



Published online: 10-4-2016

## Qualitative Research in PBL in Health Sciences Education: A Review

Jun Jin

*The University of Hong Kong, jinjun.hk@gmail.com*

Susan Bridges

*The University of Hong Kong*

IJPBL is Published in Open Access Format through the Generous Support of the [Teaching Academy at Purdue University](#), the [School of Education at Indiana University](#), and the [Educational Technology program at the University of South Carolina](#).

### Recommended Citation

Jin, J., & Bridges, S. (2016). Qualitative Research in PBL in Health Sciences Education: A Review. *Interdisciplinary Journal of Problem-Based Learning*, 10(2).

Available at: <https://doi.org/10.7771/1541-5015.1605>

This document has been made available through Purdue e-Pubs, a service of the Purdue University Libraries. Please contact [epubs@purdue.edu](mailto:epubs@purdue.edu) for additional information.

This is an Open Access journal. This means that it uses a funding model that does not charge readers or their institutions for access. Readers may freely read, download, copy, distribute, print, search, or link to the full texts of articles. This journal is covered under the [CC BY-NC-ND license](#).

# THE INTERDISCIPLINARY JOURNAL OF PROBLEM-BASED LEARNING

---

## ARTICLE

### Qualitative Research in PBL in Health Sciences Education: A Review

Jun Jin and Susan Bridges (The University of Hong Kong)

#### Abstract

**CONTEXT** Qualitative methodologies are relatively new in health sciences education research, especially in the area of problem-based learning (PBL). A key advantage of qualitative approaches is the ability to gain in-depth, textured insights into educational phenomena. Key methodological issues arise, however, in terms of the strategies of inquiry, data collection methods, and analytical approaches. This review aims to identify and appraise the current applications of qualitative studies in PBL and indicate possible new methodological directions.

**METHODS** Two computerized databases, Educational Resources Information Center (ERIC) and PubMed, were screened for solely qualitative studies of PBL in health sciences education between 2000 and 2015. Selected articles were grouped for systematic description, critical analysis, and evaluation, with a key focus on identifying methodological trends.

**RESULTS** The number of recent qualitative research studies of PBL in health sciences education is small but growing, with 61 solely qualitative articles identified in the review period. Four main research issues in PBL were identified for qualitative investigation: (1) participants' experiences or perceptions; (2) facilitation; (3) assessment; and (4) educational technologies. Participants' experiences or perceptions of PBL have drawn the most research attention to date. Methodological approaches included: self-reported studies using interview data ( $n = 29$ ); studies analyzing video recordings of PBL tutorials ( $n = 9$ ); introspective studies analyzing written reflections ( $n = 6$ ); and studies using multiple qualitative methods ( $n = 17$ ). Of the 61 identified studies, the majority are perception studies, with only a limited number focused on PBL processes or interactional analyses.

**CONCLUSIONS** This review presented and analyzed current practices in qualitative studies of PBL in health sciences education and indicated new directions. Research designs are expanding beyond an initial focus on post-hoc perception studies to explore innovative, in situ qualitative inquiries and methodologies.

*Keywords:* review, qualitative research, methodology, problem-based learning, PBL, health sciences education, higher education

---

#### INTRODUCTION

Problem-based learning (PBL) has had a profound impact on education worldwide. While the implementation of PBL has gradually extended from clinical to nonclinical disciplines (Lu, Bridges, & Hmelo-Silver, 2014), the majority of research studies in PBL have been conducted in health sciences educational contexts such as medicine (Schmidt, Vermeulen, & van der Molen, 2006) and dentistry (Winning & Townsend, 2007). This body of research has mainly emphasized quantitative investigations with growing interest in

mixed-methods approaches (Albanese & Mitchell, 1993; Berkson, 1993; Newman, 2003; Shin & Kim, 2013; Smits, Verbeek & de Buissonjé, 2002; Vernon & Blake, 1993). This may be seen as a historical shift from positivist toward interpretivist designs. Indeed, the role of qualitative research in health sciences education has been increasingly acknowledged since the 2000s (Bligh & Anderson, 2000; Eva & Lingard, 2008), and its impact on the field in addressing new lines of inquiry is expanding.

Qualitative research aims to gain an understanding of people's experiences in the world and their perspectives in

social situations. Merriam (1998) identified five central characteristics of qualitative research in education:

1. Understanding the phenomenon of interest from the participants' perspectives, not the researcher's;
2. Situating the researcher as the primary instrument for data collection and analysis;
3. Usually involving fieldwork;
4. Employing an inductive research strategy; and
5. Focusing on process, meaning, and understanding with the product of a qualitative study being richly descriptive (Merriam, 1998).

As such, qualitative research aims to capture the complexities and subtleties of human thoughts and behaviors rather than measure population variables as in survey research (Cohen, Manion, & Morrison, 2000). Quantitative studies tend to select large samples in experimental designs with randomized control trials viewed as a "gold standard," particularly in health sciences research. Their goal is to achieve an objective, generalizable representation of a phenomenon. Qualitative studies, on the other hand, are inclined to focus on small, nonrandom, and purposeful samples such as typical and atypical case studies to gain subjective, nuanced understandings.

For studies in PBL, compared to quantitative studies that mainly measure the effectiveness of PBL programs or curricula, qualitative studies primarily investigate the perceptions of participants and various practices within the PBL learning process. Some of the earlier qualitative studies in problem-based health sciences education drew on public health survey traditions to examine students' and facilitators' perceptions through open-ended questions in written questionnaires, focus group interviews, and other self-report approaches (e.g., De Grave, Dolmans, & van der Vleuten, 2002; Steinert, 2004; Virtanen, Kosunen, Holmberg-Marttila, & Virjo, 1999). Previous literature reviews of PBL in health sciences education have predominantly included these quantitative studies. For example, Koh, Khoo, and Wong's (2008) review focused on the effects of PBL on physician competency, while Polyzois, Claffey, and Mattheos's (2009) review investigated the benefits of PBL compared with conventional teaching.

Hmelo-Silver (2004) and Bridges, McGrath, and Whitehill (2012) noted that there were fewer empirical studies to investigate *what* and *how* students were learning in the PBL process. The potential for the relevance and utility of qualitative research in studies of PBL in health sciences education research is indicated, but no systematic work has been conducted to date to map trends in this relatively new field. Thus, it is timely to review this developing field and identify future directions in terms of both research focus and approach. This

review, therefore, focuses on qualitative research studies in PBL in health sciences education, with a particular focus on current and emerging methodological trends. The key research question addressed is: What are the current methodological trends in qualitative research studies in PBL in health sciences education?

As Chiriac (2008) suggested, a good literature review presents a critical synthesis of research articles, identifies knowledge, highlights gaps, and provides guidance, eventually offering a new perspective. For this literature review, the existing research studies of PBL in health sciences education were searched via online databases and the results were synthesized. Research foci, methods, and findings are identified. Research gaps are indicated in terms of topics, study designs, and methodology in general. The implications for future research are made accordingly.

## METHODS

The screening process and classification of selected articles were guided by Cook and West's (2012) stepwise approach to conducting systematic reviews in medical education (Leung, Mok, & Wong, 2008; Polyzois et al., 2010), as presented below.

### Screening Process

Two computerized databases were screened: the Educational Resources Information Center (ERIC), and PubMed. ERIC is a digital library of education literature, and PubMed includes peer-review literature in health sciences education. Initial search terms were "problem-based learning," OR "PBL," AND "qualitative." Publications in the English language were selected. The criteria for inclusion were:

1. Original research within health sciences education between 2000–2015;
2. Empirical studies conducted in real-life PBL classrooms;
3. The subjects of studies are students in health sciences education; and
4. The research methods in the studies are solely qualitative.

Exclusion criteria included:

1. Controlled or simulated study designs;
2. Mixed-methods (both quantitative and qualitative methods) studies; and
3. Review studies.

The process of literature searching and identification is presented in Figure 1. Precisely 2,405 journal articles were

identified in the initial search. Titles, keywords, and abstracts of articles were then screened to refine results according to the above criteria for inclusion and exclusion. This screening process resulted in the selection of 82 publications that met the criteria for inclusion. Full-text articles were retrieved and assessed, while duplicates were removed. From there, 53 full-text articles were included for in-depth review. Cross-referencing uncovered 8 additional qualitative research articles from the grey literature. Finally, 61 full-text articles were included for analysis.

**Classification of Selected Articles**

In order to address the research questions, the studies were classified according to research methodology. The coding categories were discussed and confirmed by the research team. Based

on the identified features of data sources and research methods in qualitative study designs (Denzin & Lincoln, 2000; Holliday, 2002; Merriam, 1998), four groups of studies were identified. These included: self-reported studies using interview data (see Table 1); video recording-based studies (see Table 2); introspective studies analyzing written reflections (see Table 3); and studies adopting multiple qualitative methods (see Table 4). Following Cook and West’s (2012) approach, key information (i.e., author, year, research focus, subject, region, data sources, analytical approach, and main findings) for each article were included. The results were then analyzed and synthesized by narrative or quantitative pooling, examining themes of key information in the selected articles. The quality of these studies is not assessed, which is a limitation in this review process.

Figure 1. The process of literature searching and identification

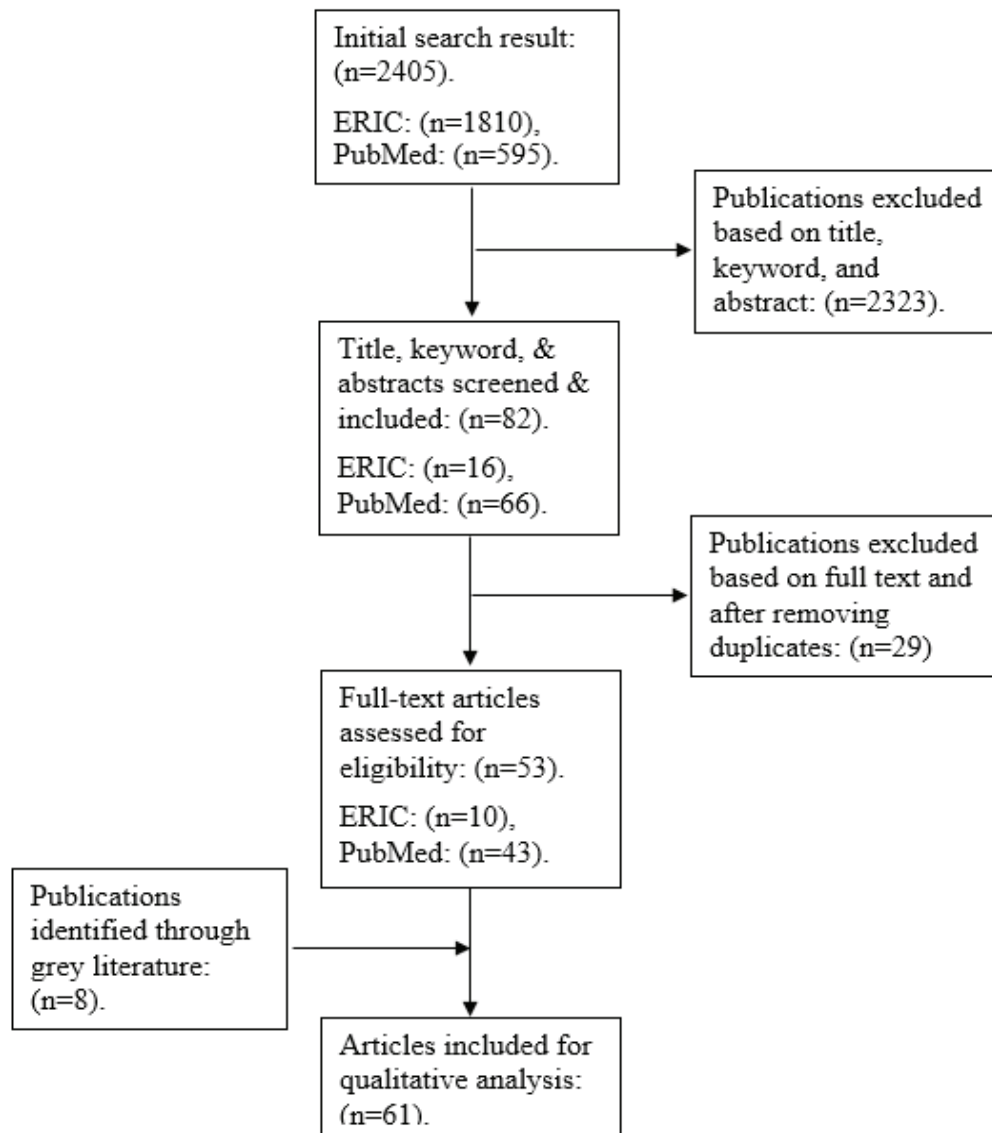


Table 1. Self-report studies using interview data.

