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Full Length Research Paper

Theme: The 21st century adult learner

Lopez Brown, P.

Faculty of Education and Arts, University of Belize. Belize.

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Problem-based learning is an innovative educational approach that is gaining prominence in higher education using "real world" problems or situations as a context for learning. The present study explored the use of problem-based learning with teacher trainees of the University of Belize. Using a concurrent mixed method design with 74 teachers in training from the Belmopan and the EU Sugar Belt Project in the Orange Walk and Corozal Districts, teachers in training were immersed in the development and application of Problem-Based lessons, and learning centres. Identified in survey instruments is that, problem-based learning can be applied across all areas of study of Belize's Primary and Lower Secondary curricula by aligning concepts with authentic problems stimulates critical thinking, and provides the use of a pragmatic approach to teach real- life concepts. Responses from focus group interviews and application of Problem-based learning centres with primary and secondary students are that this inductive model of teaching stimulates higher order learning when compared to other traditional pedagogical practices.

Key words: Problem-based learning, critical thinking, cooperative learning.

INTRODUCTION

The report entitled, Challenges and Opportunities in Belize Education Sector denotes that "Belize is paying a lot for education but getting little. More youth are outside the school system than in it, and many fails to make the transition to the workforce. More and more youth drop out of school, and become involved in gang activities. While the challenges are great, the recommendation is to focus on increased efficiency, quality and equity (2013).

It is suggested by this report that there is a need to examine Belize's Education System with increased attention on teacher training, and quality of education delivery at all levels. The phrase "getting little", which is synonymous to the term diminishing returns, also alludes to a lack of meaningful and relevant education in Belize. While this research study cannot address factors, which impede quality educational delivery, what is emphasized herein are best practices to improve the training of teachers and promote 21st century thinking skills including creative thinking, collaboration and innovative pedagogy (Carroll, 2007; Trilling and Fidel, 2009). Efforts to assess effectiveness of Problem-Based Learning are aligned to contemporary research findings which suggests that 21st Century Learning Skills are critical for accomplishing transformation in educational delivery and student achievement.

There are many proposed instructional strategies to raise standards as evidenced using effective pedagogy and acquisition of skills. What is important is an

E-mail: plopez@ub.edu.bz.

understanding of how students learn, including the importance of fostering metacognitive thinking, and immersing teacher trainees in authentic experiences to promote higher order of thinking.

This involves the use of planned activities, knowledge of one's own thought processes, beliefs and intuitions (Schoenfeld, 1992). Essentially, the use of problem-based learning at the tertiary level of training in Belize must include opportunities for instructional practices to connect prior knowledge to new learning (National Research Council, 2000).

LITERATURE REVIEW

21st century teaching and learning methodologies are reflective of practices aimed at engaging students in cognitive learning, and the development of higher order thinking skills (Christensen, 2008; National Academies of Science, 2007).

This research study focus on the effective use of problem-based learning as a viable instructional method that challenges students to "learn to learn", and to working cooperatively in groups to seek solutions to real world problems (Duch et al., 2001).

Using the sociocultural theory as the basis for social interaction and language within a cultural context, students refine problems, develop research questions, investigate topics using a wide variety of primary source materials and engage in critical thinking activities to identify possible solutions to real world problems (Johnson, 2009). It is envisioned that promotion of a critical thinking learner centred approach within teacher training institutions in Belize will:

1. Foster high levels of thinking and engagement among teacher trainees;
2. Promote application of more meaningful teaching and learning activities across all levels of schooling;
3. Reinforce the need for effective use of collaborative strategies for self-regulation of learning;
4. Support approximating understanding/use of prior knowledge to meaningfully construct understanding.

