Chapter 14
The Next Generation: Research Directions in PBL

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This edited volume was conceived as an attempt to share recent scholarship investigating our understandings and implementations of problem-based learning (PBL) in clinical education. Globally, we are witnessing a rapid shift in the way higher education perceives itself and how it is perceived by society. Social theorists have asked us to consider society in the era of 'liquid modernity' (Baumann, 2000), characterized by uncertainty, continuous risk and shifting loyalties and trust. Liquidity is evident not only in our desktop designs but our views of time and knowledge as we have come to expect instant access to information on demand. In terms of higher education, the impact of these social changes can be described as an educational 'climate change' signalled by fundamental shifts in the way we perceive knowledge and learning (Goodyear & Ellis, 2010). First, our conception of knowledge is moving from inert and fragmented knowledge to a notion of working knowledge. Second, the focus is moving from an individualistic model of the learner to one of learning communities. Third, the teaching dynamic is changing from teacher-directed to learner-managed learning. This logically forces a shift from learning experiences that focus on content and presentation, i.e., information transmission and presentation pedagogies, to those that focus on student activity through the design of learning tasks and environments and the provision of tools for individual and collaborative work.

As higher education moves to respond to this forecast for educational climate change by adopting active, learner-centred, outcomes-based instructional approaches that promote deep learning strategies (Biggs, 1999), PBL curriculum designers may be feeling somewhat reassured. The social constructivist theoretical groundings of PBL that focus on supporting the learner in the process of individual and group knowledge construction remain highly relevant. Indeed, given the oft cited knowledge explosion afforded by increased

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technological access, as noted in the preface to this volume, the educational rationale for PBL may be even more cogent today than when the approach originated over 40 years ago.

Given the rise of new educational technologies, one could argue that PBL is also facing a climate change. As this volume's chapters examining the role of educational technologies in PBL indicate, Net Generation learners, otherwise referred to as 'tech savvy' students, and their facilitators are moving into the next generation of blended learning in PBL (Bridges, Botelho, & Tsang, 2010) by accessing, reviewing and synthesizing knowledge via educational technologies both within face-to-face tutorials as well as in the self-directed learning phase of the problem cycle (Bridges, Dyson, & Corbet, 2009). The next generation of PBL curriculum designers in clinical education is building on the initial principles of the traditional PBL tutorial process (Barrows, 1986; Davis & Harden, 1999; Schmidt, 1989) to adapt to changing programmes, students and technologies.

As PBL practitioners and educational researchers reviewing studies on PBL to date, we have noted a subtle but significant shift in not only curriculum design but also research approaches. Initial research naturally sought to provide empirical data to justify PBL in comparison with traditional, lecture-based curricula. There was also the critical dimension of examining 'how well' students were achieving learning outcomes through PBL. The first issue can now be considered moot. As an inquiry-based approach, PBL has been found to be socially and academically relevant to higher education. Indeed, much work now has been on introducing the approach to secondary schooling. Good teachers will always be interested in gaining the best from their students through the learning experiences that they design, so research into student learning outcomes will remain a key focus of attention. However, in higher education, specifically in clinical areas with the longest experience in PBL, we believe that the research agenda has matured to shift from justifying 'why' PBL to investigating 'how' students and faculty are engaging in clinical education.

Chapters in this collection have drawn on studies that examine PBL from its theoretical background to studies reporting empirical research into practice undertaken by academic staff actively engaged in evaluation and researching the programmes they develop. The volume draws on a wide range of experience in terms of geography, discipline areas and length of PBL implementation. Geographically, this volume represents work from Australia, Canada, Germany, Hong Kong, Japan, Sweden and the USA. The discipline areas encompass traditional areas such as dentistry, medicine, biology/pharmacology, speech and language pathology as well as some interdisciplinary approaches such as Imafuku's study on first-year health sciences in Japan or Howe and Schnabel's dentistry/design collaboration between Australia and Hong Kong. The curricula described here also embrace a range of experience from decades since implementation to more recent curriculum reform and innovation. This collection has not only actively explored the effects of PBL

on student learning experiences and outcomes but has also begun to explore how aspects such as content integration, educational technologies and inter-professional learning are reconfiguring approaches to PBL for clinical education.

