Problem-Based Learning: A Process for the Acquisition of Learning and Generic Skills

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Abstract

This research seeks to explore how problem-based learning (PBL) supported learning and the acquisition of generic skills in pre-university college students. Eighty participants from a local private institution participated in this study. The topic of study was the inheritance of Huttington's disease, under the subject of Genetics. Students were trained in two PBL learning sessions on another topic before the actual intervention. Feedback on the implementation of PBL were gathered through written responses at the end of the three-week PBL session. Analyses of the written responses showed the strength of PBL in supporting learning and the acquisition of generic skill. Students reported positively in terms of acquiring various skills such as problem solving, critical and analytical thinking, communication, team work, life-long learning and self-directed learning. This research further support the value of implementing PBL as an approach towards teaching and learning.

Keywords: Problem-based learning, thingking skills, communication skills, team work skills;

1. Introduction

In the quest of developing a scientific and progressive society, the Malaysian Government has taken measures to enhance the potential of Malaysian education in moving the nation towards a knowledge society. In a scientific society, the entity of an individual is as important as the society shift. This paradigm shift is important to the nation's growth and calls for intellectuals and academicians in the education world to be forward looking, versatile and multi-disciplinary. The significance of this shift is to reshape the education system and draw global attention towards the country's educational potential. A comprehensive and constructive education system has the potential to develop students who are critical thinkers and innovators who will be able to contribute to the development of the nation.

Learning in the 21st century entails personal meaning making and construction of knowledge. This process is encouraged through student-teacher active interaction and social negotiation among peers. However this approach demands new teaching methods and strategies as well as greater empowerment of learning onto learners. The process of teaching and learning for the 21st century advocates lesser teacher centeredness and greater student centeredness to support the development of not only meaningful acquisition of concepts but skills in thinking and reasoning. An effective teaching and learning approach must not only develop students intellectually but also affectively. In attaining the holistic individual as aspired by the National Philosophy of Education, the learning process must progressively develop students with the necessary generic skills, which are crucial to effectively function and compete locally and abroad.

2. Background of Research

The current teaching and learning experience in schools and colleges in Malaysia is still very much didactic. Most teaching practices a one-way pedagogical model where the students are passive recipients of knowledge, the teacher as the provider of knowledge and learning is more rote than meaningful. As a consequence there exist minimal interactiveness to support productive learning least developing thinking or generic skills. It has also been shown by numerous research that passive learning settings does little to promote deep conceptual understanding of fundamentals concepts.

What does it take to teach Biology to be relevant and practical to human life? Problem Based Learning (PBL) could be the answer to this. It is an excellent strategy where learning begins with a problem naturally occurring in everyday life that bears relevance and meaning to the students. The problem posed triggers students' past experiences and prior knowledge. These serves as the foundation to anchor new concepts acquired through the PBL process. Since PBL involves collaborative learning, students gain more confidence while working through and addressing the problem posed. PBL is a teaching and learning process that integrates non-traditional in-class instruction that is constructivist in nature and empowers student centred learning. When learning through PBL, students acquire multifaceted skills cognitively and affectively.

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According to Savin-Baden (2000), PBL is an approach to learning that is characterised by flexibility and diversity in the sense that it can be implemented in a variety of ways in different subjects and disciplines and in diverse contexts. PBL have the functional entity in allowing the development of higher order thinking among students and thus promotes an analytical mind. In PBL, students also experience materializing scientific information where there is "pursuit of meaningful knowledge through the use of procedures that are thoughtfully generated and evaluated by those who are asking questions" which is part and parcel of a scientific inquiry (Palinscar et. al. 1993).

An important feature of the PBL process is making reflections at the end of the PBL process. This happens in the last stage of the PBL process. Reflections can be defined as a complex process of thinking in which students can reflect and comment critically about their strengths and weaknesses highlighting areas for development (Lin, 2009). Students' reflections will also enhance their passion and pursuit for seeking explanations and solutions to scientific phenomena surrounding their everyday life. This research aims to understand how PBL contributed towards strengthening learning and developing generic skills crucial to the development of holistic individuals.