Research context

The University of Belize is an English-speaking multi-locational institute for higher education, and the national university of Belize. The university's vision is to foster Belize's development by preparing graduates for a future of dynamic change with relevant knowledge, lifelong skills, for continuous empowerment. It is with this vision that the Faculty of Education and Arts consistently evaluates its teaching approaches to keep abreast of the emerging needs of learners, stakeholders and Belize. Teacher training programs accessible in Orange Walk, Corozal, Belize, Belmopan, and Punta Gorda promote the most innovative pedagogy to address the changing dynamics among students and the various school systems. This research then explores the importance Problem-Based Learning including the use of metacognitive activities to assist teacher trainees to garner skills to promote critical thinking and problem solving skills.

Overview of problem based literature

In recent years, problem-based learning has taken on a greater prominence in tertiary education directed at independent and team learning. It incorporates a variety of methods: peer teaching, collaborative learning, metacognitive skills, self-regulation, and use of cognitive apprenticeship (Creedy and Hand, 1995).

Proponents of the Sociocultural Theory suggest that Problem-Based Learning is grounded on constructivist assumptions that: knowledge is co- constructed in social learning groups, knowledge is developed in meaningful contexts, and knowledge is anchored in and indexed by relevant contexts (Barrow, 1996; Marra et al., 2004).

What's more is that the constructs for teaching Problem-Based Learning are very different from traditional classroom/lecture teaching because it fosters independent thinking as opposed to conventional direct instruction and rote learning (Wells et al., 2009). A major thrust is the interactive dynamism among learners fostering analytic student-centred thinking in collaborative learning groups (Enger et al., 2002; Wee and Kek, 2002).

Knowledge construction within meaningful contexts is rooted in situated learning (Hung, 2002). Situated learning or situated cognition suggests that meaningful learning is embedded in activities that promote exploration of the environment (Dewey, 1903, 1961).

Consequently, schools should take advantage of children's natural curiousity by bringing the outside world inside, and the need for memorable representations of concepts (Jonassen, 2006, 2010). While Problem-Based Learning is a viable model to promote critical thinking, lectures remain the dominant pedagogical strategy (Bligh, 2000; Pascarella and Terenzini, 2005).

Instructors need to be cognizant that in lecture type instructional settings, students are less actively involved than their instructors perceive them to be. Approximately, one-half of students' time during lectures is spent on thinking about things unrelated to the lecture content (Johnstone and Su, 1994; Milton et al., 1986). If 21st century learners are to be educated in the process of developing critical thinking, problem solving, and communication skills, use of meta-level cognitive activities for lifelong learning is of paramount importance.

While skill development is a vital component of problem-based learning, teachers must also skilfully seek opportunities for students to think, reflect and become engaged in meaningful activities (Hacker et al., 1998).

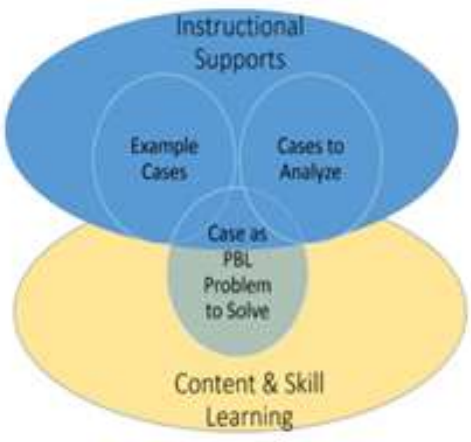

Figure 1. Relations between case functions and problem based learning (PBL) (Source: Marra et al. (2014) Journal on Excellence in College Teaching).

This has to do with identifying activities to promote metacognition which is critical awareness of one's thinking and learning as a thinker and learner (Flavell, 1987; Hmelo-Silver, 2004).

Additionally, teachers need to develop authentic *in situ* experiences. *In situ* problems are represented in cases providing opportunities to draw on prior knowledge to solve problems to learn content and skills (Jonassen, 2010). Case studies require contextually relevant problems to facilitate interdisciplinary learning by making meaningful connections between specific topics and real world societal issues, and applications (Bonney, 2013).