Author & Year	Research Focus	Subject & Region	Data Sources	Analytical Approach	Main Findings
Chan, et al. (2015)	Participants' perceptions of mobile device usage	Facilitators ( $n = 6$ ) and undergraduate medical, dental, and speech and hearing sciences students ( $n = 44$ ); Hong Kong	Interviews; focus groups	Grounded theory and a systematic coding procedure (Creswell, 2008; Sbaraini et al., 2011)	<ul style="list-style-type: none"> <li>Participants found mobile devices to be useful learning tools, yet they were aware of the potential distractions for students and negative effects on student learning</li> </ul>
Spiers, et al. (2014)	Experience trajectories and satisfaction of graduates	Nursing graduates ( $n = 45$ ); Canada	Interviews; focus groups	Thematic analysis (Charmaz, 2009); Comparative matrix analysis (Draucker et al., 2007)	<ul style="list-style-type: none"> <li>Diverse levels of satisfaction are differing orientations to studying. The approach to understanding how students typically approach learning is strongly linked to perceptions of academic quality and program satisfaction in higher education research</li> </ul>
Landeen, et al. (2013)	Perceptions of consistency among students and faculty in PBL	Nursing students ( $n = 16$ ) and faculty ( $n = 13$ ); Canada	Interviews; focus groups	Thematic analysis using Morse and Field's (1995) four intellectual processes	<ul style="list-style-type: none"> <li>Less experienced students were more likely to describe consistency in terms of sameness and fairness</li> <li>More experienced students and faculty had a higher tolerance for ambiguity and valued learning experiences adapted to students' learning needs</li> </ul>
Cooper & Carver (2012)	Students' experience in PBL	Postgraduate students in mental health nursing ( $n = 30$ ); UK	Focus group	Constant comparative method (Burnard, 1991)	<ul style="list-style-type: none"> <li>Participants had mainly positive experiences and gained a range of study and interpersonal skills</li> <li>There were initial anxieties but participants increasingly gained confidence</li> </ul>
Green-Thompson et al. (2012)	Graduating students' reflections of a transforming medical curriculum	Graduating medical students ( $n = 35$ ); South Africa	Individual and pair interviews; Focus groups	Content analysis: Tesch's (1990, in Creswell, 2003) eight steps	<ul style="list-style-type: none"> <li>A number of areas need attention: ensuring that assessment is standardized; student support structures and appropriate levels of teaching</li> </ul>

Table 1., cont'd. Self-report studies using interview data.

Author & Year	Research Focus	Subject & Region	Data Sources	Analytical Approach	Main Findings
Gunn, et al. (2012)	How skills gained through PBL are applied in practice	Physiotherapy placement supervision ( <i>n</i> = 10); UK	Interviews	Thematic analysis (Braun & Clarke, 2006)	<ul style="list-style-type: none"> <li>The supervisors felt that PBL offered positive benefits for both student education and clinical practice</li> <li>There was evidence of the application of skills and attributes associated with PBL, including positive learning behaviors and a high level of motivation and self-direction</li> </ul>
Papinczak (2012)	Perceptions of job satisfaction	Year 1 & Year 2 tutors ( <i>n</i> = 13); Australia	Focus groups	Constant comparison methods (Corbin & Strauss, 1990); Refinement and validation based on Allen and Meyer's (1990) framework	<ul style="list-style-type: none"> <li>Supportive and compensatory nature of the collegial relationships formed between casual tutors</li> <li>Role attenuation was a predominant perception because it related to dysfunctional groups and increasing student disengagement with PBL</li> </ul>
Singaram, et al. (2011)	Collaborative heterogeneous PBL group learning	Year 2 medical students ( <i>n</i> = 10) and facilitators ( <i>n</i> = 11); South Africa	Focus groups	Open and axial coding (A. Strauss & J. Corbin, 1998)	<ul style="list-style-type: none"> <li>Collaborative heterogeneous learning has two sides that need to be balanced: ideology vs. practice</li> </ul>
Bearn & Chadwick (2010)	Students' experiences	Postgraduate orthodontic students ( <i>n</i> = 12); UK	Interviews; Focus groups	Inductive approach (Non-specified)	<ul style="list-style-type: none"> <li>PBL led to tensions both within the individuals and the group because of the conflict between valuing it and practical problem</li> </ul>
Lekalakala-Mokgele (2010)	Experiences of facilitators and students	Facilitators ( <i>n</i> = 4 groups, 5-8 per group) and nurse students ( <i>n</i> = 8 groups, 8-12 per group) in four universities; South Africa	Focus groups	Content analysis: Tesch's (1990) eight steps and Giorgi's (1970) basic steps	<ul style="list-style-type: none"> <li>The control of teaching and learning became a problem for the students</li> <li>Traditional trained facilitators experienced difficulties</li> </ul>

Table 1., cont'd. Self-report studies using interview data.

Author & Year	Research Focus	Subject & Region	Data Sources	Analytical Approach	Main Findings
Midla & Coryell (2010)	PBL preparation for physician assistant faculty	Faculty members ( $n = 7$ ) in two universities; USA	Interviews	Inductive approach (Cresswell, 2003; Hitchcock & Hughes, 1995) and grounded theory (Strauss & Corbin, 1990)	<ul style="list-style-type: none"> <li>Issues addressed included: facilitator outlook; previous experience; approaches that assisted in preparing faculty and students to teach and learn; academic resources; and the use of nonclinical tutors</li> </ul>
Papinczak (2010)	Perceptions of tutor evaluation	Tutors ( $n = 9$ ) and medical students ( $n = 7$ ); Australia	Interviews; Focus groups	Inductive approach (Patton, 1990)	<ul style="list-style-type: none"> <li>PBL tutorial environment can create school-wide mistrust and confusion (tutor and student) on several levels</li> </ul>
Al Kadri, et al. (2009)	Students' and teachers' perceptions of clinical assessment program	Teachers ( $n = 12$ ) and health science students ( $n = 40$ ); Saudi Arabia	Interviews; Focus groups	Open coding and axial coding phases of grounded theory (Strauss, 1987)	<ul style="list-style-type: none"> <li>Assessment affects students' perceptions of learning and how they learn</li> <li>These effects are not uniformly positive</li> </ul>
Bollela, et al. (2009)	Students and tutors' social representations of assessment	Tutors ( $n = 10$ ) and medical students ( $n = 10$ ); Brazil	Interviews	Content analysis using ALCESTE (Analyze Lexicale par Contexte d'un Ensemble de Segments de Texte) software	<ul style="list-style-type: none"> <li>Both students and tutors felt undertrained and lacked confidence in tutorial assessments</li> </ul>
Barron, et al. (2008)	A creative and visual trigger to stimulate student enquiry	Year 1 students ( $n = 75$ ); Ireland	Focus groups	Content analysis (Burnard, 1991)	<ul style="list-style-type: none"> <li>Well designed, open ended, real life and challenging "problems" or "triggers" are key elements to the success of PBL implementation</li> <li>One challenge is that the process is primarily controlled by lecturers</li> </ul>
Mete & Sari (2008)	Students' expectation from tutors and effects of tutors' behavior on students	Nursing students ( $n = 21$ ), Turkey	Focus groups	Content analysis (Strauss & Corbin, 1990)	<ul style="list-style-type: none"> <li>Seven tutor characteristics were identified</li> <li>Tutors behavior affected their motivation and success in PBL</li> </ul>

Table 1., cont'd. Self-report studies using interview data.

Author & Year	Research Focus	Subject & Region	Data Sources	Analytical Approach	Main Findings
Shankar, et al. (2007)	Student views on P-drug learning sessions, assessment, and small group dynamics.	Medical students (n = 12), Nepal	Focus groups	Inductive approach (non-specified)	<ul style="list-style-type: none"> <li>The sessions on P-drugs should be continued and strengthened with modification and possible extension</li> <li>Sessions during the clinical years and internship training can be considered</li> </ul>
Goldie, et al. (2007)	Medical tutors' and students' perspectives of professionalism in the early years	Tutors (n = 10) and student focus groups (n = 3); UK	Interviews; Focus groups	Grid analysis (Knodel, 1993) and coding (Morgan, 1997)	<ul style="list-style-type: none"> <li>Reflection is integral to professional development</li> <li>Early clinical contact is an important part of the process of socialization</li> <li>Role models can contribute to students' learning and identity formation</li> </ul>
Heading, et al. (2007)	Using PBL in public health service based training	Public health trainees (n = 9) and staff (n = 10); Australia	Interviews	Inductive analysis (Non-specified)	<ul style="list-style-type: none"> <li>Collaboratively developed and delivered, experiential rural public health PBL was a positive learning experience for trainees in public health</li> <li>PBL appears to be suitable in rural and non-rural public health training settings</li> </ul>
White (2007)	Using PBL in public health service based training	Public health trainees (n = 9) and staff (n = 10); Australia	Interviews	Inductive analysis (Non-specified)	<ul style="list-style-type: none"> <li>Collaboratively developed and delivered, experiential rural public health PBL was a positive learning experience for trainees in public health</li> <li>PBL appears to be suitable in rural and non-rural public health training settings</li> </ul>
Matthew-Maich, et al. (2007)	Pedagogy and achievement of self-regulated learning goals	Medical students (n = 36); USA	Interviews	Thematic analysis (Miles & Huberman, 1994)	<ul style="list-style-type: none"> <li>PBL and traditional students described two very different medical school experiences</li> <li>The traditional students had a rougher transition from the classrooms to the clerkships</li> </ul>
Fyrenius, et al. (2007)	Students' conceptions of underlying principles	Medical students (n = 16); Sweden	Interviews	Phenomenography (Dahlgren & Fallsberg, 1991)	<ul style="list-style-type: none"> <li>A complex conception of underlying principles includes an ability to problemize phenomena beyond long causal reasoning chains, which is often rewarded in traditional examinations and tests</li> <li>Keywords for problemized processing are as follows: comparisons, differences, similarities, conditions, context, relevance, multiple sampling, connections, and dependencies</li> </ul>



Table 1., cont'd. Self-report studies using interview data.