2. Problem Statement

Biology in Malaysia is taught with a specified curriculum and syllabus. To many students the depth and breath of the biology content is overwhelming and detered them from embracing the subject with ease and confidence. This is compounded by the complexities and intricacies of structures and functions, terms and terminologies, and mechanisms and processes involved in learning the subject. To a naïve student this may prove too laborious and irrelevant. If the teaching and learning of Biology remained teacher-centred, exam oriented and painstaking memorization of facts and concepts, students will choose to learn subject that offer more authentic and practical applications of knowledge. This aspect could be one of the contributing factors to the dwindling enrolment in the sciences at the higher education level.

Genetics and Inheritance has been reported as topics that are difficult and abstract. Misunderstandings and misconceptions has always prevailed in the teaching and learning of genetics. Past research have identified several problematic areas in studying genetics. Students have difficulty understanding the very basic units of genetics such as chromosomes, genes or allelles (Collin and Steward, 1989; Albaladejo and Lucas, 1988); they cannot adequately interpret concepts such as homozygous or heterozygous (Slack and Steward, 1990); they have alternative views of the mieosis and mitosis process (Kindfield, 1994; Brown, 1990; Stewart et al., 1990); and they could not fully understand the meanings of probability in relations to genotype and phenotype frequencies (Browning and Lehman, 1988; Cho et al., 1985). However bearing in mind that the study of genetics has important impact in various aspects of life such as medicine, food production, health and lifestyle, new approaches and methods must come into place to teach and learn genetics more effectively and meaningfully. On that note, the researchers believe that the PBL approach to teach the topic of genetics and inheritance could offer a more constructive and meaningful learning experience for the students.

Students graduating from higher institution in Malaysia are often faced with criticisms from employers, especially from the private sectors, pertaining to their lack of communication, team work, problem solving and analytical skills. These skills are the generic skills or more commonly known as the soft skills that students need to acquire before leaving the institution. Acting upon the poor evaluation by the private sectors, the Ministry of Higher Education has announced that public universities in Malaysia must introduce soft skill elements and incorporate them in the undergraduate syllabus. Given this situation the researchers feel that PBL can offer an excellent platform for the development of generic skills.

4. Research Objective

This research aims to answer the following questions:

1. How does PBL help learning?
2. What are the generic skills developed during the PBL approach?

5. Literature Review

Problem-based learning (PBL) is an inquiry-based instructional approach in which students work in small groups to solve ill-structured problems. An ill-structured problem is defined as a problem with no clear solution or solution path (Hung,2003). PBL is used in medical schools and is now used in many educational settings (Barrows & Tamblyn, 1980; Gallagher, Stepien, & Rosenthal, 1992; & Torp & Sage, 1998). In PBL, students (a) collaboratively determine what they know and need to know, (b) research content and/or conduct scientific tests, (c) communicate research results among themselves, (d) collectively determine a solution to their problem, and (e) present their solutions to classmates (Hmelo-Silver, 2007).

According to Hmelo-Silver (2004) PBL is well suited in helping students become active learners because it situates learning in real-world problems and make students responsible for their learning. Educators are interested in PBL because of its emphasis on active, transferable learning and its potential for motivating students. Agran, Blanchard, Wehmeyer, and Hughes (2003)

argued that students must develop their problem-solving skills in order to succeed in life. Given that PBL can increase the problem-solving skills of university, gifted, and average students (Barrows & Tamblyn, 1976), mainstreamed students may benefit from PBL in similar ways.

Students must also be given the opportunity to develop self-directed learning (SDL) skills in order to succeed academically and personally (Wehmeyer *et al*., 2000). SDL skills refer to students' abilities to initiate appropriate actions to gain knowledge or skill (Gibbons, 2002). PBL has been shown to increase the SDL skills of advanced students (Evensen, Salisbury-Glennon, & Glenn, 2001). The PBL approach improves students' ability to analyse, synthesise and evaluate situations thus cultivating the habits of using the higher order thinking and reasoning skills.

In the PBL process students are required to give feedback and make reflections on their learning. Making reflections is a metacognitive skill which play a key role in the metacognitive process of self-directed learning (Ertmer, 1996). Making reflections help students to become aware of their mental structures, subject them to a critical analyses and if necessary, restructure them accordingly (Korthagen, 2001). Reflection is also intended to enable students to assess their own growth and changes in their thinking over a period of time.

Salomon (1989) mentioned that reflecting on the relationship between problem solving and learning is a critical component of PBL and is needed to support the construction of extensive and flexible knowledge. Reflection helps students (a) relate their new knowledge to their prior understanding, (b) mindfully abstract knowledge, and (c) understand how their learning and problem-solving strategies might be reapplied. Hmelo-Silver (2004) claims that student reflections refer to specific behaviors exhibited through both positive and negative comments from students. These comments provide others in their group with information they can use to improve their effectiveness as collaborators and their self-directed learning ability.