Methodologically, the volume has shared traditional and new methodologies in higher education research. While volumes on PBL, to date, have tended towards descriptive accounts geared towards providing advice for teachers intending to adopt PBL at course or programme level, this collection has taken a strong research focus reflecting a renewed interest in higher education on the scholarship of teaching and learning. Historically, we have noted that, due to the research backgrounds of scholars in clinical education and the initial need to establish PBL as a viable approach, many empirical studies focused on resolving debates surrounding 'why PBL', aiming to justify the adoption of PBL in clinical education. As expressed earlier, this volume has sought to capitalize on the growing body of empirical research on PBL evaluations but has also sought to move the paradigm forward by including studies that reflect the growing body of empirical research on 'how PBL'. The latter have drawn on both evaluative data to explore the attainment of student learning outcomes, including achievement of graduate attributes, as well as discourse-based studies on PBL-in-action. The focus of this volume, therefore, has been twofold – research-driven and embracing new methodologies to explore how we can support student learning in PBL courses and programmes.

In their chapter framing the relationship between PBL and educational theory, Hmelo-Silver and Eberbach have highlighted some under-researched areas in PBL. These include investigating collaboration in terms of sustained lifelong learning; the relationship between intrinsic motivation and sustaining productive dispositions in clinical practice; as well as the role of cultural tools, specifically educational technologies, in achieving the goals of PBL.

In moving the PBL research agenda forward beyond this volume, we also envisage potential research in the areas of student learning outcomes (particularly in the area of graduate attributes, including clinical competences), new research methodologies and staff development.

14.1 Examining Graduate Outcomes

To date, many studies have focused on the first-year experience and the transition into problem-based programmes. Relatively few have explored the issue of graduate outcomes. With current global trends in clinical education to redefine graduate competencies for the 'safe beginner', it is important to understand how PBL programmes can contribute to the achievement of such competencies. We are pleased to present current approaches to this issue in the opening chapters (2, 3, 4, 5 and 6) of this volume where researchers share findings on studies that explore how student learning outcomes, graduate attributes and professional

competencies are developed in problem-based programmes. Toulouse et al. (Chapter 2) have reflected on the notion of consequential validity and the influence of both PBL and the assessment processes on graduates in their careers in science. Shuler (Chapter 3) has drawn on a body of longitudinal data to evaluate improved achievement of PBL students in the basic sciences domain of the National Board Dental Examination (NBDE). Samuelsson et al.'s (Chapter 4) cross-institutional survey of both specific and general competencies in two PBL Swedish Speech Language Pathology (SLP) programmes found that graduates who have had more experience of PBL rate their general competencies higher than the graduates who have not used PBL throughout the curriculum. They also noted that the students from both the PBL-throughout and the semi-PBL curricula rated themselves high on many specific competencies. Now that PBL has more than 'come of age', there is scope for more work in this area of student learning outcomes, particularly comparative and longitudinal studies.

14.2 Methodological Directions

Much of the early research on PBL focused on comparisons between PBL and traditional curricula, particularly in medical schools. Such studies tended to employ primarily quantitative methods of analysis, for example, using student achievement on external assessment measures such as standardized national professional exams, learning styles, etc. Quantitative outcome measures facilitate comparison to be made between different settings and are often considered as being more amenable to inform evidence-based practice. However, it is important to determine the validity (content, face, construct and criterion validity) as well as reliability (internal and test-retest) of such outcome measures. Unfortunately, this has not always been the case and outcome measures have often been developed in an 'ad hoc' approach without appropriate psychometric testing to validate them. Another issue is the cross-cultural adaptation of the outcome assessment measures for use in different linguistic and cultural settings. To date the issue of cross-cultural adaption of structured quantitative assessment measures has not been explored to any great extent. Furthermore, it is not simply the quantitative assessment of outcomes that is important but also how the PBL process (and other factors) influence outcomes. Fortunately, today with advances in statistical modelling, it is now possible to verify conceptual and theoretical dimensions of PBL through PATH analyses/Structural Equation Modelling (e.g., Everitt & Dunn, 1991) and to decipher the specific pathways to the key outcomes of PBL. Nevertheless, it should be borne in mind that quantitative methods, with their focus on group differences, may not be able to capture data or trends of interest and value. More recently, researchers have combined quantitative and qualitative methods of inquiry in order to provide a

more comprehensive picture of the PBL process or student learning outcomes (for example, Stokes, MacKinnon, & Whitehill, 1997; Winning, Chapter 5; O'Toole, Chapter 6).

