Interactional Research Into Problem-Based Learning

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INTRODUCTION

Problem-based learning (PBL) has had a profound impact on education worldwide. While its implementation 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 Buisonjé, 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, p. 6).

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.

Qualitative studies in PBL, compared to quantitative studies that mainly measure the effectiveness of PBL programs or curricula, primarily investigate the perceptions of participants and various practices within the PBL 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., Steinert, 2004; Virtanen, Kosonen, 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 discussed 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, Claffey, & Mattheos, 2009), 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-reviewed literature in health sciences education. Initial search terms were “problem-based learning,” OR “PBL,” AND “qualitative.” Publications in the English language were selected. Following are the criteria for inclusion:

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

The following were excluded:

1. Controlled or simulated study designs.
2. Mixed-methods (both quantitative and qualitative methods) studies.
3. Review studies.
The process of literature searching and identification is presented in Figure 1.1. 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 eight additional qualitative research articles from the gray 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 1.1), studies analyzing video recordings of PBL tutorials (see Table 1.2), introspective studies analyzing written reflections (see Table 1.3), and studies using multiple qualitative methods (see Table 1.4). 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 was 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.

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 1.1); studies analyzing video recordings of PBL tutorials (n = 9) (see Table 1.2); introspective studies analyzing written reflections (n = 6) (see Table 1.3); and studies using multiple qualitative methods (n = 17) (see Table 1.4). 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 1.1 and 1.3 provided access to participants’ reflections and insights into PBL by analyzing interviews and written reflections, all 9 studies in Table 1.2 drew upon analysis of video recordings to examine actual, real-time learning processes
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<tr>
<th>Author &amp; year</th>
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<tr>
<td>Chan et al. (2015)</td>
<td>Participants’ perceptions of mobile device usage</td>
<td>Facilitators ($n = 6$) and undergraduate medical, dental, and speech and hearing sciences students ($n = 44$); Hong Kong</td>
<td>Interviews; focus groups</td>
<td>Grounded theory and a systematic coding procedure (Creswell, 2008; Sbaraini et al., 2011)</td>
<td>• 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.</td>
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<td>Spiers et al. (2014)</td>
<td>Experience trajectories and satisfaction of graduates</td>
<td>Nursing graduates ($n = 45$); Canada</td>
<td>Interviews; focus groups</td>
<td>Thematic analysis (Charmaz, 2009); comparative matrix analysis (Draucker et al., 2007)</td>
<td>• 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.</td>
</tr>
<tr>
<td>Landeen et al. (2013)</td>
<td>Perceptions of consistency among students and faculty in PBL</td>
<td>Nursing students ($n = 16$) and faculty ($n = 13$); Canada</td>
<td>Interviews; focus groups</td>
<td>Thematic analysis using Morse and Field’s (1995) four intellectual processes</td>
<td>• Less-experienced students were more likely to describe consistency in terms of sameness and fairness. • More-experienced students and faculty had a higher tolerance for ambiguity and valued learning experiences adapted to students’ learning needs.</td>
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| Cooper & Carver (2012)| Students’ experience in PBL                         | Postgraduate students in mental health nursing ($n = 30$); UK | Focus group           | Constant comparative method (Burnard, 1991) | • Participants had mainly positive experiences and gained a range of study and interpersonal skills.  
• There were initial anxieties, but participants increasingly gained confidence. |
| 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 group s | Content analysis: Tesch’s (1990, in Creswell, 2003) eight steps | • A number of areas need attention: ensuring that assessment is standardized; student support structures, and appropriate levels of teaching. |
| Gunn et al. (2012)    | How skills gained through PBL are applied in practice | Physiotherapy placement supervision ($n = 10$); UK | Interviews            | Thematic analysis (Braun & Clarke, 2006)  | • The supervisors felt that PBL offered positive benefits for both student education and clinical practice.  
• 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. |