Moving on to the acquisition of generic skills, the institution of higher learning in Malaysia faces a huge challenge in producing students who are not only excellent in knowledge but excel in terms of skills in the workplace. Currently both local and global workplaces are demanding workers with high employability skills such as basic skills, thinking skills, and interpersonal competencies. A survey done by Richens and McClain (2000), claimed that most employers require that entry-level workers possess good employability skills rather than technology competencies. According to Wilhelm (2002), employers assert that too many high school and college graduates do not possess the skills necessary to contribute productively in their jobs. To address these problems the Malaysian Ministry of Higher Education has taken steps to identify the major soft skills deemed necessary to improve marketability and employability of students leaving the higher institution. Seven major elements of the generic skills were identified, of which communication, problem solving and critical thinking, teamwork, lifelong learning and information management was explored in this study.

6. Methodology

This research is an exploratory study on the ability of PBL to promote learning and skill acquisition during teaching and learning. This intervention explored the ability of PBL to promote the much needed generic skills in students. These generic skills include communication, critical and problem solving, team work and life-long learning skills. Apart from this, the research explored how PBL help students learn through their group discussions and interactions. Sampling of the students was done through a non-probability purposive sampling that uses intact groups of students These were students enrolled in a Pre-University programme of a private college. Four different classes were taken as samples for the study. The total no of students were 80. These students went through a PBL session studying the topic of Genetics and Inheritance with a special focus on Huntington's Disease.

Students were grouped randomly as heterogeneous sample with 5 students to a group. A total of 16 groups were formed. Students were briefed on the PBL approach with two examples of a PBL scenario before starting with the actual intervention. This step was taken to familiarize the students with the different stages of PBL. The study was conducted for 3 weeks with a 4 hours face-to-face contact with the facilitator each week. The PBL scenario was introduced during the second stage of the PBL process followed by generation of learning issues individually and as a group. After the seventh stage of the PBL process, written reflections on learning through the PBL approach were collected from the students.

7. Data Analysis

Students in this study responded to two main reflective questions given by the researcher. These questions were:

1. How PBL helped you in your learning?
2. What are the skills you acquired in the process of learning through PBL approach?

These reflections were manually analysed and coded into more general themes. The steps for this process were: (1) selecting relevant ideas (2) discovering repeating ideas (3) organizing repeating ideas into themes and (4) creating narratives to describe the research concern.

8. Results

Written responses were analysed and identified for the purposes of answering the two research questions formulated. These responses were discussed in two main sections that is 'How PBL helped learning and skills acquired during learning through PBL'.

8.1. How PBL helped students learn

Some of the major contributions of PBL in the learning process include achieving a higher level in the learning outcome, acquiring specific science process skills, inculcating the scientific mind, meaningful learning, increased knowledge acquisition and motivation.

8.1.1. Improved learning

One student's response to this aspect was:

"PBL instil higher order thinking within me as the approach requires me to be aware of mental blocks that can lock me into a fixed way of doing a particular thing in a specific manner." (PM 13 080)

Further students' reflections supported this view:

... I also can learn how to elaborate points better and take suitable action to solve a problem (PM 5 015)

"*... I have realised that PBL will give much momentum for me to study, analyse, and make probable assumption and variables..* (PM 5 019)

" I have to use the biological way of thinking and apply the knowledge of biology in my thinking." (PM 13 052)

"*.. ability to define problems, gather and evaluate information* (PM 5 013)

"*I learnt how to research a problem and analyze the key factors of a case scenario.* (PM 5 014)

as I learn to compare and decide on correct information regarding the scenario" (PM1 001)

all the information that is needed and the unnecessary ones

8.1.2. Acquire scientific skills and inculcating the scientific mind

The various ways PBL supported learning in terms of acquiring scientific skills was clearly manifested in this study. Written responses that supports this notion include:

"*collecting and filtering information and points are essential. We also learnt how to relate questions in order to rethink and* pose a new questions *which requires someone to elaborate more"* (PM 13 042)

Analytical skills can be acquired too, as it requires thinking for the FILA chart where we need to sort out. (PM 8 018)

"PBL has helped me to find the accurate and best solution by following the whole procedure which will lead to the solution in end, ... to look things with different angle." (PM 5 022)

... I also learnt to be more observant..." (PM1 004)

and it raised my curiosity about many things...." (PM6 040)

"PBL made me more inquisitive and helped me in researching further on the topic (PM 6 030)

PBL inspired a need for critical thinking and logical investigation when considering a problem". (PM 5 014)

8.1.3. Meaningful learning

The ability to understand and adapt to novel situations were evident in these responses:

"*I learned that understanding is more important than memorizing facts and will help me* (PM 5 025)

to learn new things through PBL approach."