Although case studies appear to be significantly more effective than other methods, production of novel case studies is time consuming and requires skills not all instructors have perfected. Despite the assumption that authentic cases are not easy to develop, a recent study to assess perceptions of learning gains using case study revealed positive correlations associated with oral and written communication skills, and the ability to make connections with real life situations (Bonney, 2015).

As shown in Figure 1 (Marra et al., 2014), Case studies are pivotal to teach content and skills to promote analytical thinking. That is, students assume responsibility for their own learning by interpreting authentic problems, monitor their own learning and apply their background knowledge to solve problems (Jonassen, 2014; Prince, 2004).

Apparent is that case studies are an integral component of problem-based learning, and provides opportunities for students to synthesize complex analytical questions. It also increases self-efficacy for learning and performance by providing opportunities to view issues from multiple perspectives (Yalçınkaya, 2012).

Even as problem-based learning is a viable model for 21st century learners, there are notable limitations. The first is that instructors must invest more time to assess learning. This includes identifying suitable performance assessment to assess levels of competence and skills to perform an activity or create a product (Airasian, 2000). This can only occur if teachers can skilfully assess students' engagement and learning in social learning groups (Sockalingam and Schmidt, 2011; Zimmerman, 2002; Zimmerman and Moylan, 2009).

Teachers must also be skilled at identifying tasks and activities that would question students' knowledge, and beliefs in order to steer them in the right direction. Even as it is recognized that teachers should possess a multiplicity of skills, problem-based learning may be foreign to some instructors; hence they may experience difficulty altering their traditional teaching styles (Reithlingshoefer, 1992; Wood, 2003).

An exploratory study

An exploratory design is a viable research design to investigate a research problem when there are few or no earlier studies to refer to (Ballard, 1990; Barbie, 2007). The primary purpose of this exploratory study is to gain insights into the use of problem-based learning as a viable 21st century learning tool. The Mann-Whitney U test, a rank-based nonparametric test, was used to determine if there are differences between two groups of teachers in training on a continuous or ordinal dependent variable. Pallant (2009) posits that the Mann-Whitney U test is a robust non parametric test to assess independence of observations. The following assumptions for use of the Mann-Whitney U test were accounted for in this study:

Assumption 1: One dependent variable was measured at a continuous or ordinal level. The ordinal variable used was a 5 point Likert Scale to assess perceptions of effective use of Problem Based Learning.
Assumption 2: One independent variable consisting of two categorical independent groups. Examples include gender and teaching experience.
Assumption 3: Use of independent observations. In this study there was no relationship of the independent variable or between the groups themselves. That, is the participants on UB's Belmopan campus differ from those in the EU Sugar Belt Project.
Assumption 4: Assessment of the distribution of ratings of both groups. This is accounted for in the comparison of variables: males and females, type of training, and qualifications

Research problem

This study was guided by the following research problem: How and why is problem-based learning a useful

approach in teacher education/training?

Research questions

1. Can use of Problem-Based Learning promote opportunities for active engaging and knowledge construction?
2. Can Problem-Based Learning activities promote the development of self-directed learning?
3. Can use of Problem-Based Learning activities provide context to foster critical thinking?
4. Can use of Problem Based Learning Centres promote collaborative learning?

In addition to the research problem and questions, to guide the analysis of data, the following null hypothesis was utilized:

There is no significant difference in perceptions of the effective use of problem-based learning among students enrolled in teacher education programs in the European sugar belt program, and those enrolled at the University of Belize central campus in Belmopan.

