PROBLEM-BASED LEARNING: LITERATURE REVIEW

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Abstract

Problem-based learning is a learning strategy which begins and centres on a clinical problem. It has been used extensively in the medical faculty and until recently has been adopted in the nursing faculty and in clinical practice. The outcome of problem-based learning has been said to develop practitioners who are critical, reflective thinkers, self-directed and lifelong learners. Review of the literature points towards greater evidence for the effectiveness of problem-based learning in enhancing learning supporting for the possibility for its implementation in clinical nursing education.

Key Words: Problem-Based Learning, Clinical Practice, Teaching Strategy

Introduction

Problem-based learning (PBL) is not problem solving (Wood, 2003) or case-based instructions. PBL is a learning strategy which begins and centres on a clinical problem (Alexander, McDaniel, Baldwin & Money, 2002; Pross, 2002). It has its origin from the McMaster University and is widely used in the training of medical students (Barrows & Tamblyn, 1997). It was only until recently that problem-based learning was introduced into the faculty of nursing and more recently into clinical nursing practice. What evidence is there that learning has been effective in PBL?

This paper will present models of the processes of PBL. It aims to explore the literature for evidence of its effectiveness in enhancing the three domains of learning, namely knowledge, skills and attitudes. Implications for feasibility of implementation of PBL will be addressed.

Process of Problem-Based Learning

Barrows (1995) described the process in PBL as comprising four phases. The first phase involves learners reasoning through the problem and identifying their learning needs as a group. The second phase is a process of discovery as the learners conduct self-directed study. Group process occurs in phase three.

In this phase, each individual learner consolidates their research and applies new knowledge to the problem. The group also critiques their previous work. Phase four involves summary and integration. Wood (2003) described the Maastritch model of the 'seven jump' steps comprising of identifying and clarifying unfamiliar terms, defining problem, brainstorming, reviewing definition and discussion of brainstorming and arranging explanations and solutions, formulating learning objectives, private study, and lastly, sharing of results of self-study. Both the McMaster (Barrows, 1995) and the Maastritch models involve similar processes. There does not seem to be much difference in the processes presented. Amos and White (1998) identified seven outcomes of PBL; critical thinking through the process of reflection (Burton, 2000), learning how to learn, creativity in learning, link to community, teamwork, research skills and personal growth. The expected outcome from both programmes seems to be similar.
Effectiveness of Problem-Based Learning

知识

Patel et al (1998) 探索了实施 PBL 课程的影响，该课程的基础是传统的实习课程。十和十七名四年级学生分别随机分配到 PBL 和传统讲授教学小组。PBL 小组被安排收到十二次辅导，而传统讲授教学小组收到讲授教学课程。学生们被要求回答一个问卷，使用利克特量表 1 到 5 的方式来评价他们完成实习课程后的表现。研究结果表明，PBL 小组的学生认为自己获得了更多的理论知识，而没有 PBL 的小组则获得了理论知识的内化，能够将新知识与以前的学习联系起来。尽管使用的采样方法是一个随机分布，但不清楚为什么两个小组的分布不均匀，这可能导致研究结果的偏见。讲授教学课程的具体类型和数量也没有由研究人员指定，这可能会影响研究结果。尽管这项研究不能被一般化，但其对评价学习策略的科学证据的贡献不应被忽视。进一步的研究使用复制研究和更大的样本量可以得出更明确的结论。

Another study compared the examination results of 123 students from two randomly assigned cohorts, PBL and lecture based learning (Antepohl & Herzig, 1999). The setting for this study took on a similar profile as the study by Patel et al (1998) where PBL was introduced into a traditionally lecture based learning environment. At first scrutiny, there seems to be comparable result in the outcome of PBL and lecture based learning in the overall results, short essay questions and multiple choice questions. However, when compared to the results of the students from the PBL programme, the researchers inferred a tendency towards PBL in achieving better results in the short essay questions. The exact same findings were observed on the examination results of Chiropody students (Finch, 1999). PBL seems more effective in preparing learners for short essay questions which purportedly require more cognitive processing, reflection and integration of knowledge.