Author & Year	Research Focus	Subject & Region	Data Sources	Analytical Approach	Main Findings
Vischers-Pleijers, et al. (2006)	Student perceptions about the characteristics of an effective discussion	Year 1 and 2 medical students (n = 48); Netherlands	Focus groups	Deductive analysis based on van Boxtel's (2000) coding scheme and Mercer's (1996) modes of talk	<ul style="list-style-type: none"> <li>• Students have clear ideas about what promotes effective discussions during the reporting phase</li> <li>• Their PBL experience has provided them with some insights that are in line with theory and research on collaborative learning</li> </ul>
Wood (2006)	Views of the effectiveness of PBL	Mental health students (n = 14); UK	Focus groups	Content analysis (non-specified)	<ul style="list-style-type: none"> <li>• The need to carefully plan students' initial placement experiences and provide extra support at this stage</li> <li>• The need to extend mentor preparation on the use of PBL in practice to ensure flexibility in the PBL process</li> </ul>
Dornan, et al. (2005)	How clinicians perceive their roles, and how closely those perceptions link to the curriculum they teach	General physicians (n = 14); UK	Focus groups	Phenomenological method (Moustakas, 1994)	<ul style="list-style-type: none"> <li>• Third year clinical teaching was described in terms that bore little relation to PBL</li> <li>• Teachers placed great importance on the social dimension of professional learning</li> <li>• Traditional apprenticeship is unsustainable under present day conditions of practice</li> </ul>
Lohfeld, et al. (2005)	Canadian residents' views on PBL	Medical residents and fellows (n = 17); Canada	Interviews	Thematic analysis (Addison, 1999)	<ul style="list-style-type: none"> <li>• Medical residents are an underutilized source of information about undergraduate medical programs</li> <li>• More emphasis on faculty development and upgrading health care problems will improve PBL-based education</li> </ul>
O'Neill, et al. (2003)	The views of pre-registration house officers using critical incidents	Traditional course graduates (n = 24) and new course graduates (n = 23)	Interviews	Grounded Theory (Dunn & Hamilton, 1986; Glaser & Strauss, 1967; Green, 1998; Miles & Huberman, 1994; Strauss & Corbin, 1998)	<ul style="list-style-type: none"> <li>• Graduates of the new, integrated curriculum seemed to be much better at dealing with uncertainty, knowing their personal limits, and asserting their rights for support when they felt the limits had been reached</li> <li>• Communication difficulties and emotional involvement remain major factors in students' transition to pre-registration house officers PRHO</li> </ul>

Table 1., cont'd. Self-report studies using interview data.

Author & Year	Research Focus	Subject & Region	Data Sources	Analytical Approach	Main Findings
Prince, et al. (2000)	Students' perceptions and attitudes regarding this transition in undergraduate medical training.	Fifth-year medical students ( <i>n</i> = 20)	Focus groups	Thematic analysis (non-specified)	<ul style="list-style-type: none"> <li>• Students have difficulty in bridging the gap between the theoretical and clinical phase of the curriculum, as well as in applying theoretical knowledge in clinical practice</li> <li>• In the clinical phase their learning changes from passive acquisition of knowledge to more active learning</li> </ul>
Treloar, et al. (2000)	Factors affecting progress of Australian and international students in a PBL medical course	Medical students ( <i>n</i> = 30); Australia	Interviews; Focus groups	Thematic analysis (non-specified)	<ul style="list-style-type: none"> <li>• Positive and negative experiences related to the course structure</li> <li>• Relationship between sense of "belongingness" to the medical school community</li> </ul>

Table 2. Studies analyzing video recordings of PBL tutorials.

Author & Year	Research Focus	Subject & Region	Data Sources	Analytical Approach	Main Findings
Lu & Chan (2015)	Whether paper and video triggers stimulate different social and cognitive processes	Year 2 medical students and their facilitator ( <i>n</i> = 11); Hong Kong	Videotaping of PBL tutorials	Inductive and deductive analysis (Kamin et al., 2001)	<ul style="list-style-type: none"> <li>Students who used video triggers put more effort into communicating their understanding of the problem and relevant knowledge than students who used paper triggers</li> </ul>
Aarnio, et al. (2014)	How tutor facilitation helps students to collaboratively resolve conflicts on knowledge	Medical and dental tutors ( <i>n</i> = 3), first-year medical students ( <i>n</i> = 23), and dental students ( <i>n</i> = 10); Finland	Videotaping of PBL tutorials	Defining and detecting the conflict and tutor intervention episodes in the video; Categories were identified (Creswell, 2007; Lincoln & Guba, 1985)	<ul style="list-style-type: none"> <li>Tutors often intervened by confirming what the students had said or by giving explanations</li> <li>Tutors gave more explanations during knowledge conflicts</li> </ul>
Hmelo-Silver (2013)	The learning space in a PBL tutorial led by an expert facilitator	Year 2 medical students ( <i>n</i> = 5); USA	Videotaping of PBL tutorials	Content analysis (Hmelo-Silver & Barrows, 2008)	<ul style="list-style-type: none"> <li>Much of students' talk is focused in related conceptual spaces</li> <li>A substantial amount of the overall learning space is engaged in the group discussion</li> </ul>
Yew & Schmidt (2009)	Evidence for constructive, self-regulatory, and collaborative processes	Year 1 health science students ( <i>n</i> = 5); Singapore	Audio recording of PBL tutorials and SDL	Episodic coding scheme (van Boxtel, 2000)	<ul style="list-style-type: none"> <li>PBL encourages students toward constructive, self-directed, and collaborative learning activities</li> <li>The proportions of interaction for constructive processes were less compared to those for collaborative and self-directed activities</li> </ul>
Clouston (2007)	Exploring methods of analyzing talk in PBL tutorials	Healthcare students ( <i>n</i> = 9) and tutor ( <i>n</i> = 1); UK	Videotaping of PBL tutorials	Discourse analysis (Fairclough, 1995; Silverman, 2001) and conversation analysis (Psathas, 1995; Sacks, 1984, 1992)	<ul style="list-style-type: none"> <li>Discourse and conversation analysis can enable an understanding of how effective problem-based learning communication is constructed</li> </ul>

Table 2., cont'd. Studies analyzing video recordings of PBL tutorials.

Author & Year	Research Focus	Subject & Region	Data Sources	Analytical Approach	Main Findings
Woodward-Kron & Remedios (2007)	Classroom discourse in PBL classrooms in the health science	Year 1 medical students; Australia	Videotaping of PBL tutorials	Discourse analysis (Egginis & Slade, 1997)	<ul style="list-style-type: none"> <li>Description of the linguistic resources students draw on to co-construct and negotiate knowledge, as well as show how the tutor, with minimal strategic interventions, scaffolds students' learning</li> <li>PBL environment can be a challenging one for students whose cultural and linguistic backgrounds differ</li> </ul>
Legg (2007)	The genre of PBL tutorial	Year 1 medical students ( <i>n</i> = 48); Hong Kong	Videotaping of PBL tutorials	Genre analysis (Egginis & Slade, 1997)	<ul style="list-style-type: none"> <li>Identified a consistent structure in all the tutorials:                             <ul style="list-style-type: none"> <li>- 3 compulsory and 3 optional stages</li> <li>- 2 overall macro moves</li> </ul> </li> </ul>
Hmelo-Silver & Barrows (2006).	To understand the goals and strategies of an expert facilitator in support of collaborative learning	Year 3 medical students ( <i>n</i> = 5); USA	Videotaping of PBL tutorials	Interaction analysis (Jordan & Henderson, 1995)	<ul style="list-style-type: none"> <li>An expert facilitator has a repertoire of strategies that can be adapted to meet the goals of PBL</li> </ul>
Vischers-Pleijers, et al. (2004)	Exploration of a method to analyze group interactions in problem-based learning	Year 1 medical students ( <i>n</i> = 2 group) and Year 2 medical students ( <i>n</i> -1 group); Netherlands	Videotaping of PBL tutorials	Episodic coding scheme (van Boxtel, 2000)	<ul style="list-style-type: none"> <li>Cognitive interactions identified in the tutorial groups</li> <li>Transcript analysis supported identification of co-constructions</li> </ul>

Table 3. Introspective studies analyzing written reflections.

Author & Year	Research Focus	Subject & Region	Data Sources	Analytical Approach	Main Findings
L'Ecuyer, et al. (2015)	Effectiveness of PBL in preparing students for interprofessional collaborative practice	Undergraduate nursing students ( <i>n</i> = 81); USA	Reflective assignments	Content analysis (Eylar & Giles, 1999; Kolb, 1984)	<ul style="list-style-type: none"> <li>PBL is an effective method for teaching interprofessional collaboration skills to nursing students</li> </ul>
Rowe (2012)	Use of assisted performance within an online social network to develop reflective reasoning	Year 3 & 4 physiotherapy students ( <i>n</i> = 70); South Africa	Reflective blog posts within the network	Deductive approach based on the Theory of Assisted Performance (Tharp & Gallimore, 1991)	<ul style="list-style-type: none"> <li>Online social networks can be used to facilitate reflective reasoning in clinical contexts</li> <li>Careful facilitation using sound pedagogy is still necessary</li> </ul>
Larin, et al. (2010)	Students' perceptions of PBL in a transitional doctoral program	Physical therapy students ( <i>n</i> = 63); USA	Reflective journals	Inductive approach (Creswell, 2007)	<ul style="list-style-type: none"> <li>A single PBL course within the curriculum was well accepted by students</li> <li>Students appreciated the benefits of learning in a group</li> </ul>
Hendry (2009)	Tutors' conceptions of their development as tutors	Tutors ( <i>n</i> = 29); Australia	Written responses	Inductive approach (Kerlind, 2007)	<ul style="list-style-type: none"> <li>Identified four conceptions of the PBL tutor role</li> <li>There was homogeneity in the relations between levels of sophistication</li> </ul>
Lin (2005)	Medical students' perception of good PBL tutors	Tutors ( <i>n</i> = 29) and undergraduate medical students ( <i>n</i> = 49); Taiwan	Tutor evaluation forms	Deductive approach (De Grave, et al., 1999)	<ul style="list-style-type: none"> <li>Students valued personality aspects of a tutor, an area that had been neglected in previous studies</li> </ul>
Solomon & Crowe (2001)	Perceptions of student peer tutors	Physiotherapy students ( <i>n</i> = 59); UK	Reflective journals	Deductive approach (De Grave, et al., 1999)	<ul style="list-style-type: none"> <li>Students struggled with basic facilitation skills and had difficulty separating the role of student from that of the tutor</li> <li>Students developed strategies to allow them to succeed, were able to evaluate their performance in a positive light, and appeared to value their tutoring experience</li> </ul>

Table 4. Studies with multiple qualitative methods.