MEHODOLGOY

A study was undertaken with a convenience non-probability sample of teacher trainees enrolled in methods classes on the University of Belize Central Campus in Belmopan and in the European Union Accompanying Measures for Sugar Project in the North of Belize. The methodology was largely quantitative. Qualitative data were also collected from open-ended items and focus group responses. The data was collected over a four month period commencing January to April 2016. In the first stage, teacher trainees were trained to teach using Problem-Based Learning. Thereafter, they developed problem-based lesson plans, and learning centres. Students also taught problem-based lessons at the primary and secondary levels of schooling in 26 schools to assess whether this inductive module of teaching:

1. Promoted opportunities for active engaging and knowledge construction
2. Promoted the development of self-directed learning
3. Provided context to foster critical thinking
4. Promoted collaborative learning

A 5 point Likert scale instrument consisting of 4 statements in each of the following categories was used to collect the quantitative data: Constructive/active learning, Self-directed Learning, Contextual Learning, and Collaborative Learning. The average inter-item correlation revealed 0.7 “Cronbach’s alpha (α). Conventionally editors and reviewers consider a measure of alpha 0.70 as reliable for research purposes (Bland and Altman, 1997; Helms et al., 2006).

RESULTS

Mean participant age was 32 years (SD=7.55). Twenty-one participants (36.8%) were male and thirty-six (63.2%) were female. Twenty-eight (51%) highest qualification was that of an associate’s degree, twenty-four (43.6%) bachelor’s degree, and three (5.4%) with a master’s degree. Forty (71.4%) are in-service teachers, and two (3.6%) pre-service teachers. Fourteen (25%) are in training with no teaching experience.

Table 1 shows the means, standard deviation and internal consistency (Cronbach’s α) for each of these sub-scales of the 5-point Likert scale ratings 1 to 5. The data revealed that all four measures: opportunities for active engaging and knowledge construction, development of self-directed learning, provide context to foster critical thinking and promote collaborative learning were very high (mean=4.7053; mean=4.4842; mean=4.5643 and mean=4.5929, respectively). Scores for items on constructive and active learning were the highest while the scores on self-directed learning were the lowest.

Perceptions of the effectiveness of problem-based learning to provide opportunities for active engaging and knowledge construction were the same for males and females (*Mann Whitney test*: *p*=0.639). Similarly, perceptions of the effectiveness of problem-based learning to provide opportunities for active engagement and knowledge construction were the same for participants in Belmopan and Orange Walk/Corozal (Mann Whitney).

However, the perception is different among participants with different professional qualification and with different teaching experience (*Kruskal-Wallis Test*: p=0.025 and p=0.023, respectively). Compared to participants who possess bachelor’s degrees and master’s degrees, participants who possess associate’s degrees had greater propensity to feel that Problem-Based Learning provides opportunities for students to engage in active learning and knowledge construction (p=0.035).

Also revealed is that pre-service teachers had a greater propensity than other teachers to feel that Problem-Based Learning was not as effective in providing students the opportunity in active learning.

What was indicated by this finding is a consistency of beliefs that Problem-Based Learning provided opportunities for students to be actively engaged in knowledge construction. This aligns to a national survey of public school teachers in the U.S which revealed that they were most likely to use Problem-Based Learning in their classrooms which promotes 21st century skills such as collaborative learning and presentation techniques (Bradley and Mosier, 2014) (Table 2).

Perceptions of the effectiveness of problem-based learning towards development of self-directed learning was the same between genders, among participants with different professional qualification and among those with different teaching experiences (Mann-Whitney test: p=0.065; Kruskal-Wallis Test: p=0.411; Kruskal-Wallis Test: p=0.512, respectively). These quantitative findings are supported by trainees’ responses to open ended

Table 1. Mean, standard deviation and internal consistency (Cronbach's α) for each sub-scale.

Scale	Mean	Std. deviation	(Cronbach's α)
Opportunities for active engaging and knowledge construction	4.7053	0.04787	0.793
Development of self-directed learning	4.4842	0.05772	0.699
Provide context to foster critical thinking	4.5643	0.05622	0.767
Promote collaborative learning	4.5929	0.06303	0.818

Table 2. Rating of effectiveness of problem based learning to provide students with the opportunity for active engaging and knowledge construction.