Prince et al (2003) conducted a study on Year 4 medical students across 8 Universities, including Maastritch University, comparing student perception and examination result on the content knowledge of anatomy. The study found no difference in the examination result for knowledge of anatomy with PBL and non PBL. The researchers concluded that PBL did not result in deficiency in content knowledge. However, focus group interview of clinical nurse educators on student’s performance assessed during clinical placement revealed lack of fundamental knowledge of anatomy and physiology (Williams, 1999). Most empirical evidence of content knowledge had found results for PBL to be of no significant difference or better. The study by Williams presents a subjective view of the nurse educators on the performance of the students. It may be possible that the nurse educators had higher expectations as there was no basis for comparison as in some other studies.

Skills

Frost (1996) conducted an analysis on the scope and practice of PBL and concluded that PBL is a promising alternative to subject-based, teacher-centred courses in closing the theory-practice gap. PBL seems to elicit survival skills for application into practice. A retrospective study was conducted as a follow-up of doctors and their performance after graduating from a PBL curriculum (Antepohl, et al). A 6-point Likert scale (0 to 5) survey
questionnaire was distributed to students who graduated in 1992 to 1999. Three hundred and thirty six responses (77%) were received from the graduates of the Faculty of Health Sciences, Linkoping University. All items showed good result with a mean of more than 3, except for items on ‘taking care of acute patients’. The highest score was seen on preparation for ‘patient communication’ followed by ‘overall preparation’ for professional practice with rating of 4.11 and 4.02 respectively. Developing ‘scientific attitude and critical thinking’, and ability to ‘collaborate with other health staff’ were the other skills that the graduates perceived they have attained. Outcome of the learning process through PBL presented in a qualitative study includes public speaking, computer skills, effective communication skills, problem-solving skills, and management skills (White, et al). In another study of 24 returning registered nurse students, evaluation of the students revealed seven outcomes of PBL: critical thinking, learning how to learn, creativity in learning, link to community, teamwork, research skills and personal growth (Amos & White, 1998; Doucet et al., 1998). Additional positive outcome of a successful programme included developing a working relationship and network through having worked together. Both empirical and qualitative data seem to point towards problem-based learning in developing an all-rounded practitioner with the skills required to tackle the realities of clinical practice.

There were also studies that aimed to identify specific outcomes of problem-based learning. Doucet et al (1998) conducted a study on family physicians comparing the impact on continuing medical education. One of the outcomes of the course was to assess the enhancement of clinical reasoning skill using the ‘key features problem’ (KFP) assessment tool developed by the researchers following the guidelines from Bordage & Page (1987) and Page & Bordage (1995) mentioned in the study. The key feature assessed the critical steps in resolution of a problem, in this case, the management of headache. The results of the study concluded that there was great improvement in clinical reasoning skills, scoring a mean of 34.75 for PBL as compared to 28.00 for lecture-based learning on a 38 item questionnaire based on clinical case problems. A difference of 25% was noted by the researchers as educationally significant. Participants from the PBL cohort also attributed that the learning was enhanced by the discussion which might have enhanced the process of attaining the clinical reasoning skill. The use of the KFP seems appropriate to assess clinical reasoning. The study sample, however were self-selected as randomisation was not possible as these were working physicians and additional time was required for the PBL cohort. The researchers have identified that more time was allocated to the problem-based learning cohort and cautioned that this probably attributed to a more positive result from the cohort. The study was not able to assess whether there was a change in the practice of the physicians after undergoing the course. This was mentioned by the researchers as a limitation.

Another study explored novice’s ability to think critically, manage complex patients and prioritise aspects of patient care when PBL was implemented into an orientation programme in an acute care tertiary hospital (Celia, 2001). A 6-item survey questionnaire was distributed to 26 novice nurses. The finding confirmed the aim of the programme in which the novice nurses were able to function confidently and comfortably in the clinical area. This was attested to by the preceptors and directors who seemed to be satisfied with the transition of the novices into clinical practice. The instrument used in the survey questionnaire was simple, thus it was not sufficiently extensive to be conclusive. The questions were not tested for reliability or content validity. Requirements relating to research protocols were inadequate. The study did not control for confounding variables such as different preceptors and facilitators. There was also no inter-rater reliability. The cohort for the preceptor, director and facilitator took on a qualitative interview approach and reporting of the interview were not extensive. The mismatch in the different methodology makes it difficult to correlate conclusively the findings from the nurses’ responses to that of the directors and preceptors. The sample size is small and the setting of the study is specific to this facility, thus, the study cannot be generalised. Although this is a simple survey and inadequate in research protocol, the knowledge gained is tremendous as the study is based on the practicality of implementation of PBL driven by a need in clinical practice.