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| Papinczak (2012)      | Perceptions of job satisfaction        | Year 1 & Year 2 tutors \(n = 13\); Australia                                    | Focus groups                      | Constant comparison methods (Corbin & Strauss, 1990); refinement and validation based on Allen and Meyer's (1990) framework | • Supportive and compensatory nature of the collegial relationships were formed between casual tutors.  
  • Role attenuation was a predominant perception because it related to dysfunctional groups and increasing student disengagement with PBL. |
| Singaram et al. (2011)| Collaborative heterogeneous PBL group learning | Year 2 medical students \(n = 10\) and facilitators \(n = 11\); South Africa | Focus groups                      | Open and axial coding (Strauss & Corbin, 1998)                                       | • Collaborative heterogeneous learning has two sides that need to be balanced: ideology vs. practice.                                      |
| Bearn & Chadwick (2010)| Students’ experiences                  | Postgraduate orthodontic students \(n = 12\); UK                               | Interviews; focus groups           | Inductive approach (nonspecified)                                                     | • PBL led to tensions both within the individuals and the group because of the conflict between valuing it and practical problems.           |
| Lekalakala-Mokgele (2010)| Experiences of facilitators and students | Facilitators \(n = 4\) groups, 5–8 per group) and nurse students \(n = 8\) groups, 8–12 per group in 4 universities; South Africa | Focus groups                      | Content analysis: Tesch's (1990) eight steps and Giorgi's (1970) basic steps         | • The control of teaching and learning became a problem for the students.  
  • Traditionally trained facilitators experienced difficulties.                                                                                           |
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<tr>
<td>Midla &amp; Coryell (2010)</td>
<td>PBL preparation for physician assistant faculty</td>
<td>Faculty members (n = 7) in 2 universities; USA</td>
<td>Interviews</td>
<td>Inductive approach (Creswell, 2003; Hitchcock &amp; Hughes, 1995) and grounded theory (Strauss &amp; Corbin, 1990)</td>
<td>• 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.</td>
</tr>
<tr>
<td>Papinczak (2010)</td>
<td>Perceptions of tutor evaluation</td>
<td>Tutors (n = 9) and medical students (n = 7); Australia</td>
<td>Interviews; focus groups</td>
<td>Inductive approach (Patton, 1990)</td>
<td>• PBL tutorial environment can create school-wide mistrust and confusion (tutor and student) on several levels.</td>
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</table>
| 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)                | • Assessment affects students’ perceptions of learning and how they learn.  
  • These effects are not uniformly positive.                                                                                           |
<p>| 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 (Analyse Lexicale par Contexte d’un Ensamble de Segments de Texte) software | • Both students and tutors felt undertrained and lacked confidence in tutorial assessments.                                                                       |</p>
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| Barron et al. (2008)| A creative and visual trigger to stimulate student inquiry                     | Year 1 students (n = 75); Ireland | Focus groups   | Content analysis (Burnard, 1991)         | • Well designed, open ended, real life, and challenging “problems” or “triggers” are key elements to the success of PBL implementation.  
• One challenge is that the process is primarily controlled by lecturers.                                                        |
| 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) | • Seven tutor characteristics were identified.  
• Tutors’ behavior affected their motivation and success in PBL.                                                                 |
| 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 (nonspecified)         | • The sessions on P-drugs should be continued and strengthened with modification and possible extension.  
• Sessions during the clinical years and internship training can be considered.                                                        |
| 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) | • Reflection is integral to professional development.  
• Early clinical contact is an important part of the process of socialization.  
• Role models can contribute to students’ learning and identity formation.                                                          |
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| 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 (nonspecified) | • Collaboratively developed and delivered, experiential rural public health PBL was a positive learning experience for trainees in public health.  
• PBL appears to be suitable in rural and nonrural public health training settings. |
| White (2007)            | Pedagogy and achievement of self-regulated learning goals | Medical students \(n = 36\); USA | Interviews   | Thematic analysis (Miles & Huberman, 1994) | • PBL and traditional students described two very different medical school experiences.  
• The traditional students had a rougher transition from the classrooms to the clerkships. |
| Matthew-Maich et al. (2007) | PBL nurse education in a community of faculty development | Nursing staff \(n = 30\); Canada | Focus groups | Thematic analysis (Burnard, 1991; Sandelowski, 1995) | • Attests to the benefits of a collaborative faculty development program  
• Process will guide future faculty development, and promote mastery in PBL. |

