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Pre-Service Teachers Experience in Project-Based Learning Approach: A Case Study of Two Campuses of the University of A (UNA)

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Abstract

Project based learning is becoming more important and relevant as we integrate the technology in the 21st century educational system and the need for sustainable development equipping pre-service teachers to be self-sustained in all the areas of education concepts. This paper explores the experience of project-based learning in pre-service teacher's educational program. Project based learning enhances awareness of learning and teaching support materials among pre-service teachers. The solicitation of project-based learning in solving educational problems encountered during school-based studies shows the importance of the project-based approach by the pre-service teacher's reflections. A quantitative research approach was used in this paper. Eighty-seven pre-service teacher of University of "A" took part in the study. The study was guided by constructivism theory. Questionnaires were used in this study for the pre-service teachers and analyzed. Findings confirmed that project-based learning has helped to nurture a positive skills attitude towards the learning and teaching support materials production in a constructive manner. The skills embrace 21st century skill like critical thinking, collaboration skills, communication skills, creativity and innovation skills, directing skills, international or global connections, local connections and information technology (IT) skills. As part of recommendation, it is suggested that at least one to two weeks PBL tutorial classes be provided for pre-service teachers before engaging them on 12 week projects duration.

Keywords

Project-Based Learning, Learning and Teaching Support Materials, 21st Century, Awareness, Pre-Service Teachers

1. Introduction and Background

The Project-based learning (PBL) module at the University of "A" (UNA) is a dynamic pre-service teacher's form of learning which is branded by pre-service teacher's constructive inquiries, goal-setting, collaboration, communication and reflection within real-life educational practices. The PBL enhances pre-service teachers to develop a project in their field of study which can be used as a learning and teaching support material in their area of specialization.

PBL has been used in different phases of schooling, but UNA assigned PBL research project module for year 3 level pre-service teachers as a semester module to be graded on completion. Modern digital technology, group processes of high quality, teachers' ability to effectively scaffold students' learning and provide guidance and support, the balance between didactic instruction with in-depth inquiry methods and well-aligned assessment have been identified in the literature as facilitating factors in the implementation of PBL.

The PBL impact as stated in literature reviewed considered being essential for the successful adoption of a PBL approach in the mainstream of University of "A" education program setting. With the adoption of PBL by UNA, this study tried to investigate and mediate any unseen problem associated with the PBL as a teaching and learning strategy. This study took place at two campuses of UNA.

Problem statement

According to Hmelo-Silver & Pfeffer (2004), the claims of PBL advocates are not all supported by an extensive research base, and much of the research has been restricted to medical schools only. UNA introduced PBL as a module where year 3 level pre-service teachers develop a project of their choice and work on it. Pre-service teachers get confused about what they should do and how to go about the project, and what might be the intended outcome. This remains the challenge of the project-based learning (PBL) at UNA; hence, this study investigates UNA pre-service teachers' experience of PBL at two UNA campuses.

Purpose of study

The purpose of the study is to investigate and mediate pre-service teachers experience and means of constructing knowledge during project-based learning resulting in the production of learning and teaching support materials (LTSMs). This paper also explores how the use of project-based learning could stand-in the development of 21st century skills as part of the skills and attributes required of trained pre-service teachers. Educators are interested in PBL because of its emphasis on active, transferable learning and its potential for motivating pre-service teachers. This enhances the implementation of project-based learning as a teaching and learning strategy that might be significant for pre-service teachers' preparation programme.

Significance of the study

This study seeks to develop an effective professional means of handling PBL project among pre-service teachers at the UNA. It might provide insight into the enhancement of skills and content knowledge needed for PBL (project-based

learning) activities. It will benefit lecturers working together with the pre-service teachers. The study could inform the University of "A" Professional Policy Developer to extend the strategy anchored on constructivism theory which is the bases of PBL approach. Pre-service teachers of University of A might have new directions for PBL in learning and teaching support materials (LTSMs) development in school during their primary assignment on completion.

Research Questions

This paper was guided by the following research question:

What are the pre-service teachers' experiences in project-based learning approach at the two campuses of the UNA?