*with PBL's hands-on approach - a two-way process that directly links knowledge and application that just doesn't happen in traditional learning methods***."** (PM 5 014)

PBL is self- learning, involves discussion among friends and also individual which steer self-directed learning instead of being fed with knowledge by the teacher." (PM 13 043)

"I have learnt to rephrase my sentences correctly and improve my grammar and vocabulary." (PM 13 050)

8.1.4. Increased knowledge

Analyses of the students' responses revealed that the PBL sessions helped students increase their knowledge acquisition. Some of these responses are:

I have broaden my horizon and learnt in depth of the topic. It was also more interesting. (PM 6 030)

"*it has helped me to broaden my knowledge of the problem given*" (PM1 006)

" ... we get to pay particular attention to one subtopic only, hence we could acquire more knowledge... (PM 13 049)

" ...learning the new information from researches done by team members involves sharing of information between members will broaden the insights of content. (PM 1 005)

"*it has helped me to broaden my knowledge of the problem given*" (PM1 006)

"*PBL helped to make learning easier. The base concepts were easier to grasp. It motivated me to learn more, to probe deeper***.** (PM5 014)

This was also supported by another response which quotes:

8.1.5. Motivation

There was also evidence that students developed the use of non-verbal skill such as writing skill.

"PBL had me more interested about the topic discussed… (PM 6 040)

"It is teamwork that we can learn through PBL. We work together as a team and somehow managed to get the FILA chart done. This feeling actually motivates us and helps us to be passionate learners." (PM 5 018)

The base concepts were easier to grasp. It motivated me to learn more, to probe deeper. Furthermore, retention of the things learnt was so much easier (PM5 014)

8.2. Acquisition of skills during the process of PBL

The data from open-ended responses were carefully studied and repeating themes and ideas were categorized. There are mainly four skills that students frequently wrote about: (i) communication skill, (ii) critical thinking and problem solving (iii) teamwork and (iv) lifelong learning and information management skill.

8.2.1. Communication skill (CS)

Majority of the students mentioned about the improvement of their communication skills throughout the PBL learning. The essence of PBL was communication between the members in the group. The students also agreed and believed that they had greatly benefited from it, especially those few who were introverts. The responses below described this view:

" I learnt some communication skills and developed some analytical skills" (PM1 004)

"I have learned to be more socialise and can communicate better with my friends through PBL . This is because we need to communicate with others and discuss among ourself to get the FILA chart done. (PM5 015)

" *.. speaking skills are more developed as well when presenting our findings*" (PM 6 038)

Some of the responses were sub-skills for communication such as ability to communicate ideas clearly and confidently during presentations.

"I am able to present to my friends with more confidently and address the queries with relevant information. I feel so happy about this". (PM 13 074)

"*...before this I am quiet and sometimes don't talk publicly especially to present. Now I think I have improved and able to do presentations without fear."* (PM13 077)

8.2.2. Critical Thinking and Problem Solving

Several responses from students for the various critical thinking and problem solving are listed below. The summary of the skills are categorised into three skills namely; ability to identify and analyse ill structured and complex problems and make justified evaluation, ability to develop and improve thinking, and thinking out of box/creative thinking. Students are able to meet the problem when they first encountered it. Transforming information is also important key to problem solving in PBL. Some students' responses supporting this notion include:

...develop solutions, team skills ... and also the ability to use all skills to address problems in a complex real- world setting." (PM 5 013)

Brainstorming the issues present in the problem given taught me how to view facts objectively, from all sides. The idea of questioning a fact thoroughly was something I came across over and over again when working with the PBL group. (PM 5 014)

Students viewpoint in thinking out of the box were evident through these responses:

" I developed the ability to think out of box"

"*I learned to think differently and creatively to solve the scenario as it requires to think really hard to learn through the approach of PBL."* (PM 1 008)