Author & Year	Research Focus	Subject & Region	Data Sources	Analytical Approach	Main Findings
Skinner, et al. (2015)	Students' understandings of the purpose and value of PBL groups for their learning	Year 1 undergraduate students; Australia & Ireland	Classroom observations; Interviews	Ethnography using inductive thematic method (Liamputtong & Ezzy, 2005) based on a grounded theory approach (Charmaz, 2000)	<ul style="list-style-type: none"> <li>Students constructed PBL learning as individual knowledge gain, and group purpose as information gathering and exchange</li> <li>Few students acknowledged the learning potential of group processes</li> <li>Group value depended on assessment and curriculum context</li> </ul>
Jin, et al. (2015)	Role of online searching during PBL tutorials	2 PBL groups of Year 1 undergraduate students in Medicine and Dentistry ( $n = 19$ ); Hong Kong	Video and audio recordings of PBL tutorials; Stimulated recall interviews	Interactional ethnography (Green et al., 2003; Rex, 2006); Thematic analysis (Monrouxe, Rees, & Hu, 2011; Ritchie & Spencer, 1994)	<ul style="list-style-type: none"> <li>Use of students' personal mobile devices with online searching capacity is considered a dynamic pedagogically and socially constructed process</li> <li>Online searching during the PBL process identified as a "site-of-struggle" for first-year undergraduates</li> </ul>
Imafuku, et al. (2014)	The processes of collective knowledge construction in Japanese students in PBL tutorials	Year 3 students from medicine, dentistry, and pharmacy ( $n = 12$ ); Year 2 students ( $n = 6$ ) from nursing, occupational therapy, and physiotherapy; Japan	Videotaping of PBL tutorials; E-portfolio	Ethnographic case study using classroom discourse analysis (Eggin & Slade, 1997; Tsui, 1994); Thematic coding of e-portfolio (Strauss & Corbin, 1998)	<ul style="list-style-type: none"> <li>Two patterns of knowledge construction identified: (a) co-constructions between students from different disciplines and (b) elaborations between students from the same discipline</li> </ul>
Lee, et al. (2013)	Tutors' behavior in facilitating group dynamics	Tutorial groups from various medical disciplines ( $n = 40$ ); Taiwan	Videotaping of PBL tutorials and tutors' explanations of their interventions	Grounded theory and constant comparative method (Pope, et al., 2009)	<ul style="list-style-type: none"> <li>Identified tutors' intentions of their interventions as: (a) iteration of PBL principles, (b) delegation of responsibility to the students, (c) creation of a good discussion forum, and (d) the generation of a good learning atmosphere</li> </ul>

Table 4., cont'd. Studies with multiple qualitative methods.

Author & Year	Research Focus	Subject & Region	Data Sources	Analytical Approach	Main Findings
Paige & Smith (2013)	Faculty participation in PBL	Nurse faculties (n = 50); US	Interviews and observation	Interpretive phenomenological analysis (Smith, et al., 2009)	<ul style="list-style-type: none"> <li>Epistemic doubt happens when action and intent toward PBL teaching perspective do not match underlying beliefs</li> </ul>
Anderson & Reid (2012)	Students' perceptions of a PBL scenario	Year 1 dental nurse students (n = 21); UK	Open-ended questionnaires regarding students' perceptions	Inductive approach (Braun & Clarke, 2006; Silverman, 2005)	<ul style="list-style-type: none"> <li>PBL could be valuable in the acquisition of deep knowledge and improved patient care</li> <li>Concerns of confidence in PBL sessions and a need for improved feedback</li> </ul>
Frambach, et al. (2012)	How culture challenges SDL	Year 1 & 3 medical students (n = 56), tutors (n = 17), and curriculum leaders (n = 15); Middle East, Hong Kong, and Netherlands	Interviews; Observations; Document analysis; Contextual information	Thematic approach using template analysis (King, 2004)	<ul style="list-style-type: none"> <li>Cultural factors can pose a challenge to the application of PBL in non-Western settings</li> <li>Contextual factors can inhibit or enhance SDL</li> </ul>
Lee, et al. (2009)	When a problem-based learning tutor decides to intervene	Medical tutors (n = 8); Taiwan	Videotaping of PBL tutorials; Stimulated recall	Grounded theory, constant comparative method (Pope, et al., 2000)	<ul style="list-style-type: none"> <li>Identified 3 types of tutor interventions: (a) tutorial group process; (b) quality of discussion; and (c) quality and quantity of the materials discussed</li> </ul>
Moore (2009)	Lecturer as facilitator within PBL context	Nursing lecturers (n = 12); UK	Observations; Interviews; Memo writing	Open coding and constant comparative analysis (Boy-chuk, 2004; Corbin, 1986; Glaser & Strauss, 1967)	<ul style="list-style-type: none"> <li>Personal pedagogical beliefs and values influenced lecturers' interpretations and applications of their roles as facilitators</li> </ul>

Table 4., cont'd. Studies with multiple qualitative methods.

Author & Year	Research Focus	Subject & Region	Data Sources	Analytical Approach	Main Findings
Cooke & Matarazzo (2005)	Promoting reflection in mental health nursing practice	Student (n = 1); Australia	Written analysis of five cases; Interviews	Thematic analysis (non-specified)	<ul style="list-style-type: none"> <li>• Illustrated the students' reflections on the theme of "hope" for the clients and identified three obstacles</li> <li>• Reflective learning strategies can be incorporated in on- and off-campus learning environments</li> </ul>
Schoenfeld-Tacher, et al. (2005)	Whether and how the introduction of a new technology (WebCT) influenced faculty teaching styles while facilitating in PBL	Clinical sciences faculty members (n = 9); USA	Observations; Interviews	Inductive approach (Schwandt, 2001)	<ul style="list-style-type: none"> <li>• No direct evidence to suggest use of WebCT affected teaching behaviors</li> <li>• All facilitators showed a moderate increase in comfort with the technology during the semester, and one participant showed remarkable gains in technology skills</li> </ul>
Valaitis, et al. (2005)	Students' views about learning and group process in the online environment	Undergraduate nursing and mid-wifery students and graduate students in a neonatal nurse practitioner program (n = 22) and tutors (n = 30); Canada	Individual written reflections; Focus groups	Constant comparison approach (Lincoln & Gube, 1985)	<ul style="list-style-type: none"> <li>• Conducting PBL online is feasible</li> <li>• Students felt that it increased their flexibility for learning, enhanced their ability to deeply process content, and provided access to valuable learning resources</li> <li>• Students experienced a period of adaptation to the online environment, perceived a heavy workload, and had difficulties making group decisions online</li> </ul>
Bland (2004)	Teaching statistics to medical students using PBL	Medical schools using PBL (n = 10); Australia	Interviews; Emails	Thematic analysis (non-specified)	<ul style="list-style-type: none"> <li>• Identified difficulties in implementing an integrated approach; however, not integrating is detrimental to statistics and research methods teaching, requisite for evidence-based medicine.</li> </ul>



Table 4., cont'd. Studies with multiple qualitative methods.

Author & Year	Research Focus	Subject & Region	Data Sources	Analytical Approach	Main Findings
Lloyd-Jones & Hak (2004)	The experience and practice of students entering a PBL medical undergraduate course and to identify contributory social, curricular, and contextual factors	Two successive cohorts of Year 1 medical students; UK	Participant observation; Interviews and focus groups; Survey; Documentary analysis	Inductive approach (Mammersley & Atkinson, 1995)	<ul style="list-style-type: none"> <li>• Student learning was socially agreed upon amongst the peer group and directed by faculty-given resources</li> </ul>
Ryan, et al. (2004)	Evaluation of an online Clinical Reasoning Guide	Year 3 medical students ( $n = 53$ ) and clinical tutors ( $n = 6$ ); Australia	Video documentation; Interviews	Inductive approach for video data (non-specified); Deductive approach for interview questions (non-specified)	<ul style="list-style-type: none"> <li>• Efficacy of guide as a tool for augmenting the PBL process in clinical settings and promoting the development of clinical reasoning</li> <li>• Tool prompted critical thinking re own, colleagues' and other clinicians' reasoning processes</li> </ul>
Darvill (2003)	Experience of diplomat student nurses and their PBL facilitators during a cultural awareness module	Student nurses ( $n = 20$ ) and their lecturers ( $n = 4$ ); UK	Participant observations; Focus groups; Student-diary summaries; Student evaluation	Thematic analysis (Burnard, 1991; Dey, 1993); Pattern matching (Morse, 1994; Stake, 1994; Yin, 1994)	<ul style="list-style-type: none"> <li>• Undergoing PBL as a teaching and learning strategy had positive outcomes for the students</li> <li>• Identified challenges in the transition to a PBL strategy from the perspective of the students and lecturers</li> </ul>

Table 4., cont'd. Studies with multiple qualitative methods.

Author & Year	Research Focus	Subject & Region	Data Sources	Analytical Approach	Main Findings
Solomon, et al. (2003)	Students' perceptions of their learning through participation in an inter-professional problem-based course on rehabilitation and HIV	Senior-level students from the occupational therapy, physiotherapy, medical, nursing and social work programmes (n = 9), tutors (n = 2), resource tutors (n = 2); Canada	Journals; Interviews	Open-coding technique (Strauss & Corbin, 1998)	<ul style="list-style-type: none"> <li>• Students gained an appreciation of the roles of others and developed a sense of confidence through justifying their professional roles</li> <li>• Students were able to increase the breadth and depth of their learning and also gained a rehabilitation perspective</li> </ul>

## RESULTS

The number of recent qualitative research studies of PBL in health sciences education is small but growing, with 61 qualitative articles identified in the review period. Four main research issues in PBL were identified in the review period: (1) participants' experiences or perceptions, (2) facilitation, (3) assessment, and (4) educational technologies. Participants' experiences or perceptions of PBL have drawn the most research attention to date, while issues of facilitation, assessment, and educational technologies have been addressed to a lesser degree. Identified articles include: self-reported studies using interview data ( $n = 29$ ) (see Table 1); studies analyzing video recordings of PBL tutorials ( $n = 9$ ) (see Table 2); introspective studies analyzing written reflections ( $n = 6$ ) (see Table 3); and studies using multiple qualitative methods ( $n = 17$ ) (see Table 4). Among these studies, the majority are perception studies, with only a limited number focused on the learning process of PBL or conducting interactional analysis. The following section reviews the research topics and findings of the 61 selected articles.

### Participants' Experiences of PBL

While the self-reported and introspective studies in Tables 1 and 3 provided access to participants' reflections and insights into PBL by analyzing interviews and written reflections, all 9 studies in Table 2 drew upon analysis of video recordings to examine actual, real-time learning processes in PBL, and 9 of the 17 studies in Table 4 have used mixed qualitative methods to explore a more textured, nuanced picture of participants' experiences or perceptions in PBL (e.g., Anderson & Reid, 2012; Bland, 2004). These studies had different research foci in terms of participants' experiences or perceptions of PBL, including:

1. The dynamics of PBL tutorials (Cooper & Carver, 2012; Woodward-Kron & Remedios, 2007);
2. Clinical practice in a PBL curriculum (e.g., Heading, Fuller, Lyle, & Madden, 2007; Shankar, Palaian, Gyawali, Mishra, & Mohan, 2007);
3. PBL curriculum in general (e.g., Bearn & Chadwick, 2010; Green-Thompson et al., 2012; Landeen, Jewiss, Vajoczki, & Vine, 2013; Spiers et al., 2014);
4. The bridging or transitioning between classroom theory and clinical practice (e.g., Gunn, Hunter, & Haas, 2012; Prince, van de Wiel, Scherpbier, van der Vleuten, & Boshuizen, 2000); and
5. Comparison of traditional classrooms versus PBL curricula (e.g., O'Neill, Jones, Willis, & McArdle, 2003; White, 2007).

The majority of these studies elicited student perceptions (e.g., Larin, Buccieri, & Wessel, 2010; L'Ecuyer, Pole, & Leander, 2015; Solomon & Crowe, 2001), with the remainder providing insights from both students/trainees and facilitators/staff (e.g., Landeen et al., 2013; Lekalakala-Mokgele, 2010), in addition to graduates (e.g., Lohfeld, Neville, & Norman, 2005; O'Neill et al., 2003; Spiers et al., 2014). The emerging body of research using video recordings and transcripts (Clouston, 2007; Legg, 2007; Visschers-Pleijers, Dolmans, Wolhagen, & van der Vleuten, 2004; Woodward-Kron & Remedios, 2007; Yew & Schmidt, 2009) has begun to examine real-time interactional processes more closely to better understand the learning dynamic as it evolves within contexts and over the duration of a tutorial or problem cycle.