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| Fyrenius et al. (2007)     | Students’ conceptions of underlying principles   | Medical students ($n = 16$); Sweden | Interviews   | Phenomenography (Dahlgren & Fallsberg, 1991)                                           | • 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.  
  • Keywords for problemized processing are as follows: comparisons, differences, similarities, conditions, context, relevance, multiple sampling, connections, and dependencies. |
| Visschers-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 | • Students have clear ideas about what promotes effective discussions during the reporting phase.  
  • Their PBL experience has provided them with some insights that are in line with theory and research on collaborative learning. |
| Wood (2006)                | Views of the effectiveness of PBL                | Mental health students ($n = 14$); UK | Focus groups | Content analysis (nonspecified)                                                         | • There is a need to carefully plan students’ initial placement experiences and provide extra support at this stage.  
  • There is a need to extend mentor preparation on the use of PBL in practice to ensure flexibility in the PBL process. |
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<td>Dornan et al. (2005)</td>
<td>How clinicians perceive their roles, and how closely those perceptions link to the curriculum they teach</td>
<td>General physicians (n = 14); UK</td>
<td>Focus groups</td>
<td>Phenomenological method (Moustakas, 1994)</td>
<td>- Third-year clinical teaching was described in terms that bore little relation to PBL.&lt;br&gt;- Teachers placed great importance on the social dimension of professional learning.&lt;br&gt;- Traditional apprenticeship is unsustainable under present-day conditions of practice.</td>
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<td>Lohfeld et al. (2005)</td>
<td>Canadian residents’ views on PBL</td>
<td>Medical residents and fellows (n = 17); Canada</td>
<td>Interviews</td>
<td>Thematic analysis (Addison, 1999)</td>
<td>- Medical residents are an underutilized source of information about undergraduate medical programs.&lt;br&gt;- More emphasis on faculty development and upgrading health-care problems will improve PBL-based education.</td>
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<td>O’Neill et al. (2003)</td>
<td>The views of preregistration house officers using critical incidents</td>
<td>Traditional course graduates (n = 24) and new course graduates (n = 23)</td>
<td>Interviews</td>
<td>Grounded Theory (Dunn &amp; Hamilton, 1986; Glaser &amp; Strauss, 1967; Miles &amp; Huberman, 1994; Green, 1998; Strauss &amp; Corbin, 1998)</td>
<td>- Graduates of the new, integrated curriculum seemed to be much better at dealing with uncertainty, knowing their personal limits, and asserting their right to support when they felt the limits had been reached.&lt;br&gt;- Communication difficulties and emotional involvement remain major factors in students’ transition to preregistration house officers PRHO.</td>
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**TABLE 1.1 (Continued)**