Sub-scale	Strongly agree (%)	Agree (%)	Undecided (%)	Disagree (%)	Strongly disagree (%)
Assume responsibility for investigating the problem	43 (75.4)	14 (24.6)	0 (0)	0 (0)	0 (0)
Construct understanding with peers	42 (73.7)	14 (24.5)	1 (1.8)	0 (0)	0 (0)
Vocalize their thinking	33 (58.9)	22 (39.3)	1 (1.8)	0 (0)	0 (0)
Think critically	44 (77.2)	13 (22.8)	0 (0)	0 (0)	0 (0)
Build on existing knowledge/skills	43 (76.8)	10 (17.8)	3 (5.4)	0 (0)	0 (0)

items which denote that:

1. Problem based learning (PBL) would be an excellent instructional approach for the 21st century learners. We must move away from traditional ways of teaching and allow our learners to gain knowledge through experience and practical/hands-on activities. It is through this means that our learners will retain content for life and not merely for testing. PBL can create more meaningful lessons, ones our students would appreciate and they would also want to always be a part of (Trainee #27).

2. Problem-based learning is a solid approach because it is a student-centred approach where students learn and use their critical thinking and cognitive skills. To be better at solving any scenario or problem and the 21st century students are more efficient in doing work and pair share work. (sic. #28).

3. It is a productive learning strategy. It makes student aware and able to easily understand how the modern society works. They are also introduced to the actual work that would be conducted in their career. It gives them the experience one cannot get from learning theory alone (Trainee #29).

Noteworthy are the beliefs that problem-based learning promotes active engagement and these align to studies with medical students who indicated that clinical performance was enhanced through use of active engagement in real life experiences. Shown is that active learning is embedded in research studies which illustrate that problem-based activities develop deep understanding of important ideas and thoughtful engagement (Colliver, 2000) (Table 3).

Perceptions of the effectiveness of problem-based learning to provide context to foster critical thinking was the same between genders, among participants with different professional qualification and among those with different teaching experience (Mann-Whitney test: p=0.328; Kruskal-Wallis Test: p=0.199; Kruskal-Wallis Test: p=0.149, respectively).

Also revealed is that respondents perceived that when students are intrinsically motivated to succeed, they perform better in high cognitive tasks (Pink, 2011). Suggested is that self-motivation is an integral benefit of PBL. Further indicated by the qualitative data is that teacher trainees conceded that:

1. The use of the model was quite useful in having the students get a greater grasp of the content. It allowed them to think outside of the box. The only issue I encountered was executing a learning center in all my classes. It is quite a disadvantage at a high school level when the teacher meets the students in different home-rooms" (sic.# 17)
2. It does suit children needs since it opens their minds to look up solutions by themselves hence learning how to tackle real-life situations (sic. # 35)

Identified in these perspectives is that teachers enrolled in methods classes view self- directed learning as an integral component of problem based learning. These perceptions align to standards for the 21st century learner (2009) which denote that learners should "pursue personal and aesthetic growth including adaptability, managing complexity, and self-direction (Greene andAzevedo, 2010) (Table 4).

Table 3. Rating of effectiveness of problem based learning to provide students with the opportunity for development of self-directed learning.

Sub-scale	Strongly agree (%)	Agree (%)	Undecided (%)	Disagree (%)	Strongly disagree (%)
Compare and contrast two or more things or ideas	33 (57.9)	22 (38.5)	1 (1.8)	0 (0)	1 (1.8)
Make predictions and observe what occurs	33 (57.9)	22 (38.6)	2 (3.5)	0 (0)	0 (0)
Identify a cause and effect	28 (49.1)	23 (40.4)	6 (10.5)	0 (0)	0 (0)
Search for various resources of information	27 (47.4)	26 (45.5)	3 (5.3)	1 (1.8)	0 (0)
Become self-directed learners	37 (64.9)	17 (29.8)	3 (5.3)	0 (0)	0 (0)

Table 4. Rating of effectiveness of problem based learning to provide students with the opportunity to foster critical thinking.