Among these qualitative studies, the findings have indicated the generally positive effects of PBL and its impact on student learning (e.g., Anderson & Reid, 2012; Gunn et al., 2012; Larin et al., 2010; O'Neill et al., 2003; Visschers-Pleijers, Dolmans, de Leng, Wolhagen, & van der Vleuten, 2006; White, 2007). Studies have also noted some challenges in illustrating potential conflicts between ideology and classroom practice in PBL (Bearn & Chadwick, 2010; Singaram, van der Vleuten, & Stevens, 2011; Treloar et al., 2000) and between the theoretical and clinical phases of the curriculum (Prince et al., 2000). Others have indicated difficulties in implementing an integrated approach (Bland, 2004), in addition to cultural tensions in the application of PBL in non-Western settings (Frambach, Driessen, Chan, & van der Vleuten, 2012).

### Facilitation

Qualitative studies examining issues related to facilitation included explorations of:

1. Facilitators' PBL preparation (e.g., Midla & Coryell, 2010),
2. Facilitators' roles (e.g., Dornan, Hadfield, Brown, Boshuizen, & Scherpbier, 2005; Hendry, 2009; Lin, 2005; Mete & Sari, 2008),
3. The role of lecturer as facilitator (Moore, 2009),
4. Facilitators' interventions (Lee, Lin, & Lin, 2013; Lee, Lin, Tsou, Shiau, & Lin 2009),
5. Faculty development (e.g., Matthew-Maich et al., 2007), job satisfaction (e.g., Papinczak, 2010), and
6. Perceptions of tutors' evaluations (e.g., Papinczak, 2012).

There is agreement that facilitators play an important role in PBL (Mete & Sari, 2008), with faculty development increasingly attracting qualitative researchers' attention. For example, Mete and Sari (2008) examined students' expectations of

facilitators and the effects of facilitators' behavior as perceived by students. They used content analysis to classify individual facilitator characteristics and the behaviors that affect students' motivation and success in PBL. In Midla and Coryell's (2010) study, five factors related to facilitators' preparation for a PBL program were identified, including facilitators' outlook, previous experiences, approaches, academic resources, and the use of nonclinical tutors. Lin (2005) investigated medical students' perceptions of good PBL tutors in Taiwan and indicated that students value the personality aspects of a tutor, which had been neglected in previous studies. Using video recordings of PBL tutorials and facilitators' stimulated recall, Lee et al. (2009) and Lee et al. (2013) explored facilitators' interventions in PBL tutorials. They identified a number of contextual situations, as well as facilitators' intentions of their interventions in facilitating group dynamics (Lee et al., 2013; Lee et al., 2009).

### Assessment

Only 2 studies in Table 1 focused on the issue of assessment (Al Kadri, Al-Moamary, & van der Vleuten, 2009; Bollela, Gabarra, da Costa, & Lima, 2009). Al Kadri et al. (2009) conducted interviews and focus groups to investigate students' and teachers' perceptions of the clinical assessment program. They found that assessment affects students' perceptions of learning and the ways in which they learn in PBL, but these effects are not uniformly positive. Bollela et al. (2009) also conducted interviews to explore students and tutors' social representations of assessment and found that students and tutors perceive that their training of tutorial assessment is inadequate and they are not confident in the assessment.

### Educational Technologies

Qualitative studies of educational technologies in PBL have focused on how the innovations have impacted the PBL process. These include the incorporation of visual triggers for problem scenarios (Barron, Lambert, Conlon, & Harrington, 2008); mobile devices (Chan et al., 2015); online social networks (Rowe, 2012); online searching (Jin, Bridges, Botelho, & Chan, 2015); a Learning Management System (LMS; Schoenfeld-Tacher, Bright, McConnell, Marley, & Kogan, 2005); online guides (Ryan, Dolling, & Barnet, 2004); and a purpose-designed online environment (Valaitis, Sword, Jones, & Hodges, 2005). There was a general agreement that educational technologies were useful learning tools in PBL to enhance learning and teaching (Barron et al., 2008), facilitate reflective reasoning in clinical contexts (Rowe, 2012), increase flexibility for learning, and to enhance students' ability to deeply process content (Valaitis et al., 2005). The findings also indicated some difficulties and challenges, such as potential distractions in PBL tutorials (Chan et al., 2015), the

demand for new facilitation strategies in new environments (Rowe, 2012), impacts on workload, and difficulties in negotiating decisions in online environments (Valaitis et al., 2005).

## DISCUSSION AND IMPLICATIONS

The systematic search yielded 61 articles that met the search criteria in the two databases from 2000 to 2015. Although meeting the criteria of being solely qualitative studies, the majority were self-report, participant perception designs. Given that health sciences educational research has grown from the positivistic paradigms more familiar to the life sciences, and is particularly influenced by public health surveying approaches, the initial, survey-based foray into qualitative approaches is a logical extension. Ethnographically oriented studies examining learning artifacts and records such as video recordings of classroom interactions were fewer in number, but their growing presence indicates a growing methodological trend in the field. This recent interest in ethnographic, discourse-based qualitative research designs in PBL addresses questions related to *processes* rather than *perceptions*. This is, we would argue, a logical evolution of the field, particularly given PBL's philosophical focus on learning processes. The research foci of the 61 articles, current practices of methodology—including strategies of inquiry, data sources, and analytical approaches—and research sites are identified, analyzed, and discussed below.

### Research Foci

Participants' experiences or perceptions of PBL have drawn the most qualitative research attention to date, so the issues of facilitation, assessments, and educational technologies need to be explored further. In addition, it is of critical importance to contribute further interactional data and analysis on PBL-in-action (Bridges, Botelho, Green, & Chau, 2012), due to a perceived lack of studies into what and how students are learning (Hmelo-Silver, 2004; Prosser, 2004). Investigating collaboration or participation patterns and processes can allow researchers to understand better how learning is occurring and under which circumstances interaction can effectively support and be supported in the PBL process (Dillenbourg, Baker, Blaye, & O'Malley, 1995; Prosser, 2004; Visschers-Pleijers et al., 2006). Theoretically, while most of the qualitative studies explored PBL from a cognitive perspective, those papers introducing sociocultural and critical perspectives illustrate how such theoretical orientations can foster research designs that provide novel and insightful understandings of PBL in social practice at macro and micro levels. Further, examining PBL from a sociocultural perspective can provide insights into how subjects interact through assisted performance in specific social, historical, and cultural contexts (Lantolf, 2000;

Vygotsky, 1978). A critical perspective draws on poststructuralist and postmodernist notions of social identity and power (Gibson, 1986; Rogers, 2004) and holds potential to explore how these impact student group dynamics, knowledge construction, and analytic skills development within the PBL process. There is also scope to explore the larger curriculum design and management levels of a PBL curriculum design (Bridges, Yiu, & Botelho, 2016) from a critical perspective.

### Strategies of Inquiry

In delineating the key elements of qualitative research, it is essential to be aware of strategies of inquiry (Creswell, 2007, 2013; Denzin & Lincoln, 2011). Denzin and Lincoln (2011) noted that these strategies of inquiry included: case studies, ethnographies, phenomenological and ethnomethodological approaches, life histories, historical methods, action research, and clinical research. Creswell (2013) emphasized five qualitative approaches: narrative research, phenomenology, grounded theory, ethnography, and case study. A few of the educational studies included in this literature review have been explicit as to their orienting theoretical framework or strategy of inquiry, such as the use of ethnography (Imafuku, Kataoka, Mayahara, Suzuki, & Saiki, 2014) and grounded theory (Lee et al., 2009; O'Neill et al., 2003). Although study designs are well established and presented, the majority of the studies identified have not clearly indicated the strategies of inquiry, particularly in terms of a framing theoretical perspective. As future investigations are planned and conducted, more in-depth considerations of methodological framing and choice of research strategy should be clearly identified.

### Data Sources

Most of the reviewed studies (see Tables 1 and 3) have investigated PBL through interviews, focus group, and reflective journals/blogs, which are readily accessible means of exploring participants' viewpoints while emphasizing the social situatedness of the research (Kvale, 1996). By using self-report data, these studies have enabled participants to share personal insights into PBL in terms of what they perceived that they (a) knew (knowledge or information); (b) liked or disliked (values and preferences); and (c) thought (attitudes and beliefs) (Tuckman, 1972). A limitation is the bias that is inherent in self-reporting (Hmelo-Silver, 2004). Other records, such as real-time audio and video recordings of PBL learning in situ, especially when combined with stimulated recall, have the potential to be more powerful in detecting participants' practices and thinking processes. Audio-visual recordings in educational research have "the capacity for completeness of analysis and comprehensiveness of material, reducing the dependence on prior interpretation by the researcher" (Cohen et al., 2007, p. 407).

Thirteen out of 61 studies identified in this review (e.g., Aarnio, Lindblom-Ylänne, Nieminen, & Pyörälä, 2014; Clouston, 2007; Lee et al., 2013; Lee et al., 2009; Legg, 2007; Visschers-Pleijers et al., 2004; Woodward-Kron & Remedios, 2007; Yew & Schmidt, 2009) have used video recordings as a record for analysis. Visschers-Pleijers et al. (2004) indicated that group interaction in PBL is easier to elicit from analysis of transcripts of video-recorded PBL tutorials. Only 3 out of 61 studies (e.g., Jin et al., 2015; Lee et al., 2013; Lee et al., 2009) used stimulated recall of video as an additional think-aloud protocol. In one of the earlier applications in PBL research, De Grave, Boshuizen, and Schmidt (1996) noted that the stimulated recall approach provided detailed and unique information about hypothesis evaluation and meta-reasoning during PBL discussions and argued that the process of conceptual change by students can be made visible. They suggest that the stimulated recall method was sensitive for detecting conceptual change during problem analysis. There is potential for further studies to adopt these sources.

### Analytical Approaches

Historically, thematic analysis of qualitative records using inductive and deductive approaches (Glaser & Strauss, 1967; Marshall & Rossman, 1995) has been well accepted by researchers interested in categorizing accounts or aspects of accounts. This was found to be the predominant approach adopted in the studies yielded by this systematic review. A major benefit of this approach is the ability to organize and classify large amounts of text (documents, transcripts, open-ended written responses, etc.), including video records. Specialist coding software can support thematic coding across large datasets. However, it is worthwhile to note the potential of other analytical approaches, from discourse-based approaches to analysis of recordings made in educational contexts. In this literature review, only a limited number of studies have used alternative analytical approaches such as discourse analysis (Clouston, 2007; Imafuku et al., 2014; Legg, 2007; Woodward-Kron, & Remedios, 2007); interaction analysis (Hmelo-Silver & Barrows, 2006); and interactional ethnography (Jin et al., 2015). Clouston (2007) suggested that discourse analysis and conversation analysis could enable an understanding of how effective problem-based learning communication is constructed. He argued that by analyzing patterns of group communication and considering how participants give meaning to problem-based learning talk, problem-solving sequences and facilitation devices can be highlighted. Likewise, Legg's (2007) application of genre analysis illustrates how the approach can assist in identifying consistent learning discourse patterns and structures in PBL tutorials. Thematic and discourse-based approaches to analysis differ in terms of purpose, units, and

levels of analysis of the phenomena under examination. Such analytic approaches have strong potential to broaden our understanding of PBL learning processes.