Reports from the interview of 14 clinical nurse educators (Williams, 1999) corroborated with findings of the other researchers in that PBL improved the ability to inquire
and learn in a self-directed manner (Cooke & Moyle, 2002) and develop a holistic view of patient. In the study by Patel et al. (1998), mean score for stimulation to conduct independent study on all aspects seemed to favour PBL rather than traditional didactic teaching. Biley (1999b) reported reluctance in adopting self-directed learning, explaining that the process was time consuming and thus, there was insufficient time to cover ‘all the grounds’. Hard-facts were perceived to provide undergraduates with the expected knowledge and skills required to perform competently in clinical practice. This resulted in learners feeling that they were inadequately prepared. Assessment method with its emphasis on content knowledge may have attributed to this urgency and may undermine the objectives of problem-based learning of developing self-directed learning. However, in the same study by Williams (1999), respondents found that nursing students were unable to perform psychomotor skills. This result was attributed to lack of feedback during self-directed clinical session. Implication in the face of this finding is that probably not all methods for knowledge acquisition can be attained through self-direction. Educators need to consider some aspects of the curriculum that may not be so successful with PBL and explore the use of an appropriate method that will reap the best result.

Another point that is critical to the success of PBL is the skill of the facilitators in facilitation. According to Frost (2003), “consensus among leading educators experienced in PBL is that students benefit most from PBL when facilitators have expertise in the PBL facilitation process and the knowledge related to the subject” (p112). Biley (1999b) pointed out that the expertise of the facilitator in facilitation is central to the success in preparing and guiding learners to accept and adopt the concept of PBL.

Attitude

A qualitative ethnographic study design was used to explore 12 nursing graduates’ perception of the effectiveness of PBL in preparing graduates for the realities of clinical practice (Biley & Smith, 1998). The graduates felt a sense of personal responsibility as, “the bulk stops here”. The graduates from the PBL programme perceived themselves as change agents, autonomous, self-confident, professional, knowledgeable and independent decision maker, thus, capable of analysis and apply lessons learned into practice. The study also highlighted that the graduates expected to be empowered. This finding seems to affirm the effectiveness of PBL in propagating deep learning and preparedness of graduates to face realistic ill-defined clinical problems and in developing life-long learners. Another study supported this view in which novice nurses were observed to recognise the learning needs, attempt to seek answers from various resources and were not afraid to ask questions when they were unable to find the answers after having undergone one and half month of PBL induction programme (Celia, 2001). The novice nurses seemed to have taken responsibility for their own learning and thus, assimilated the skills for lifelong learning, making them more dependable in providing ‘safe’ and ‘just-in-time’ care to the patients. PBL seems to have been effective not merely in developing lifelong learners but also in developing positive attitudes as professional, responsible and dependable practitioners.

Understanding the purpose of PBL and being convinced of its benefits to the learner would have an effect on the possible outcome of PBL. Biley (1999b) conducted fieldwork in the form of participant observation for a period of 16 days on one cohort of 17 Year Three undergraduate nurses. This was followed by a taped unstructured interview. It was apparent from the study that the undergraduates were not comfortable in being self-directed in their learning. Structured guidelines which were clear and explicit were preferred and ‘expert’ lectures were well attended. The researchers attributed the pull towards the traditional didactic method to the preconceived ideas of the undergraduates of the role of student and of learning formed from years of being in ‘the system’. Learners have a differing view of what they consider knowledge and how they attain it. The sudden propulsion to the uncertain, self-directed technique and the responsibility associated with PBL exposes learners to an uncertain and unknown dimension, thus, eliciting fear, anxiety and the desire to hold on to something familiar when the outcome is unknown. The process of the learning experience through PBL as an andragogical technique was somehow not clearly understood or ‘reconciled’. Another study reported uncertainty in the students which hindered the learning (Carey & Whittaker, 2002). The researchers attributed
one of the hindrances to learning to unclear clarification of the direction and requirements for PBL.