2. Literature Review

The majority of the literatures reviewed were based on experimental pretest-posttest design with some baseline equivalence established, but no random allocation of respondents to control and experimental groups, and as a result, a causal link between Project-based learning (PBL) instruction and positive student outcomes cannot be established with certainty.

Theoretical framework underpinning this study

The theoretical frameworks for this study are the constructivism, namely, Piaget's cognitive constructivism and Vygotsky's social constructivism.

Brooks and Brooks (1993) define constructivism as a theory about knowledge and learning. Students construct meaning by linking new knowledge to their present knowledge. It views that knowledge is not a "truth" to be transmitted or discovered. Instead, learning is emergent, developmental, and none objective, constructed explanations by humans engaged in meaning making (Gupta, 2008). According to Moll (2002: p. 8), "Constructivism is articulated as the basis of a new approach to teaching and learning in the context of curriculum renovation". Constructivism entails personal studying, learning and teaching with emphasis on mental development and alertness as students are not blank slates. Cognitive Constructivism used because it might assist the pre-service teachers' to search for the knowledge concept to develop, which is aligned with pre-service teachers' education programme Social constructivism takes care of the social interaction between the pre-service teachers that might be working together on the same project.

Cognitive constructivism

Cognitive constructivism draws on the developmental work of Piaget (1973), who alluded that learning occurs by an active cognitive construction of meaning rather than being a passive recipient of knowledge. However, cognitive constructivism was criticized as portraying the individual as sealed in a privately constructed world in which the social component of learning is largely ignored (Davson-Galle, 2000; Ernest, 1993; Garrison, 2000). This critique led to the development of a broader view of the theory to include the other strand of constructivism, social constructivism. To mediate the problem which one is consi-

dered isolated and as not interacting socially, social constructivism was embraced the PBL (project-based learning) activities. This served to complement shortfalls in cognitive constructivism, relating to knowledge acquisitions only.

Social constructivism

Vygotsky (1978) posits that effective learning lies in the nature of social interaction between pre-service teachers. Some visible doctrines are engagement of the pre-service teachers in intra-psychological and inter-psychological. The inter-psychological or the lower mental function is characterized by the knowledge constructor interacting socially with knowledgeable individuals (Berge, 1999). PBL is important in the inter-psychological plane. This terminology plays a role in the understanding of an individual's environment. Language is used to direct or command thus an individual is regulated. The intra-psychological plane/level, also known as the higher mental function, a learner assimilates or accommodates and internalizes knowledge initially externalized (McRobbie & Tobin, 1997) while adding personal value to that knowledge (Vygotsky, 1978).

Vygotsky defines knowledge as temporary and developmental and is mediated by tools such as language. Social constructivism emphasizes the idea that students develop their own understanding that makes sense to them through interaction with knowledgeable individuals who are able to scaffold them (Schunk, 2000). The gained knowledge is internalized individually as supported by McRobbie and Tobin (1997), PBL project for pre-service teachers also enhance knowledgeable individuals to interact and communicate with each for knowledge construction or acquisition.

The social constructivist theory assisted in understanding how pre-service teacher construct knowledge makes sense of PBL approach (Hodson & Hodson, 1998). Additionally, social constructivism helps to guide the study in order to understand how the pre-service teachers collaborate, mediate learning and make sense of PBL concepts to improve their skills of developing learning and teaching support materials (LTSMs).

A critical understanding of PBL literature

Problem-based learning curricula module should provide students with guided concepts in learning through solving complex, real World problems. According to Barrows and Kelson (1995), PBL was designed with several important goals. It was designed to help students 1) construct an extensive and flexible knowledge base; 2) develop effective problem-solving skills; 3) develop self-directed, lifelong learning skills; 4) become effective collaborators; and 5) become intrinsically and extrinsically motivated to learn.

Hmelo-Silver & Pfeffer (2004) posits that the model of PBL in medical school involves an integrated, interdisciplinary curriculum organized around problems rather than subject domains. Lecturers must assess students in specific subject areas and it requires careful planning to engage in PBL in 50-min class periods. This idea is contradictory to one of the PBL tenets of encouraging students to develop flexible knowledge and effective problem-solving skills.