8.2.3 Team Work Skill

In terms of skills attained working in teams, findings from this research suggest that students foster a healthy relationship, engage in group discussion and negotiation, and work together effectively to achieve a consensus on problem solutions. Most responses from the students mentioned that compatibility among other peers gradually increased as they go through the PBL process.
One particular evidence of this is:

"Moreover I'd learnt to be more active in group and discussed with team mates." (PM 13 069)

The value of working as a collaborative team was expressed in the following statement:

"Be more active and required me to more engaged in learning n stimulates critical and creative thinking, compare and share learning strategies and self learning, the team work in summary I most enjoy in PBL." (PM 13 065)

When confronted with differing ideas and behaviours, students developed the ability to recognize and respect behaviours and beliefs of others:

"I have acquired the skill of working together and discovered is more fun and tend to solve problem faster. I also respect and am open to others opinion." (PM 5 016)

The students also developed the ability to contribute in planning and monitoring of group output. Some students seemed to be very objective and goal orientated and inspired others in team. Some written responses say:

"Skills such understanding among members also important, especially when there is a situation among members, we need to understand the situation and think the best solution in order to prevent any misunderstandings." (PM 5 022)

Some students also mentioned about gathering a new horizon and being responsible for group decisions:

"I polish through my attitude; I am more responsible to my group and its meeting." (PM 13 077)

Students also develop the ability to practice active listening skills and giving feedback:

"...tolerating and accepting ideas and viewpoint from different members are openly (PM 5 024)

practiced".

"I have learnt the skills of collaborating with teammates in achieving a common goal. Negotiation skills are important when putting forth an idea that can be accepted by the whole team. It is important to consider my teammates ideas. (PM 6 029)

8.2.4. Life Long Skills and Information Management

As the nature of the PBL assignment is ill-structured and open ended, students need to develop knowledge and skills to search and manage information. They discover their ability to find and manage relevant information from various sources. Some students responses concerning this include:

"I have learned to use the library resources." (PM1 011)
"The process of learning through PBL is selecting information *and finding out main problem* (PM 5 026)
In addition to that, it helps us to improve our skills in compiling the materials and sort it properly." (PM 6 039)
"I have also learnt how to obtain journal online using reliable sources to quote from. I have also learnt how to cite journal and prepare a full bibliography." (PM 6 028)

9. Discussion

The PBL process advocates the notion of 'learning how to learn'. At each stage of the PBL process students are needed to think of ways to solve a given problem, and make decisions to apply relevant concepts to justify the proposed problem solutions. As observed in this study, during the PBL sessions students learn through 'elaborating points', 'analysing, comparing, synthesising, and evaluating information' concerning phenomena presented in the problem scenario. It was evident that during the PBL process students displayed learning outcomes at the higher level of the Bloom's taxonomy thus reinforcing that PBL help improve students' learning. Learning becomes more substantial through group discussions and facilitation where students communicate, negotiate, and consolidate their ideas to achieve the learning goal. Students learn through exchanging and brainstorming of ideas within the group, reaffirming facts presented by members and validating information obtained from various sources. These findings supports most past research advocating PBL as an approach that supports learning.

Findings from this research supported the view that PBL plays a crucial role in developing scientific skills and inculcating the scientific mind. In this study students collected and filtered information, observed situations, ran investigations and researched relevant ideas to support proposed solutions. Much of the learning in PBL require students to develop learning issues to address the given problem. Learning issues are usually phrased in the form of questions to the ideas generated during group discussions. As learning progressed students showed an increased ability to ask higher order thinking questions, focussing more on the 'why' and 'how' of the phenomenon studied. Instances of students developing, rephrasing and asking higher order thinking questions were evident in the reflective journal transcripts. Students became curious as intriguing questions emerged through analysis of the problem scenario, thus further deepened students' interest to learn more about the phenomena studied.

A lot of efforts have been made to move away from didactic teaching in pursuit of making learning more meaningful. Students' responses in this study suggests that PBL had this potential. Students reported that the PBL sessions made them realised that 'understanding is more important than memorising facts' and 'links knowledge and application' of concepts. The PBL process also 'encouraged self-directed learning instead of being fed with knowledge by the teacher'. These responses strongly suggests that PBL could play a big role in promoting meaningful learning. In terms of knowledge acquisition PBL helped students 'learnt in depth', broaden knowledge' and promoted deep learning. On at the affective side, PBL motivated students to be passionate towards the subject matter.