### Research Sites

While noting that the body of qualitative research in PBL has been growing, it was evident in this review that few studies have addressed PBL in non-Western contexts (Imafuku et al. 2014; Lee et al., 2013; Lee, et al., 2009; Lin, 2005) or in second or foreign language contexts (e.g., Chan et al., 2015; Jin et al., 2015; Legg, 2007; Lu & Chan, 2015; Yew & Schmidt, 2009). As a discursive process where meaning is negotiated and collaboratively constructed through language, the PBL context is inherently demanding on students' linguistic and communicative repertoires. As Frederiksen (1999) noted, PBL is unique in that it "requires the students to engage in interactive task-oriented dialogue" where "participants must be able to understand the reasoning process as it is unfolding through the discourse of interaction" (p. 136). Although the studies listed above have revealed the communicative demands of PBL, more work needs to be undertaken to examine how diverse or non-Western learners in internationalized higher educational institutions participate in learning activities that require high levels of both domain knowledge and language skills.

## CONCLUSIONS

Results of this literature review indicate that since 2000, there has been a small but growing adoption of qualitative approaches in research studies examining PBL in health sciences education. As Denzin and Lincoln (2011) indicated, the future of qualitative research is "to concede the unexpected but recognize both what is new and what is the same old experience" (p. 696). This paper has mapped current practices in qualitative studies in PBL and indicated new directions. The authors encourage PBL researchers to explore these "new" research orientations and methodologies to further examine the "old" question of *how* students learn in PBL.

## ACKNOWLEDGMENTS

We would like to thank Ms. Rita Suen Po Chu and Miss Alicia Ya Fei Xue for their research assistance.

## REFERENCES

Aarnio, M., Lindblom-Ylänne, S., Nieminen, J., & Pyörälä, E. (2014). How do tutors intervene when conflicts on

knowledge arise in tutorial groups? *Advances in Health Sciences Education*, 19(3), 329–345. <http://dx.doi.org/10.1007/s10459-013-9473-5>

- Addison, J. (1999). *A discourse on antient and modern learning*. Alexandria, VA: Chadwydk-Healey.
- Åkerlind, G. S. (2007). Constraints on academics' potential for developing as a teacher. *Studies in Higher Education*, 32(1), 21–37. <http://dx.doi.org/10.1080/030757070601099416>
- Al Kadri, H. M. F., Al-Moamary, M. S., & van der Vleuten, C. (2009). Students' and teachers' perceptions of clinical assessment program: A qualitative study in a PBL curriculum. *BMC Research Notes*, 2, 263. <http://dx.doi.org/10.1186/1756-0500-2-263>
- Allen, N. J., & Meyer, J. P. (1990). The measurement and antecedents of affective, continuance and normative commitment to the organization. *Journal of Occupational and Organizational Psychology*, 63(1), 1–18. <http://dx.doi.org/10.1111/j.2044-8325.1990.tb00506.x>
- Anderson, V., & Reid, K. (2012). Students' perception of a problem-based learning scenario in dental nurse education. *European Journal of Dental Education*, 16(4), 218–223. <http://dx.doi.org/10.1111/j.1600-0579.2012.00745.x>
- Barron, C., Lambert, V., Conlon, J., & Harrington, T. (2008). "The Child's World": A creative and visual trigger to stimulate student enquiry in a problem based learning module. *Nurse Education Today*, 28(8), 962–969. <http://dx.doi.org/10.1016/j.nedt.2008.05.017>
- Bearn, D. R., & Chadwick, S. M. (2010). Problem-based learning in postgraduate dental education: A qualitative evaluation of students' experience of an orthodontic problem-based postgraduate programme. *European Journal of Dental Education*, 14(1), 26–34. <http://dx.doi.org/10.1111/j.1600-0579.2009.00588.x>
- Biley, F. (1999). Creating tension: Undergraduate student nurses' responses to a problem-based learning curriculum. *Nurse Education Today*, 19(7), 586–591. <http://dx.doi.org/10.1054/nedt.1999.0371>
- Bland, J. M. (2004). Teaching statistics to medical students using problem-based learning: the Australian experience. *BMC Medical Education*, 4, 31. <http://dx.doi.org/10.1186/1472-6920-4-31>
- Bligh, J., & Anderson, M. B. (2000). Medical teachers and evidence. *Medical Education*, 34(3), 162–163. <http://dx.doi.org/10.1046/j.1365-2923.2000.00648.x>
- Bollela, V. R., Gabarra, M. H. C., da Costa, C., & Lima, R. C. P. (2009). Students and tutors' social representations of assessment in problem-based learning tutorials supporting change. *BMC Medical Education*, 9, 30. <http://dx.doi.org/10.1186/1472-6920-9-30>
- BoyчукDuchscher, J.E. (2004). Grounded theory: Reflections on the emergence vs. forcing debate. *Journal of Advanced*

- Nursing*, 48(6), 605–612. <http://dx.doi.org/10.1111/j.1365-2648.2004.03249.x>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <http://dx.doi.org/10.1191/1478088706qp063oa>
- Bridges, S., Botelho, M., Green, J., & Chau, A. (2012). Multimodality problem-based learning (PBL): An interactional ethnography. In S. Bridges, C. McGrath, & T. Whitehill (Eds.), *Problem-based learning in clinical education: The next generation* (pp. 99–120). Dordrecht, Netherlands: Springer.
- Bridges, S. M., McGrath, C., & Whitehill, T. (2012). The next generation: Research directions in PBL. In S. Bridges, C. McGrath, & T. Whitehill (Eds.), *Problem-based learning in clinical education: The next generation*. (pp. 225–232). Dordrecht, Netherlands: Springer.
- Bridges, S. M., Yiu, C. K. Y., & Botelho, M. G. (2016). Design considerations for an integrated, problem-based curriculum. *Medical Science Educator*, 26(3), 365–373. <http://dx.doi.org/10.1007/s40670-016-0255-6>
- Burnard, P. (1991). A method of analysing interview transcripts in qualitative research. *Nurse Education Today*, 11(6), 461–466. [http://dx.doi.org/10.1016/0260-6917\(91\)90009-Y](http://dx.doi.org/10.1016/0260-6917(91)90009-Y)
- Chan, L., Bridges, S. M., Doherty, I., Ng, M., Jin, J., Sharma, N., . . . Lai, H. Y. (2015). A qualitative study on how health professional students and their PBL facilitators perceive the use of mobile devices during PBL. *Interdisciplinary Journal of Problem-Based Learning*, 9(1). <http://dx.doi.org/10.7771/1541-5015.1510>
- Chiriac, E. H. (2008). A scheme for understanding group processes in problem-based learning. *Higher Education*, 55(5), 505–518. <http://dx.doi.org/10.1007/s10734-007-9071-7>
- Clouston, T. J. (2007). Exploring methods of analysing talk in problem-based learning tutorials. *Journal of Further and Higher Education*, 31(2), 183–193. <http://dx.doi.org/10.1080/03098770701267705>
- Cohen, L., Manion, L., & Morrison, K. (2000). *Research methods in education* (5th ed.). London: Routledge Falmer.
- Cook, D. A., & West, C. P. (2012). Conducting systematic reviews in medical education: A stepwise approach. *Medical Education*, 46(10), 943–952. <http://dx.doi.org/10.1111/j.1365-2923.2012.04328.x>
- Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education* (6th ed.). London: Routledge Falmer.
- Cooke, M., & Matarasso, B. (2005). Promoting reflection in mental health nursing practice: A case illustration using problem-based learning. *International Journal of Mental Health Nursing*, 14(4), 243–248. <http://dx.doi.org/10.1111/j.1440-0979.2005.00388.x>
- Cooper, C., & Carver, N. (2012). Problem based learning in mental health nursing: The students' experience. *International Journal of Mental Health Nursing*, 21(2), 175–183. <http://dx.doi.org/10.1111/j.1447-0349.2011.00788.x>
- Corbin, J. (1986). Analyzing data for categories and description. In W. C. Chenitz & J. M. Swanson (Eds.), *From practice to grounded theory* (pp. 121–132). Menlo Park, CA: Addison-Wesley.
- Corbin, J. M., & Strauss, A. (1990). Grounded theory research: Procedures, canons and evaluative criteria. *Quality Sociology*, 13(1), 3–21. <http://dx.doi.org/10.1007/BF00988593>
- Creswell, J. W. (1994). *Research design: Qualitative and quantitative approaches*. London: SAGE Publications.
- Cresswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed methods Approaches* (2nd ed.). Thousand Oaks, CA: SAGE Publications.
- Creswell, J. W. (2007). *Qualitative inquiry and research design: Choosing among five approaches* (2nd ed.). Thousand Oaks, CA: SAGE Publications.
- Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches* (3rd ed.). Thousand Oaks, CA: SAGE Publications.
- Dahlgren, L. O., & Fallsberg, M. (1991). Phenomenography as a qualitative approach in social pharmacy research. *Journal of Social and Administrative Pharmacy*, 8(4), 150–156.
- Darvill, A. (2003). Testing the water—problem-based learning and the cultural dimension. *Nurse education in Practice*, 3(2), 72–79. [http://dx.doi.org/10.1016/S1471-5953\(02\)00082-3](http://dx.doi.org/10.1016/S1471-5953(02)00082-3)
- De Grave, W. S., Boshuizen, H. P. A., & Schmidt, H. G. (1996). Problem-based learning: Cognitive and metacognitive processes during problem analysis. *Instructional Science*, 24(5), 321–341. <http://dx.doi.org/10.1007/BF00118111>
- De Grave, W. S., Dolmans, D. H. J. M., & van der Vleuten, C. P. M. (1999). Profiles of effective tutors in problem-based learning: Scaffolding student learning. *Medical Education*, 33(12), 901–906. <http://dx.doi.org/10.1046/j.1365-2923.1999.00492.x>
- Denzin, N. K., & Lincoln, Y. S. (Eds.). (2000). *Handbook of qualitative research* (2nd ed.). Thousand Oaks, CA: SAGE Publications.
- Denzin, N. K., & Lincoln, Y. S. (Eds.). (2011). *The SAGE handbook of qualitative research* (4th ed.). Thousand Oaks, CA: SAGE Publications.
- Dey, I. (1993). *Qualitative data analysis: A user-friendly guide for social scientists*. Abingdon, Oxon, UK: Routledge.
- Dillenbourg, P., Baker, M., Blaye, A., & O'Malley, C. (1995). The evolution of research on collaborative learning. In E. Spada & P. Reimann (Eds.), *Learning in humans and machine: Towards an interdisciplinary learning science* (pp. 189–211). Oxford: Elsevier.
- Dornan, T., Hadfield, J., Brown, M., Boshuizen, H., & Scherpbier, A. (2005). How can medical students learn in a self-directed way in the clinical environment? Design-based