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Constructing extensive and flexible knowledge goes beyond having pre-service teachers learn the facts of a domain. It involves integrating information across multiple domains. UNA allocation of pre-service teachers was aligned to integrating pre-service teachers from different discipline into a group, in order to encourage pre-service teachers to develop flexible knowledge and effective problem-solving skills. Discussing problems in a PBL group before beginning to research it, activates relevant prior knowledge and facilitates the processing of new information (Schmidt et al., 1989). UNA engagement of pre-service teachers in the class before the commencement is a challenge that needs attention because pre-service teachers are able to construct new knowledge when they can relate it to what they already know (Bransford & McCarrell, 1977).

According to Larmer, Mergendoller, and Boss (2012), the implementation of project-based learning provides opportunities to develop and promote several skills that are useful in real life. UNA's idea of implementing PBL at Year 3 level for education pre-service teachers is aligned with Barrows and Kelson (1995), Larmer, Mergendoller, and Boss (2012), engaging pre-service teachers with skills needed to cope for the SBS and beyond. Skills needed by pre-service teachers as part of project-based learning include problem-solving, time management, collaboration and team-work, communication, critical thinking, and taking responsibility. Problem solving skill might help in solving problem at school during SBS. Time management skill will equip the pre-service teachers to be on time and finish on time when teaching. Collaboration and team work skills might enhance the pre-service teachers to work as a team during SBS at school. Communication, critical thinking, taking responsibility and self-directed learning are needed for the self-reliance of pre-service teachers as a professional in the field of education (Yasin, Mustapha, & Zaharim, 2009).

3. Research Methodology

Research design

According to Polict, Beck and Hungler (2001), a research design is a "researcher's overall strategy for answering the research questions or testing the research hypothesis" (p. 167). A case study research design and a quantitative research approach were used in this paper.

Sample

The sample consisted of 87 pre-service teachers' teacher from two UNA Campuses for quantitative data. 45 pre-service teachers were from campus one and 42 pre-service teachers were from campus two. All the respondents in the research were Year 3 pre-service teachers who did school based studies (SBS) in Year 1 and Year 2 of UNA Educational teaching Programme. These students were selected based on their availability. Allocation of PBL project was done by PBL coordinator.

Research instruments

The study used questionnaire as research instruments for generating data. A

questionnaire was used because it allows more opportunity for self-experience by respondents.

Data collection

The researchers used a questionnaire for data collection. The questionnaires were administered to 87 pre-service teachers, which embraced a bigger number of responses and reflection about PBL.

Data analysis

The quantitative data was analyzed using Statistical Package for the Social Sciences (SPSS).

4. Results

The graph shows the overall view of the respondents in percentage with regards to each question. The questionnaire used in this project was made of various statements the respondents had to indicate whether they strongly agree (SA), agree (A), undecided (U), disagree (D) and strongly disagree to each statement made.

The graph below (**Figure 1**) shows the respondent in percentage to the view of lecturer monitoring their PBL project. To explain the results, most responses were strongly agreed with 49%, agreed with 42% at C1 campus. C2 campus respondents have 29% and 52% strongly agreed and agreed respectively. This reflected that lecturers monitored the project; this is aligned with constructivism concepts of knowledgeable person interact with the pre-service teachers for successful learning process. Constructivism entails personal studying, learning and constructing knowledge with emphasis on mental development and alertness as pre-service teachers are not blank slates during PBL interaction.

The graph below (**Figure 2**) shows the respondent in percentage to the view of lecturer helping during their PBL project. To explain the results, most responses
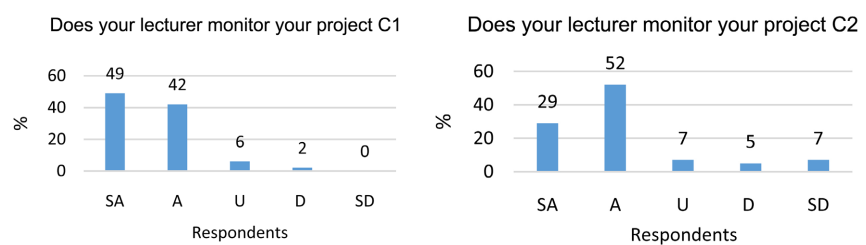