Analyses of the critical thinking and problem solving have been very closely related to the ability of identifying and analyzing ill structured and complex problems and developing a justified assessment. Response from the students indicated that PBL could be an effective approach to develop critical and problem solving skills. Their critical thinking is very closely related to the cognitive functions such as configuring, relearning, rethinking, recognizing and making patterns, connecting, imaging, and playing with ideas. As shown through the students' responses, this possibility is integrated in the PBL process where teaching and learning kick starts with a problem. The student also developed the ability of thinking out of the box which may lead to creative problem solutions. Creative thinking moved students from their comfort zone in an effort to try different perspectives using different points of entry. Students can use various methods including provocations to solve the problems.

It was also observed that students' ability to understand and adapt to novel situations was stimulated by the nature of a scenario that was unfamiliar to them. Students brought strategies and beliefs about learning to a new situation and adapt their personal strategies to the situational demands. In this study students often had difficulty initially adapting to the PBL approach but progressively improve their skills in dealing with ill-structured problems.

The PBL approach imparts beneficial characteristics to learner's needful development holistically. The term "holistic" has entered the educational arena to promote a view that an attention to wholeness is more important than attention to the separate and contributory part. Some of the skills that was evident from this study were communication, critical thinking and problem solving, team work and lifelong learning and information management skill.

PBL offered the potential to help students become reflective and flexible thinkers who used knowledge to take action and eventually became effective communicator. This study showed students developed communication skills through engagement in group dialogue, sharing of ideas during the PBL facilitation and presenting and communicating problems solutions. This promising result showed students were actually promoted to active learners as warranted by the constructivist paradigm of teaching and learning.

Good problem-solving skills was translated into the ability to define the problem when given an ill-structured situation. This ability calls for skilful analysis and accurate problem identification. Findings from this study showed that communicating and negotiating with team members helped students analyse and understand difficult situations and collectively decide on problem identification and finally resolving it. Through these processes student were able to grasp difficult concepts of Genetics and apply these concepts to more novel situations. This findings was mirrored in a research done by Norman *et al*. (1998) who found that students in PBL curricula transferred the hypothesis-driven reasoning strategy to unrelated problems and generated more coherent explanations than students without PBL experience suggesting that they have developed better problem solving strategy.

The support for team work skills is clearly evident in the students' responses. This finding is supported by research done by Schmidt and Moust (2000) which indicated that group function is the most important aspect of PBL because it affects learning outcomes and intrinsic motivation (Schmidt and Moust, 2000). In this study students enjoyed working in groups and were able to accept new ideas from team members and cooperatively work towards achieving a common goal in the learning process. Another support was through the research done by Nora Abdul Hak (2004) who found that students in her class believed that PBL had developed their ability to manage group dynamics, helped them in building their confidence working in a team and provided better cooperation between male and female students. Students also perceived that teamwork is better than individual work by motivating them to face the challenges of their study.

The students also developed lifelong learning skill and information management during the PBL process. One of the benefits of PBL is its claim to prepare lifelong learners because of its emphasis on self-directed learning (SDL). Responses showed that students on average agreed that they enjoyed learning independently and learning to make collective decisions in group work. Some of the lifelong learning skills observed in this study were students' activities in using the library to search for information, selecting and sorting relevant information, citing and preparing a full bibliography of information. These findings support the work of Hmelo-Silver (2004) who suggested that, because the problems used are complex, students work in groups, pool their expertise and experiences, and together grapple with the complexities of the issues presented. This finding is also supported by Blumberg (2000) who mentioned that if self-directed learners can define their own learning needs, assess salient information independently, and evaluate effectively the adequacy of their learning, then they should be able to function as lifelong learners. Acquisition of a strong knowledge base and superior soft skills will ultimately increase their chances of job opportunities in the market.

10. Conclusion

Reflections from the students established the notion that PBL allowed students to improve their learning and develop their generic skills through active participation during the PBL process. This approach allowed them to handle authentic problems and work in teams to come up with effective problem solutions. They also developed a common goal in formulating strategies to handle different aspects of their learning. In summary, students' reflections in this research demonstrated improvement in various facets of learning. Their written responses suggest the acquisition of deep learning and crucial generic skills to better prepare them for future real world experiences and challenges. It is apparent that learning through PBL improved students generic skill which could contribute to the development of their employability skills and increase their marketability locally and abroad.

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