- research. *Medical Education*, 39(4), 356–364. <http://dx.doi.org/10.1111/j.1365-2929.2005.02112.x>
- Dornan, T., Scherpbier, A., King, N., & Boshuizen, H. (2005). Clinical teachers and problem-based learning: A phenomenological study. *Medical Education*, 39(2), 163–170. <http://dx.doi.org/10.1111/j.1365-2929.2004.01914.x>
- Dunn, W. R., & Hamilton, D. D. (1986). The critical incident technique—a brief guide. *Medical Teacher*, 8(3), 207–215. <http://dx.doi.org/10.3109/01421598609036857>
- Eggs, S., & Slade, D. (1997). *Analysing casual conversation*. London: Cassell.
- Fairclough, N. (1995). *Critical discourse analysis: The critical study of language*. London: Longman.
- Frambach, J. M., Driessen, E. W., Chan, L.-C., & van der Vleuten, C. P. M. (2012). Rethinking the globalisation of problem-based learning: How culture challenges self-directed learning. *Medical Education*, 46(8), 738–747. <http://dx.doi.org/10.1111/j.1365-2923.2012.04290.x>
- Frederiksen, C. H. (1999). Learning to reason through discourse in a problem-based learning group. *Discourse Processes*, 27(2), 135–160. <http://dx.doi.org/10.1080/01638539909545055>
- Fyrenius, A., Silén, C., & Wirell, S. (2007). Students' conceptions of underlying principles in medical physiology: An interview study of medical students' understanding in a PBL curriculum. *Advances in Physiology Education*, 31(4), 364–369. <http://dx.doi.org/10.1152/advan.00108.2006>
- Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. New York: Aldine.
- Goldie, J., Dowie, A., Cotton, P., & Morrison, J. (2007). Teaching professionalism in the early years of a medical curriculum: A qualitative study. *Medical Education*, 41(6), 610–617. <http://dx.doi.org/10.1111/j.1365-2923.2007.02772.x>
- Green-Thompson, L. P., McInerney, P., Manning, D. M., Mapukata-Sondzaba, N., Chipamaunga, S., & Maswan-ganyi, T. (2012). Reflections of students graduating from a transforming medical curriculum in South Africa: A qualitative study. *BMC Medical Education*, 12, 49. <http://dx.doi.org/10.1186/1472-6920-12-49>
- Green, J. (1998). Commentary: Grounded theory and the constant comparative method. *British Medical Journal*, 316(7137), 1064–1065.
- Gunn, H., Hunter, H., & Haas, B. (2012). Problem based learning in physiotherapy education: A practice perspective. *Physiotherapy*, 98(4), 330–335. <http://dx.doi.org/10.1016/j.physio.2011.05.005>
- Hand, T., & Trembath, K. (1999). *The course experience questionnaire symposium 1998*. Canberra, Australia: Department of Education, Training and Youth Affairs, Evaluations and Investigations Programme.
- Heading, G. S., Fuller, J. D., Lyle, D. M., & Madden, D. L. (2007). Using problem-based learning in public health service based training. *NSW Public Health Bulletin*, 18(1–2), 8–13. <http://dx.doi.org/10.1071/NB07008>
- Hendry, G. D. (2009). Problem-based learning tutors' conceptions of their development as tutors. *Medical Teacher*, 31(2), 145–150. <http://dx.doi.org/10.1080/01421590802146026>
- Hitchcock, G., & Hughes, D. (1995). *Research and the teacher: A qualitative introduction to school-based research* (2nd ed.). New York: Routledge.
- Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn? *Educational Psychology Review*, 16(3), 235–266. <http://dx.doi.org/10.1023/B:EDPR.0000034022.16470.f3>
- Hmelo-Silver, C. E. (2013). Creating a learning space in problem-based learning. *Interdisciplinary Journal of Problem-Based Learning*, 7(1). <http://dx.doi.org/10.7771/1541-5015.1334>
- Hmelo-Silver, C. E., & Barrows, H. S. (2006). Goals and strategies of a problem-based learning facilitator. *Interdisciplinary Journal of Problem-Based Learning*, 1(1). <http://dx.doi.org/10.7771/1541-5015.1004>
- Holliday, A. (2002). *Doing and writing qualitative research*. London: SAGE Publications.
- Imafuku, R., Kataoka, R., Mayahara, M., Suzuki, H., & Saiki, T. (2014). Students' Experiences in interdisciplinary problem-based learning: A discourse analysis of group interaction. *Interdisciplinary Journal of Problem-Based Learning*, 8(2). <http://dx.doi.org/10.7771/1541-5015.1388>
- Jin, J., Bridges, S. M., Botelho, M. G., & Chan, L. (2015). Online searching in PBL tutorials. *Interdisciplinary Journal of Problem-Based Learning*, 9(1). <http://dx.doi.org/10.7771/1541-5015.1514>
- King, N. (2004). Using templates in the thematic analysis of text. In C. Cassel & G. Symon (Eds.), *Essential guide to qualitative methods in organizational research* (pp. 256–270). London: SAGE Publications.
- Knodel, J. (1993). The design and analysis of focus group studies: A practical approach. In D. L. Morgan (Ed.), *Successful focus groups: Advancing the state of the art* (pp. 35–50). Newbury Park, CA: SAGE Publications.
- Koh, G. C., Khoo, H. E., & Wong, M. L. (2008). The effects of problem based learning during medical school on physician competency: A systematic review. *Canadian Medical Association Journal*, 178(1), 34–41. <http://dx.doi.org/10.1503/cmaj.070565>
- Kvale, S. (1996). *InterViews: An introduction to qualitative research interviewing*. Thousand Oaks, CA: SAGE Publications.
- Landeen, J., Jewiss, T., Vajoczki, T., & Vine, M. (2013). Exploring consistency within a problem-based learning



- context: Perceptions of students and faculty. *Nurse Education Practice*, 13(4), 277–282. <http://dx.doi.org/10.1016/j.nepr.2013.03.013>
- Lantolf, J. P. (Ed.). (2000). *Sociocultural theory and second language learning*. Oxford: Oxford University Press.
- Larin, H. M., Buccieri, K. M., & Wessel, J. (2010). Students' perspectives on problem-based learning in a transitional doctorate of physical therapy program. *Journal of the Scholarship of Teaching and Learning*, 10(3), 128–144.
- L'Ecuyer, K. M., Pole, D., & Leander, S. A. (2015). The use of PBL in an interprofessional education course for health care professional students. *Interdisciplinary Journal of Problem-Based Learning*, 9(1). <http://dx.doi.org/10.7771/1541-5015.1497>
- Lee, G.-H., Lin, C.-S. & Lin, Y.-H. (2013). How experienced tutors facilitate tutorial dynamics in PBL groups. *Medical Teacher*, 35(2), e935–e942. <http://dx.doi.org/10.3109/0142159X.2012.714883>
- Lee, G. H., Lin, Y. H., Tsou, K. I., Shiau, S. J., & Lin, C. S. (2009). When a problem-based learning tutor decides to intervene. *Academic Medicine*, 84(10), 1406–1411. <http://dx.doi.org/10.1097/ACM.0b013e3181b6b433>
- Legg, M. (2007). From question to answer: The genre of the problem-based learning tutorial at the University of Hong Kong. *English for Special Purposes*, 26(3), 344–367. <http://dx.doi.org/10.1016/j.esp.2007.01.002>
- Lekalakala-Mokgele, E. (2010). Facilitation in problem-based learning: Experiencing the locus of control. *Nurse Education Today*, 30(7), 638–642. <http://dx.doi.org/10.1016/j.nedt.2009.12.017>
- Leung, S. F., Mok, E., & Wong, D. (2008). The impact of assessment methods on the learning of nursing students. *Nurse Education Today*, 28(6), 711–719. <http://dx.doi.org/10.1016/j.nedt.2007.11.004>
- Lin, C.-S. (2005). Medical students' perception of good PBL tutors in Taiwan. *Teaching and Learning in Medicine*, 17(2), 179–183. [http://dx.doi.org/10.1207/s15328015tlm1702\\_13](http://dx.doi.org/10.1207/s15328015tlm1702_13)
- Lincoln, Y. S., & Gube, E. G. (1985). *Naturalistic inquiry*. London: SAGE Publications.
- Lloyd-Jones, G., & Hak, T. (2004). Self-directed learning and student pragmatism. *Advances in Health Sciences Education*, 9(1), 61–73. <http://dx.doi.org/10.1023/B:AHSE.0000012228.72071.1e>
- Lohfeld, L., Neville, A., & Norman, G. (2005). PBL in undergraduate medical education: A qualitative study of the views of Canadian residents. *Advances in Health Sciences Education*, 10(3), 189–214. <http://dx.doi.org/10.1007/s10459-005-1293-9>
- Lu, J., & Chan, L. (2015). Differ in socio-cognitive processes? Some comparisons between paper and video triggered PBL. *Interdisciplinary Journal of Problem-Based Learning*, 9(2). <http://dx.doi.org/10.7771/1541-5015.1495>
- Lu, J., Bridges, S. M., & Hmelo-Silver, C. (2014). Problem-based learning. In R. Keith Sawyer (Ed). *The Cambridge handbook of the learning sciences* (2nd ed., pp. 298–318). Cambridge: Cambridge University Press.
- Mammersley, M., & Atkinson, P. (1995). *Ethnography principles in practice*. London: Routledge.
- Marshall, C., & Rossman, G. B. (1995). *Designing qualitative research*. Thousand Oaks, CA: SAGE Publications.
- Matthew-Maich, N., Mines, C., Brown, B., Lunyk-Child, O., Carpio, B., Drummond-Young, M., . . . Linton, J. (2007). Evolving as nurse educators in problem-based learning through a community of faculty development. *Journal of Professional Nursing*, 23(2), 75–82. <http://dx.doi.org/10.1016/j.profnurs.2006.07.004>
- Mercer, N. (1996). The quality of talk in children's collaborative activity in the classroom. *Learning and Instruction*, 6(4), 359–377. [http://dx.doi.org/10.1016/S0959-4752\(96\)00021-7](http://dx.doi.org/10.1016/S0959-4752(96)00021-7)
- Merriam, S. B. (1998). *Qualitative research and case study applications in education: Revised and expanded from Case Study Research in Education*. San Francisco: Jossey-Bass Publishers.
- Mete, S., & Sari, H. Y. (2008). Nursing students' expectations from tutors in PBL and effects of tutors' behaviour on nursing students. *Nurse Education Today*, 28(4), 434–442. <http://dx.doi.org/10.1016/j.nedt.2007.07.008>
- Midla, G. S., & Coryell, J. E. (2010). Problem-based learning preparation for physician assistant faculty. *US Army Medical Department Journal*, 39–47.
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Thousand Oaks, CA: SAGE Publications.
- Moloney, G., & Walker, I. (2002). Talking about transplants: Social representations and the dialectical, dilemmatic nature of organ donation and transplantation. *British Journal of Social Psychology*, 41(2), 299–320. <http://dx.doi.org/10.1348/014466602760060264>
- Moore, J. (2009). An exploration of lecture as facilitator within the context of problem-based learning. *Nurse Education Today*, 29(2), 150–156. <http://dx.doi.org/10.1016/j.nedt.2008.08.004>
- Morgan, D. L. (1997). *Focus groups as qualitative research* (2nd ed.). Newbury Park, CA: SAGE Publications.
- Morse, J. M. (1994). Designing funded qualitative research. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 220–233). Thousand Oaks, CA: SAGE Publications.
- Moustakas, C. (1994). *Phenomenological research methods*. Thousand Oaks, CA: SAGE Publications.