Sub-scale	Strongly agree (%)	Agree (%)	Undecided (%)	Disagree (%)	Strongly disagree (%)
Apply knowledge to discuss a problem	32 (59.3)	20 (37)	2 (3.7)	0 (0)	0 (0)
Apply knowledge to other situations/problems	32 (58.2)	21 (38.2)	2 (3.6)	0 (0)	0 (0)
Making learning meaningful by connecting to real life examples	40 (71.4)	14 (25)	2 (3.6)	0 (0)	0 (0)
Foster interdependence	28 (50)	23 (41.1)	5 (8.9)	0 (0)	0 (0)
To not only learn the content but to interpret why or how it is used	36 (65.5)	18 (32.7)	1 (1.8)	0 (0)	0 (0)

Perception of the effectiveness of Problem-Based Learning towards promoting collaborative learning was the same between genders, among participants with different professional qualification and among those with different teaching experiences (*Mann-Whitney test*: *p*=0.909; *Kruskal-Wallis Test: p*=0.723; *Kruskal-Wallis Test*: p=0.230, respectively).

Revealed is consistency in the view that Problem-Based Learning promoted critical thinking among students as indicated in focus group responses:

1. Problem-Based Learning helps address students' learning needs. It fosters critical thinking and allows for cooperative learning. Also the only thing for me is that it is difficult to apply for all subjects. It is easier for Math Problem Based Learning allows for our students to develop their critical thinking skills, learn to work with groups and develop teamwork (sic. #3)

2. For teaching it is a good model if we want our students to become critical learners and for them to take responsibility of their learning. At the same time to use what is learned now to solve a problem and apply it in daily life problem to solve problem (sic. #4)

3. The study believes that problem based learning helps address students' learning needs. It fosters critical thinking and allows for cooperative learning. Also, the only thing for me is that it is difficult to apply for all subjects. It is easier for Math and Science based subjects (Trainee #5)

These perceptions align Problem-Based Research which denotes that this inductive model of teaching can potentially enhance critical thinking supported by strategic implementation and supportive facilitation (Jonassen, 2014) (Table 5).

Most (53.5% to 73.2%) of the respondents strongly agree that PBL effectively promotes collaborative learning by providing opportunities for students' initiated discussion, co-constructing understanding, working with more accomplished peers, critical thinking and cognitive modelling of ideas. Few respondents (1.8% to 5.4%) have a neutral view of this. Similarly, few respondents (1.8% to 3.6%) disagree that PBL promotes co-construct of understanding, provided opportunity for students to work with more accomplished peers, and stimulated critical thinking.

Nevertheless, less than 5% of the respondents perceived that collaborative learning was unsuited, 95% were of the view that sociocultural activities provide meaningful learning opportunities. That is, students benefitted from meaningful engagement in communities of learning. Perceptions of the importance of collaborative learning in qualitative data indicate that:

Table 5. Rating of effectiveness of problem based learning to provide students with the opportunity to promote collaborative learning.

Sub-scale	Strongly agree (%)	Agree (%)	Undecided (%)	Disagree (%)	Strongly disagree (%)
Students initiated discussion	30 (53.5)	23 (41.1)	3 (5.4)	0 (0)	0 (0)
Co-construct understanding	33 (58.9)	21 (37.5)	1 (1.8)	1 (1.8)	0 (0)
Work with more accomplished peers	37 (66.1)	16 (28.5)	1 (1.8)	2 (3.6)	0 (0)
Stimulates critical thinking	41 (73.2)	13 (23.2)	1 (1.8)	1 (1.8)	0 (0)
Cognitive modelling of ideas	41 (73.2)	13 (23.2)	2 (3.6)	0 (0)	0 (0)

1. This model of teaching will be useful and it will help students to better understand concepts. It will address students' learning needs because children will work in a group so they can help each other. I think it is something good to use in our classrooms. Some teacher might have used it but under different name (sic. #41).