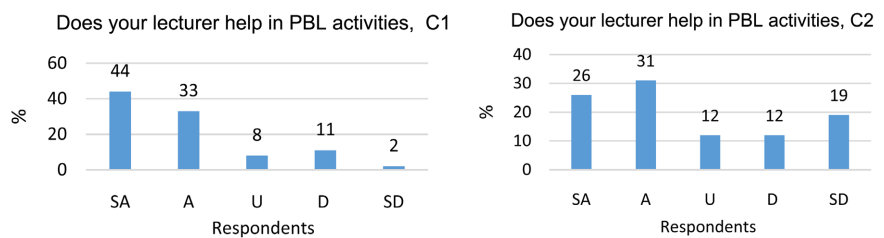**Figure 1.** Does your lecturer monitor your project?

Figure 2. Does your lecturer help in PBL?

were strongly agreed with 44%, agreed with 33% at C1 campus. C2 campus respondents have 26% and 31% strongly agreed and agreed respectively. This tells that the role of lecturers help during PBL has a great contribution to the success of the project.

The graph below (Figure 3) shows the respondents in percentage to the view of lecturer giving constructive feedback to pre-service teachers about their PBL project. To explain the results, most responses were strongly agreed with 22%, agreed with 42% at C1 campus. C2 campus respondents have 14% and 31% strongly agreed and agreed respectively and 26% disagree and 19% strongly disagreed, it indicates that giving constructive feedback at C2 was a challenge. This is an indication that some lecturers don't give constructive feedback. This is in contradiction with the constructivism theory. Cognitive constructivism draws on the developmental work of Piaget et al. (1977), who alluded that learning occurs by an active cognitive construction of meaning rather than being a passive recipient of knowledge.

The graph below (Figure 4) shows the respondents in percentage to the view of UNA providing resources during their PBL project activities. To explain the results, most responses were disagreed with 18%, strongly disagreed with 44% at C1 campus. C2 campus respondents has 26% and 48% disagreed and strongly agreed respectively. The explanation emanating from this result across the two campuses is that UNA doesn't support the pre-service teachers with materials for the PBL project.

The graph below (Figure 5) shows the respondents in percentage to the collaboration among the respondents when doing their PBL project. Most responses were strongly agreed with 49%, agreed with 42% at C1 campus. C2 campus respondents have 43% and 33% strongly agreed and agreed respectively.
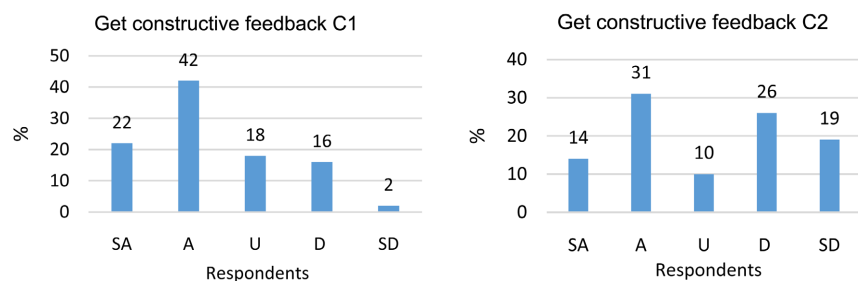

Figure 3. Get constructive feedback from your supervisor [communication].
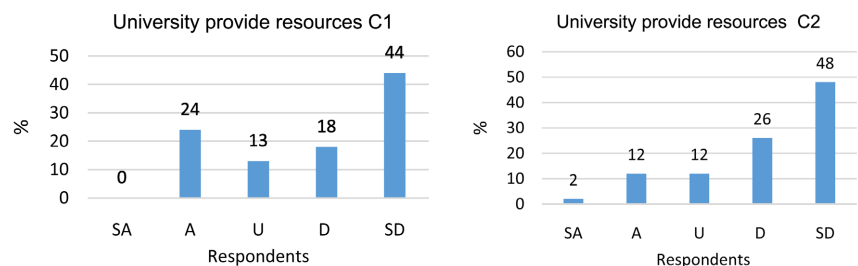

Figure 4. University provide resources.