- Omery, A. (1983). Phenomenology: A method for nursing research. *Advances in Nursing Science*, 5(2), 49–63.
- O'Neill, P. A., Jones, A., Willis, S. C., & McArdle, P. J. (2003). Does a new undergraduate curriculum based on *Tomorrow's Doctors* prepare house officers better for their first post? A qualitative study of the views of pre-registration house officers using critical incidents. *Medical Education*, 37(12), 1100–1108. <http://dx.doi.org/10.1046/j.1365-2923.2003.01714.x>
- Paige, J. B. S., R.O. (2013). Nurse faculty experiences in problem-based learning: An interpretive phenomenologic analysis. *Nursing Education Perspectives*, 34(4), 233–239.
- Papinczak, T. (2010). Assessment: An exploration of perceptions of tutor evaluation in problem-based learning tutorials. *Medical Education*, 44(9), 892–899. <http://dx.doi.org/10.1111/j.1365-2923.2010.03749.x>
- Papinczak, T. (2012). Perceptions of job satisfaction relating to affective organisation commitment. *Medical Education*, 46(10), 953–962. <http://dx.doi.org/10.1111/j.1365-2923.2012.04314.x>
- Patton, N. Q. (1990). *Qualitative evaluation and research methods*. Newbury Park, CA: SAGE Publications.
- Phillips, L., & Jørgensen, M. (2002). *Discourse analysis as theory and method*. London: SAGE Publications.
- Pope, C., Ziebland, S., & Mays, N. (2000). Qualitative research in health care: Analysing qualitative data. *British Medical Journal*, 320, 114–116. <http://dx.doi.org/10.1136/bmj.320.7227.114>
- Polyzois, I., Claffey, N., & Mattheos, N. (2009). Problem-based learning in academic health education. A systematic literature review. *European Journal of Dental Education*, 14(1), 55–64. <http://dx.doi.org/10.1111/j.1600-0579.2009.00593.x>
- Prince, K. J., van de Wiel, M., Scherpbier, A. J., van der Vleuten, C. P., & Boshuizen, H. P. (2000). A qualitative analysis of the transition from theory to practice in undergraduate training in a PBL-medical school. *Advances in Health Sciences Education: Theory and Practice*, 5(2), 105–116. <http://dx.doi.org/10.1023/A:1009873003677>
- Prosser, M. (2004). A student learning perspective on teaching and learning, with implications for problem-based learning. *European Journal of Dental Education*, 8(2), 51–58. <http://dx.doi.org/10.1111/j.1600-0579.2003.00336.x>
- Psathas, G. (1995). *Conversation analysis: The study of talk-in-interaction*. Thousand Oaks, CA: SAGE Publications.
- Rich, S. K., Keim, R. G., & Shuler, C. F. (2005). Problem-based learning versus a traditional educational methodology: A comparison of preclinical and clinical periodontics performance. *Journal of Dental Education*, 69(6), 649–662.
- Rowe, M. (2012). The use of assisted performance within an online social network to develop reflective reasoning in undergraduate physiotherapy students. *Medical Teacher*, 34(7), e469–e475. <http://dx.doi.org/10.3109/0142159X.2012.668634>
- Ryan, G., Dolling, T., & Barnet, S. (2004). Supporting the problem-based learning process in the clinical years: Evaluation of an online Clinical Reasoning Guide. *Medical Education*, 38(6), 638–645. <http://dx.doi.org/10.1111/j.1365-2929.2004.01839.x>
- Sacks, H. (1984). Notes on methodology. In M. Atkinson & J. Heritage (Eds.), *Structures of social action: Studies in conversation analysis* (pp. 21–27). Cambridge: Cambridge University Press.
- Sacks, H. (1992). *Lectures on conversation* (Vol. 1 & 2). Oxford: Basil Blackwell.
- Sandelowski, M. (1995). Qualitative analysis: What it is and how to begin. *Research in Nursing and Health*, 18, 371–375. <http://dx.doi.org/10.1002/nur.4770180411>
- Schmidt, H. G., Vermeulen, L., & van der Molen, H. T. (2006). Longterm effects of problem-based learning: A comparison of competencies acquired by graduates of a problem-based and a conventional medical school. *Medical Education*, 40(6), 562–567. <http://dx.doi.org/10.1111/j.1365-2929.2006.02483.x>
- Schoenfeld-Tacher, R., Bright, J. M., McConnell, S. L., Marley, W. S., & Kogan, L. R. (2005). Web-based technology: Its effects on small group “problem-based learning” interactions in a professional veterinary medical program. *Journal of Veterinary Medical Education*, 32(1), 86–92. <http://dx.doi.org/10.3138/jvme.32.1.86>
- Schwandt, T. A. (Ed.) (2001). *Dictionary of qualitative inquiry*. Thousand Oaks, CA: SAGE Publications.
- Shankar, P. R., Palaian, S., Gyawali, S., Mishra, P., & Mohan, L. (2007). Personal drug selection: Problem-based learning in pharmacology: Experience from a medical school in Nepal. *PLoS ONE*, 2(6), e524. <http://dx.doi.org/10.1371/journal.pone.0000524>
- Silverman, D. (2001). *Interpreting qualitative data: Methods for analysing talk, text and interaction*. London: SAGE Publications.
- Silverman, D. (2005). *Doing qualitative research* (2nd ed.). London: SAGE Publications.
- Singaram, V. S., van der Vleuten, C. P. M., & Stevens, F. (2011). “For most of us Africans, we don’t just speak”: A qualitative investigation into collaborative heterogeneous PBL group learning. *Advance in Health Science Education*, 16(3), 297–310. <http://dx.doi.org/10.1007/s10459-010-9262-3>
- Skinner, V. J., Braunack-Mayer, A., & Winning, T. A. (2015). The purpose and value for students of PBL groups for learning. *Interdisciplinary Journal of Problem-Based Learning*, 9(1). <http://dx.doi.org/10.7771/1541-5015.1499>

- Solomon, P., & Crowe, J. (2001). Perceptions of student peer tutors in a problem-based learning programme. *Medical Teacher*, 23(2), 181–186. <http://dx.doi.org/10.1080/01421590020031101>
- Solomon, P., Salvatori, P., & Guenter, D. (2003). An interprofessional problem-based learning course on rehabilitation issues in HIV. *Medical Teacher*, 25(4), 408–413. <http://dx.doi.org/10.1080/0142159031000137418>
- Spiers, J. A., Williams, B., Gibson, B., Kabotoff, W., McIlwraith, D., Sculley, A., & Richard, E. (2014). Graduate nurses' learning trajectories and experiences of problem based learning: A focused ethnography study. *International Journal of Nursing Studies*, 51(11), 1462–1471. <http://dx.doi.org/10.1016/j.ijnurstu.2014.03.002>
- Stake, R. (1994). Case studies. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 236–247). Thousand Oaks, CA: SAGE Publications.
- Staun, M., Bergstrom, B., & Wadensten, B. (2010). Evaluation of a PBL strategy in clinical supervision of nursing students: Patient-centred training in student-dedicated treatment rooms. *Nurse Education Today*, 30(7), 631–637. <http://dx.doi.org/10.1016/j.nedt.2009.12.013>
- Steinert, Y. (2004). Student perceptions of effective small group teaching. *Medical Education*, 38(3), 286–293. <http://dx.doi.org/10.1046/j.1365-2923.2004.01772.x>
- Stjernquist, M., & Crang-Svalenius, E. (2007). Problem based learning and the case method—medical students change preferences during clerkship. *Medical Teacher*, 29(8), 814–820. <http://dx.doi.org/10.1080/01421590701601592>
- Strauss, A. L. (1987). *Qualitative analysis for social scientists*. Cambridge: Cambridge University Press.
- Strauss, A., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. Newbury Park, CA: SAGE Publications.
- Strauss, A., & Corbin, J. (1998). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (2nd ed.). Thousand Oaks, CA: SAGE Publications.
- Teixeira, M. C. V., Settembre, F. M., & Leal, S. B. (2007). A survey of women's social representations of aging and rejuvenation. *The Spanish Journal of Psychology*, 10(1), 104–114. <http://dx.doi.org/10.1017/S1138741600006363>
- Tharp, R. G., & Gallimore, R. (1991). A theory of teaching as assisted performance. In P. Light, S. Sheldon, & M. Woodhead (Eds.), *Learning to think* (pp. 42–61). London: Routledge.
- Treloar, C., McCall, N., Rolfe, I., Pearson, S.-A., Garvey, G., & Heathcote, A. (2000). Factors affecting progress of Australian and international students in a problem-based learning medical course. *Medical Education*, 34(9), 708–715. <http://dx.doi.org/10.1046/j.1365-2923.2000.00625.x>
- Tsui, A. B. M. (1994). *English conversation*. Oxford: Oxford University Press.
- Tuckman, B. W. (1972). *Conducting educational research*. New York: Harcourt Brace Jovanovich.
- Valaitis, R. K., Sword, W. A., Jones, B., & Hodges, A. (2005). Problem-based learning online: Perceptions of health science students. *Advances in Health Science Education*, 10(3), 231–252. <http://dx.doi.org/10.1007/s10459-005-6705-3>
- van Boxtel, C. (2000). *Collaborative concept learning: Collaborative learning tasks, student interaction and the learning of physics concepts*. Utrecht, Netherlands: Utrecht University.
- Virtanen, P. J., Kosunen, E. A.-L., Holmberg-Marttila, D. M. H., & Virjo, I. O. (1999). What happens in PBL tutorial sessions? Analysis of medical students' written accounts. *Medical Teacher*, 21(3), 270–276. <http://dx.doi.org/10.1080/01421599979518>
- Visschers-Pleijers, A. J. S. F., Dolmans, D., de Leng, B., Wolffhagen, I., & van der Vleuten, C. (2006). Analysis of verbal interactions in tutorial groups: A process study. *Medical Education*, 40(2), 129–137. <http://dx.doi.org/10.1111/j.1365-2929.2005.02368.x>
- Visschers-Pleijers, A. J. S. F., Dolmans, D. H. J. M., Wolffhagen, I. H. A. P., & van der Vleuten, C. P. M. (2004). Exploration of a method to analyze group interactions in problem-based learning. *Medical Teacher*, 26(5), 471–478. <http://dx.doi.org/10.1080/01421590410001679064>
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
- White, C. B. (2007). Smoothing out transitions: how pedagogy influences medical students' achievement of self-regulated learning goals. *Advances in Health Science Education*, 12(3), 279–297. <http://dx.doi.org/10.1007/s10459-006-9000-z>
- Wood, S. (2006). Views of the effectiveness of problem-based learning. *Nurse Times*, 102(21), 34–38.
- Woodward-Kron, R., & Remedios, L. (2007). Classroom discourse in problem-based learning classrooms in the health sciences. *Australian Review of Applied Linguistics*, 30(1), 9.1–9.18. <http://dx.doi.org/10.2104/ara10709>
- Yew, E. H. J., & Schmidt, H. G. (2009). Evidence for constructive, self-regulatory and collaborative processes in problem-based learning. *Advances in Health Sciences Education*, 14(2), 251–273. <http://dx.doi.org/10.1007/s10459-008-9105-7>
- Yin, R. (1994). *Case study research: Design and Methods*. Thousand Oaks, CA: SAGE Publications.

---

Susan Bridges is an associate professor and currently assistant dean (curriculum innovation) with the Faculty of Education and the Centre for the Enhancement of Teaching and Learning at The University of Hong Kong. She has been an educator in both

mainstream and higher education with the latter focusing on reforms in curriculum design and staff development, including e-learning initiatives, to enhance student learning outcomes. This resulted in a 2012 HKU Outstanding Teaching Award (team) for work on blended learning in PBL in dentistry. Her research interests are interactional and ethnographic, exploring the “how” of effective pedagogy and professional communication. Recent work has focused on integrated, inquiry-based curriculum designs. She has published widely on the role of educational technologies in PBL in the health sciences.

---

Dr. Jun Jin’s work at Hong Kong University of Science and Technology (HKUST) as an instructor and at Hong Kong University (HKU) as a postdoctoral fellow has helped to

build her research strength with and interest in the issue of interaction in different learning contexts. Specifically, she is analyzing the role of silence, technology-mediated interaction, student identity construction, and small group settings (e.g. problem-based learning, project-based learning). She would like to further explore multilevel perspectives on student learning, combining micro- (i.e., the use of language) and macro-level analysis (i.e., social, cultural, and political practice). The ultimate goal of her research is to improve and enrich the student learning experience. Dr. Jun Jin was awarded the Doris Zimmern HKU-Cambridge Hughes Hall Fellowship in 2014. Her academic output includes both sole authored and co-authored publications on the basis of local and international collaborative work.