Certainly, studies to date have been reassuring in establishing that PBL is 'working' in terms of knowledge acquisition but at issue is how we obtain empirical evidence on the 'soft' areas that we as educators often intuitively know are working. An avenue for research directions is in developing the use of recent innovations in qualitative methodologies to build on the robust and now widely accepted use of reflective interviews and grounded theory analysis (see Skinner et al., Chapter 12). In the age of the 'linguistic turn', researchers in clinical education are also drawing on a wider variety of research methods, particularly those loosely grouped under the title of 'discourse analysis'. Narrative approaches can facilitate greater reflection and emic or 'insider' perspectives on learning (see Toulouse et al., Chapter 2). Ethnographic approaches are being used by proponents arguing for richer, in-depth analysis or 'thick descriptions' (Geertz, 1973) to explore various aspects of the PBL tutorial as it is enacted in *real time*. Data collection from this paradigm includes video and audio recordings of the tutorial process with a multiplicity of analytic lenses being applied. Bridges et al. (Chapter 7) use an interactional ethnographic (IE) approach to investigate student learning and learning activity, with a particular focus on independent and online learning in a third-year dental PBL group. This relatively new and under-used (at least in PBL research) methodological approach offers exciting new developments as it is applied to PBL. Other areas of related research interest include the relationships between language and its link to conceptual development and disciplinary knowledge as well as group dynamics and their effect upon the learning process. For example, work by Skinner et al. (Chapter 12) found that PBL groups initally formed as a 'social unit' and subsequently became a 'work unit' indicating implications for student induction into PBL programmes.

Cognitive approaches have also contributed to the types of interview transcripts that we can analyse. Stimulated recall protocols, for example, afford insights into task performance (Bridges & Bartlett, 2009) and have been used in a few PBL studies both in this volume and elsewhere (Remedios, Clarke, & Hawthorne, 2008). Imafuku's (Chaper 10) study of first-year Japanese medical students' learning processes applied analysis of stimulated recall transcripts within a mixed-method design to investigate their socialisation process into the new academic community. One finding was that although the PBL environment can be a challenging one for first-year students, it can also provide an opportunity to autonomously develop their generic skills.

The possible analytic lenses applied to such transcripts may include critical discourse (CDA) and conversation analysis (CA), to name but a few. Jin's (Chapter 11) analysis of silence in PBL group interactions drew upon both CA and CDA and indicated that silence can be perceived and practised as a productive resource, a collaborative practice, a platform for handling conflicting understandings and a signal of shifting power relations in PBL tutorials.

Also engaging with discourse-based approaches is the work of Chan et al. (Chapter 9) who examined coded transcript units to better understand the implications of the effects of new technologies on the PBL process, in this case, video triggers in second-year medicine.

Chapters in this volume have also indicated how expanding the use of mixed or complementary methodological approaches can be employed to further unravel the multiple variables at play in a learning environment, especially one as rich as PBL. Typically, this manifests in the use of qualitative data such as interviews or observational field notes to provide a more textured layer to analyse the trends indicated in quantitative data. Howe and Schnabel (Chapter 8), for example, adopted a mixed method approach to examine another area of educational teachnology – online social networking. Their study of an interprofessional PBL project indicated that the application of such technologies supported the blurring of disciplinary, professional, institutional and national boundaries whilst achieving student learning outcomes. Harendza et al. (Chapter 13) used calibrated observations and survey data to examine the role of tutors in PBL group dynamics with recommendations for staff development.

As noted above, we see great potential in partnering approaches such as pre-post-test design of surveys and validated scales with analysis of interview and/or ethnographic data to provide greater insights into the PBL process and to evaluate curriculum innovations.

14.3 Staff Development

Another area for future research is that of staff development. In the field of PBL staff development in higher education, work to date has remained mainly descriptive focusing on initial tutor training, with relatively little research on continuing staff development (see for example, Hmelo-Silver & Barrows, 2006). Also, we see possibilities for research exploring the effectiveness of new approaches to staff induction and professional development. An additional area worthy of attention is exploring issues related to tutor judgement both within the tutorial process, in terms of in situ decision making, as well as when assessing student performance. In terms of ongoing quality assurance, the issues of reliability of facilitator feedback and consistency in standards are as increasingly relevant for PBL as for any other higher education programme. The greater tension for PBL may be in the assessment of 'process' such as the quality of contributions to the group rather than the standard measurement of student 'products' such as written assignments or exams. There is, therefore, much more work that can be undertaken to investigate both innovations to the delivery of staff development for PBL facilitators as well as studies exploring facilitator effectiveness.

14.4 Conclusion

We trust that, by the end of this collection, readers have gained some further insights into the directions current clinical educators are taking as they move educational practice and research into PBL forward to the next generation. In reflecting on this body of work, we have noted that these educator/researchers have moved beyond the original research question of justifying PBL as a valid learning approach and are finding new and innovative ways to explore the questions higher education is asking of all curricula and learning experiences – how and how well are students achieving the learning outcomes we plan and enact?

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