Group dynamics is critical in the process of PBL as evidenced by Biley (1999b) and Carey (2002). In his study, Biley found that there was ineffective group dynamics which might have resulted from the learners who were unsure of and unprepared for their expectations. Factors that did not support the process of PBL were passivity amongst the learners, dependence for learning needs, blaming, resentment, calculative, and competition resulting in withholding of information. There did not seem to be a shared goal and purpose in working as a group. Carey (2002) reported 27% of all learning hindrances (which made up 72% of the total sample) pointed towards group issues. In another participant interview fieldwork, Biley (1999a) attributed these issues to reluctance and feeling uncomfortable in sharing ideas for fear of being exposed to criticisms and judgment. Members in a group might be passive and had not been transformed from being ‘spoon-fed’ to being self-directed, owing to the legacy of traditional learning. On a positive note, in the study by Celia (2001), there seems to be a shared goal in solving the problem. Facilitators also observed that the group began to take greater responsibility for their learning and less reliance on the facilitator as the programme progressed. Experiences gained from the group might have also changed the characteristics of certain individuals. In this cohort, group dynamics had been a powerful tool in character building resulting from the PBL process. Evidence has not been conclusive for ensuring positive group dynamics. No conclusive answers can be found to overcome this. However, it does confirm the importance of group dynamics in transformation and integration of knowledge.

Implications for Implementation

Two prominent models of the PBL were found; the McMaster and the Maastritch models. The processes were inclusive for both and the purported outcomes were similar. Either one of these models should be applicable as a framework for the development of problem-based learning curriculum in clinical practice.

There seems to be more positive than negative evidence pointing towards PBL in acquiring knowledge. The type of knowledge acquired seems to be of a higher cognitive value and the knowledge internalised. There was no conclusive evidence that PBL enhanced content-type knowledge nor was there evidence to support its claim of enhancing long-term memory. In developing the curriculum, assessment method that supports the objectives of PBL needs to be considered. Sufficient time is another factor for consideration.

From the literatures, the evidence on PBL seems to support its claim of developing in learners critical thinking, clinical reasoning, and in some cases, the ability to provide holistic care to patients. However, there has been no direct evidence of the outcome of the application of the skills attained. Some studies that have been conducted explored confidence of the practitioner and perception of his/her ability to utilise the skills. Further research is required to address this gap in clinical practice. Probably, the sample this time could include those that would receive the greatest impact, that is, patients. The skill in facilitation it seems has been instrumental to the success of PBL.

The evidence seems to point towards the development of positive attitude and in taking responsibility both for one’s own learning as well as in managing patients. However, as PBL is a new programme, it requires time and effort in gaining acceptance. Ensuring understanding of the processes of PBL and getting ‘buy-in’ to objectives are crucial first steps towards the direction of attaining success and reaping the benefits of PBL. Group dynamics, skill in facilitation and attitude towards self-directed learning are areas that need to be addressed. Group dynamics seems to stand out as an area that warrants further analysis.

Conclusion

Much of the empirical evidence on the effectiveness of PBL came from the medical faculty. Few nursing studies exploring the effectiveness of PBL were found and most were qualitative type studies. From the literature review, evidence points towards PBL in being successful in enhancing knowledge, skills and attitude. The potential for developing knowledgeable, competent, dependable and professional practitioners has been mentioned in some studies. How then could nurse educators tap on these studies to breed the positive outcomes of PBL and overcome its limitations would be the next step forward in implementing PBL in clinical practice.
References

Answers to Riddles
1. The doctor is the mother (female doctor) and the nurse is the father (male nurse).
2. e n t (The first seven letters stand for – one two three four five six seven).
3. A mirror.
4. A Piano.
5. Few.
6. The name of the ship.
7. When you add two hours to eleven o’clock, you get one o’clock.
8. Heartache and Headache.
9. The postman (mailman)
10. “Therein”: the, there, he, in, rein, her, here, ere, therein, herein.

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