Collaborations aligned with constructivism theory pre-service teachers learn from each other as result of social interaction to enhance the success of the project. Vygotsky (1978) posits that effective learning lies in the nature of social interaction between individual and their peers.

The graph below (Figure 6) shows the respondents in percentage over PBL respondents disrupting the project activities. Most responses were disagreed with 36%, strongly disagreed with 31% at C1 campus. C2 campus respondents has 19% and 40% disagreed and strongly disagreed respectively. No disruption from respondents, collaborations prevailed, pre-service teachers being able to work together to solve problems or answer questions and assume shared responsibility for completing the project (Vygotsky, 1978).

The graph below (Figure 7) shows the respondents in percentage to the view of consultations with their lecturers when doing their PBL project. Most responses were strongly agreed with 64%, agreed with 24% at C1 campus. C2 campus respondents have 78% and 19% strongly agreed and agreed respectively. Consultations aligned with constructivism theory, pre-service teachers learn from each other as result of social interaction to enhance the success of the project. Social constructivism emphasizes the idea that pre-service teachers develop their own understanding that makes sense to them through interaction with knowledgeable individuals who are able to scaffold them (Schunk, 2000).

The graph below (Figure 8) shows the respondents in percentage to the benefit of PBL project activities. Most of the responses were strongly agreed with 56%, agreed with 29% at C1 campus. C2 campus respondents have 45% and 29% strongly agreed and agreed respectively. Benefits concurred with Yasin, Mustapha and Zaharim (2009) self-reliance as a professional in the field of education.

The social constructivist theory assisted us to understand how pre-service teachers' socially constructed knowledge makes sense of PBL activities coming
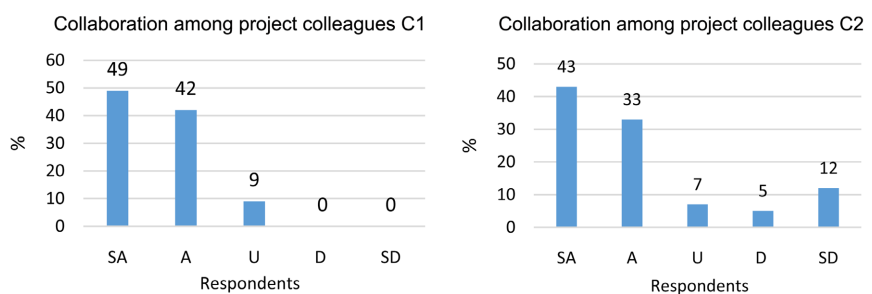

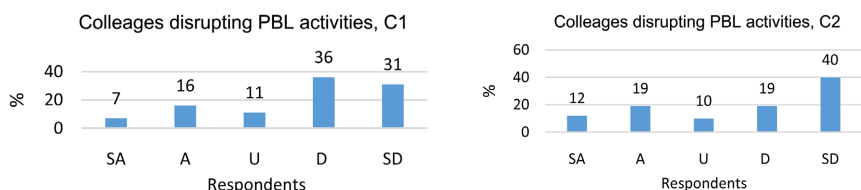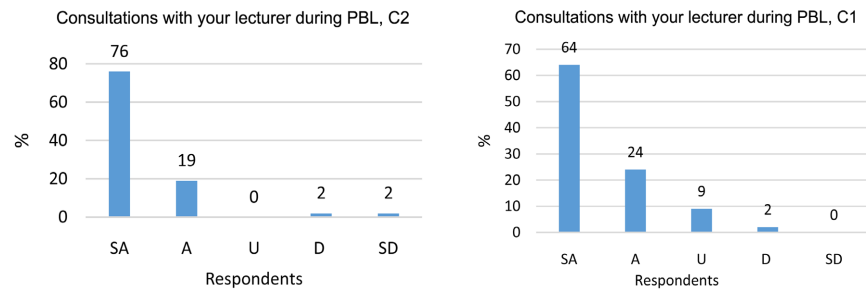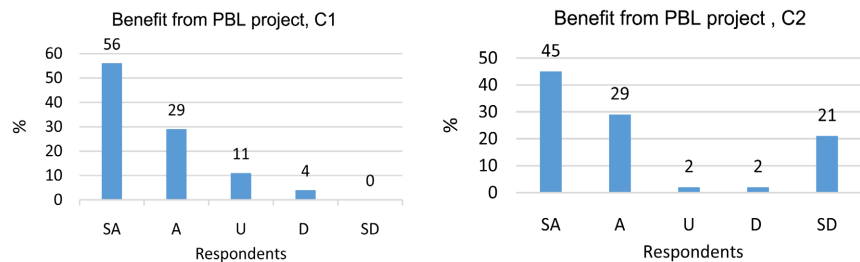Figure 5. Collaboration among project colleagues.

