learning and Instruction*. NJ: Prentice Hall.
- Mayer, R. E., & Wittrock, M. C. (2006). Problem solving. In P. A. Alexander & P. H. Winnie (Eds.) *Handbook of educational psychology*. NJ: Lawrence Erlbaum. 287–303.
- Mazman, S. G., & Usluel, Y. K. (2010). Modelling educational usage of Facebook. *Computers & Education*, 55, 444-453.
- Ministry of Education (MOE). (2012). Pelan Pembangunan Pendidikan Malaysian 2013-2025. (online) <http://www.moe.gov.my/userfiles/file/PPP/Preliminary-Blueprint-ExecSummary-BM.pdf>
- Minnors, J. (2012). Survey says: College graduates not prepared for the workforce. LexisNexis Legal Newsroom. (online) <http://www.lexisnexis.com/legalnewsroom/lexis-hub/b/careernews-and-trends/archive/2012/02/01/survey-says-college-graduates-not-prepared-for-theworkforce.aspx>
- Noor Hidayah, C. L., & Zaidatun, T. (2014). A Meta-Analysis Of Research Of Problem Solving Activities In Online Discussion. *Proceedings of International Education Postgraduate Seminar (IEPS) 2014, Johor Bahru*.
- Organisation for Economic Cooperation and Development (OECD). (2014). PISA 2012 Results: Creative Problem Solving (Volume V). Students' Skills in Tackling Real-Life Problems. (online) http://www.keepeek.com/Digital-Asset-Management/oecd/education/pisa-2012-results-skills-for-life-volume-v_9789264208070-en#page3

- Overton, T., Potter, N., & Leng, C. (2013). A Study of Approaches to Solving Open-ended Problems in Chemistry. *Chemistry Education Research and Practice*, 14, 468-475.
- Petrović, N., Petrović, D., Jeremić, V., Milenković, N., & Ćirović, M. (2012). Possible educational use of Facebook in higher environmental education. *ICICTE 2012 Proceedings*, 355-362.
- Polya, G. (1973). *How to solve it*. Princeton, NJ: Princeton University Press. (Original work published 1945).
- Prensky, M. (2001). Digital Natives, Digital Immigrants, Part 1, *On the Horizon*, 9 (5), 3-6. <http://dx.doi.org/10.1108/10748120110424816>
- Ramos, J. L. S., Dolipas, B. B., & Villamor, B. B. (2013). Higher Order Thinking Skills and Academic Performance in Physics of College Students: A Regression Analysis. *International Journal of Innovative Interdisciplinary Research*, 4, 48–60.
- Robinson, P. (2015). Facebook vs. Twitter: Social Media Strategy Differences. (online) <http://www.meltwater.com/blog/facebook-vs-twitter-social-media-strategy-differences/> (6 December 2015).
- Roblyer, M. D., McDaniel, M., Webb, M., Herman, J., & Witty, J.V. (2010). Findings on Facebook in higher education: A comparison of college faculty and student uses and perceptions of social networking sites. *Internet and Higher Education*, 13, 134-140.
- Salvation, M., & Nor Azura, A. (2014). The Influence of Social Network Sites (SNS) upon Academic Performance of Malaysian Students. *International Journal of Humanities and Social Science*, 4, 10(1), 131-137.
- Schwartz, H. L. (2010). Facebook: The New Classroom Commons? *Education Digest: Essential readings condensed for quick review*. 75 (5), 39-42.
- Selwyn, N. (2009). Faceworking: Exploring students' education-related use of Facebook. *Learning, Media and Technology*, 34, 157–174.
- Shahizah, S., & Zaidatun, T. (2014). Promoting Critical Thinking through Asynchronous Online Discussion Forum: The Theoretical Framework. *Proceedings of International Education Postgraduate Seminar (IEPS) 2014, Johor Bahru*.
- Shazaitul Azreen, R., & Maisarah, M. S. (2015) The Perception of Critical Thinking and Problem Solving Skill among Malaysian Undergraduate Students. *Procedia - Social and Behavioral Sciences*, 172, 725–732.
- Silva, E. (2009). Measuring Skills for 21st-Century Learning. *The Phi Delta Kappan*, 90 (9), 630–634.
- Sivakkumar, B., & Muhammad Sukri, S. (2014). Kerangka konseptual kesedaran guru dalam melaksanakan pentaksiran berasaskan sekolah (PBS) di sekolah menengah semenanjung Malaysia. *Proceedings of International Education Postgraduate Seminar (IEPS) 2014, Johor Bahru*.
- Shakir, R. (2009). Soft skills at the Malaysian institutes of higher learning. *Asia Pacific Education Review*, 10 (3), 309-315.
- Tapscott, D. (2009). *Grown up Digital: How the Net Generation is Changing Your World*. New York: McGraw-Hill.
- Wang, R. (2015). LS Vygotsky and education. *British Journal of Educational Studies*, 63 (1), 112-114.
- Wilson, R. E., Gosling, S. D & Graham, L. T. (2012). A Review of Facebook Research in the Social Sciences. *Perspectives on Psychological Science*, 7 (3), 203–220.
- Zohar, A., & Dori, Y. J. (2003). Higher Order Thinking Skills and Low-Achieving Students: Are they Mutually Exclusive? *Journal of the Learning Sciences*, 12, 145–181.