The study perspective of the use of problem based learning as a 21st century instructional approach is a good one. As teachers are trying to promote student-centred classroom as well as enhancing students' critical thinking, this approach will guide and facilitate teachers to develop such skills (sic.#42). The study believe this model could assist students in becoming responsible for their own learning, and help them become critical thinkers. At the same time, students will develop other skills and attitudes that well assist them to do better and be productive individuals (Trainee #43).

CONCLUSION

The findings reveal that majority of students enrolled in education programs at University of Belize consider problem-based learning as an effective instructional tool to facilitate students' learning. This aligns to hundreds of comparative studies comparing problem based learning to traditional instruction (Kellner and Share, 2007; Perkins, 2008). The meta-analyses/systematic reviews on the use of problem base learning also point to positive results for cognitive, developmental, and affective outcomes (Gainer, 2010).

The p-value (> 0.05) as indicated in Table 1 concludes a failure to reject the Null hypothesis (H_0) indicating that there is no significant differences in perceptions of the effective use of problem based learning among students enrolled in the European Union Sugar Belt Program, and those in University of Belize's Central Campus for both genders. Shown is that participants who possess associate's degrees were less likely than other participants with higher education qualifications to believe that problem based learning provides opportunities for students to engage in active learning and knowledge construction. One challenge identified by respondents is the lack of resources to continuously implement problem based type activities.

Although it is important to examine generalizability, what is worth noting is that the findings of this study align to two comparative action research conducted during the period January to May 2016 in Belize to assess effectiveness of collaborative learning on performance. One study examined effectiveness of cooperative learning using multimedia sources and interactive techniques as tools for teaching clauses and sentence structure.

This study which was conducted with 9th grade students revealed that collaborative activities using technology improved students' ability to site clauses and improve writing skills (Wade, 2015; Babbie,1998). A second action research with 9th grade students to examine collaborative learning as an instructional tool to teach grammatical and mechanical structures revealed that the use of collaborative learning increased knowledge and performance of students with B and below average (Aguilar, 2016). What is illustrated is that the use of focused group activities can potentially aid in the development of higher levels of performance.

Even though there are multiple sources of evidence to support use of problem based learning in Belize, it could be informative to confirm these findings using a larger sample and repeating this study in the remaining five teacher training institutions in Belize. This would strengthen the assertion that the use of Problem Based Learning can promote critical thinking as an integral component of teacher training and educational delivery in Belize.

RECOMMENDATIONS

Based on observations of teaching practice in Belize, it is reasonable to conclude that it may be challenging for educators to smoothly transition from knowledge provider to facilitator of learning.

"The reality is that learners who are new to PBL require significant instructional scaffolding to support the development of problem-solving skills, self-directed learning skills, and teamwork/collaboration skills to a level of self-sufficiency where the scaffolds can be removed" (Savery, 2006).

To adopt a problem-based learning approach, teaching institutions must engage professional staff in extensive tutor-training programs in recognition of the critical importance of their role in facilitating the PBL learning experience. Recommended by theorist and Standford News Letter is the need for:

1. Clearly defined purpose for PBL engagement: This is important to ensure that clear learning goals and objectives are identified.
Professional development sessions for teachers. Professional development training is a major requirement to ascertain whether lecturers/teachers understand the theoretical foundations of PBL which requires a pragmatic approach to teaching.
2. Development of structured problems: Instructors must develop skills to write relevant problems to facilitate critical thinking and reflection.
3. Use scaffolding skills and less direct instruction: Emphasis on guiding learners to seek answers, ask questions and to extend their thinking must become the major focus of PBL activities.
4. Plan for collaboration among learners: This must include opportunities for co-construction of knowledge and the development of meaning verbal learning promoting building on prior knowledge and conceptual understanding.
5. Assess authentically: Real- life task must be assessed using alternative means of assessment.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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