Figure 6. Colleagues disrupting PBL activities.

Figure 7. Do you consult your lecturer during PBL project [communication].

Figure 8. Benefit from PBL projects.

up with learning and teaching materials to be used for class room teaching (Hodson & Hodson, 1998).

5. Discussion

The problem that this study aimed to address was exploring and mediating the problem pre-service' teachers might have experienced during the PBL activities at the University of A, during their project based learning activities. The research questions aiming to address this problem was structured in Likert scale type of questions with strongly agreed (SA), agreed (A), Undecided (U), disagreed (D) and strongly disagreed (SD) as respondent choices for each question. Project-based learning was implemented as a strategy to develop skills that pre-service' teachers need for life term learning. It was discovered that the pre-service teachers had not had previous exposure to project-based learning research before.

Pre-service teachers' response frequency on collaboration as the particular skill that they developed the most during the project based activities was, explicitly reflected in **Figure 5**, their collaboration skills has improved and encouraged them to partake in a project-based activity. Collaborative planning is a skill that forms an essential part of the project-based learning process, where collective planning was the core foundation (Wurdinger & Qureshi, 2015: p. 285).

It is possible that the pre-service teachers already had some time management skills when they started their SBS, during the first and second year of their teaching career. It was expected that the challenges that pre-service teachers were confronted with in the project-based learning module, would solidify collaboration skills and provide opportunities for continuous professional development (CPD) as a teacher.

In a nut shell summary of types of skill benefited as reflected in the study can be enumerated as follows., critical thinking, collaboration skills, communication skills, creativity and innovation skills, self-reliance or directing skills, international or global connections, local connections, use of information technology (IT) skills. These skills are the tenets for 21st century upward for school based studies, teaching practice and learning in the pre-service teachers' program.

6. Conclusion

The findings from this study indicate that the implementation of PBL in the pre-service teacher program allowed respondents to experience the development of several important skills and subject content in a practical real life. Project-based learning is a suitable module needed for self-reliance of pre-service teachers' preparation of the teaching job market. Project-based learning as revealed in literature reviewed contributed to the development of the indispensable 21st century skills needed in teaching profession.

7. Recommendation

From the findings of this study, the following recommendation was suggested to the management or coordinator of PBL project for sustainability of PBL at UNA.

UNA module developers should provide project-based learning curricula, to provide pre-service teacher with guided concepts in learning through solving and constructing knowledge.

UNA to provide resources for the PBL projects is having same duration of about 12 weeks same with School Based Studies.

Coordinators of PBL project must make it a mandatory event for Lecturers to give their pre-service teacher constructive feedback.

At least one to two weeks PBL tutorial classes should be provided for pre-service teachers before engaging them on 12 week projects duration. This coincides with the response in Figure 7 indicating strongly agreed with 64%, agreed with 24% at C1 campus respondent and C2 campus respondents have 78% and 19% strongly agreed. The consultation with the lecturers was because of state of confusion, pre-service teacher not knowing exactly what to do at initial on-set of project based activities.

Collective presentation of PBL project should be encouraged for the benefit of other pre-service teacher. Constructivism theoretical approach to learning should be emphasized in all the modules not only PBL, pre-service teachers learn better when they are socially interacted with each other.

Area of specialization needs to be considered when allocating pre-service teachers to lecturers for PBL project activity.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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