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| Prince et al. (2000) | Students’ perceptions and attitudes regarding this transition in undergraduate medical training | Fifth-year medical students (n = 20) | Focus groups      | Thematic analysis (nonspecified) | • Students have difficulty bridging the gap between the theoretical and clinical phase of the curriculum, as well as applying theoretical knowledge in clinical practice.  
• In the clinical phase their learning changes from passive acquisition of knowledge to more active learning. |
| Treloar et al. (2000) | Factors affecting progress of Australian and international students in a PBL medical course | Medical students (n = 30); Australia | Interviews; focus groups | Thematic analysis (nonspecified) | • Positive and negative experiences related to the course structure were identified by students  
• Students' experiences demonstrated a relationship between sense of “belongingness” to the medical school community, participation in learning opportunities and progress through the course |
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<tr>
<td>Lu &amp; Chan (2015)</td>
<td>Whether paper and video triggers stimulate different social and cognitive processes</td>
<td>Year 2 medical students and their facilitator ( n = 11 ); Hong Kong</td>
<td>Videotaping of PBL tutorials</td>
<td>Inductive and deductive analysis (Kamin et al., 2001)</td>
<td>• Students who used video triggers put more effort into communicating their understanding of the problem and relevant knowledge than students who used paper triggers.</td>
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| Aarnio et al. (2014) | How tutor facilitation helps students to collaboratively resolve conflicts on knowledge | Medical and dental tutors \( n = 3 \), first-year medical students \( n = 23 \), and dental students \( n = 10 \); Finland | Videotaping of PBL tutorials                     | Defining and detecting the conflict and tutor intervention episodes in the video; categories were identified | • Tutors often intervened by confirming what the students had said or by giving explanations.  
• Tutors gave more explanations during knowledge conflicts.                                                                                                                                                                                                 |
| Hmelo-Silver (2013) | The learning space in a PBL tutorial led by an expert facilitator | Year 2 medical students \( n = 5 \); USA                                         | Videotaping of PBL tutorials                     | Content analysis (Hmelo-Silver & Barrows, 2008)                                     | • Much of students’ talk is focused on related conceptual spaces.  
• A substantial amount of the overall learning space is engaged in the group discussion.                                                                                                                                                              |
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| Yew & Schmidt (2009)          | Evidence for constructive, self-regulatory, and collaborative processes        | Year 1 health science students ($n = 5$); Singapore        | Audio recording of PBL tutorials and SDL         | Episodic coding scheme (van Boxtel, 2000)                | • PBL encourages students toward constructive, self-directed, and collaborative learning activities.  
• The proportions of interaction for constructive processes were less compared to those for collaborative and self-directed activities. |
| Clouston (2007)               | Exploring methods of analyzing talk in PBL tutorials                          | Health-care students ($n = 9$) and tutor ($n = 1$); UK     | Videotaping of PBL tutorials                    | Discourse analysis (Fairclough, 1995; Silverman, 2001) and conversation analysis (Psathas, 1995; Sacks, 1984, 1992) | • Discourse and conversation analysis can enable an understanding of how effective problem-based learning communication is constructed. |
| Woodward-Kron & Remedios (2007)| Classroom discourse in PBL classrooms in the health sciences                   | Year 1 medical students; Australia                          | Videotaping of PBL tutorials                    | Discourse analysis (Eggins & Slade, 1997)               | • Students draw on linguistic resources to coconstruct and negotiate knowledge, as well as show how the tutor, with minimal strategic interventions, scaffolds students’ learning  
• The PBL environment can be a challenging one for students whose cultural and linguistic backgrounds differ. |
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| Legg (2007)         | The genre of PBL tutorial                                                      | Year 1 medical students ($n = 48$); Hong Kong          | Videotaping of PBL tutorials    | Genre analysis (Eggins & Slade, 1997)     | • A consistent structure was identified in all the tutorials:  
  – 3 compulsory and 3 optional stages; and  
  – 2 overall macro moves.                                                                                                                     |
| Hmelo-Silver & Barrows (2006) | To understand the goals and strategies of an expert facilitator in support of collaborative learning | Year 3 medical students ($n = 5$); USA                  | Videotaping of PBL tutorials    | Interaction analysis (Jordan & Henderson, 1995) | • An expert facilitator has a repertoire of strategies that can be adapted to meet the goals of PBL.                                                                 |
| Visschers-Pleijers et al. (2004) | Exploration of a method to analyze group interactions in problem-based learning | Year 1 medical students ($n = 2$ group) and Year 2 medical students ($n-1$ group); Netherlands | Videotaping of PBL tutorials    | Episodic coding scheme (van Boxtel, 2000) | • Cognitive interactions were identified in the tutorial groups.  
  • Transcript analysis supported identification of coconstructions.                                                                                                                         |
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<td>L’Ecuyer et al. (2015)</td>
<td>Effectiveness of PBL in preparing students for interprofessional collaborative practice</td>
<td>Undergraduate nursing students ((n = 81)); USA</td>
<td>Reflective assignments</td>
<td>Content analysis (Kolb, 1984; Eyler &amp; Giles, 1999)</td>
<td>• PBL is an effective method for teaching interprofessional collaboration skills to nursing students.</td>
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<tr>
<td>Rowe (2012)</td>
<td>Use of assisted performance within an online social network to develop reflective reasoning</td>
<td>Year 3 &amp; 4 physiotherapy students ((n = 70)); South Africa</td>
<td>Reflective blog posts within the network</td>
<td>Deductive approach based on the Theory of Assisted Performance (Tharp &amp; Gallimore, 1991)</td>
<td>• Online social networks can be used to facilitate reflective reasoning in clinical contexts. • Careful facilitation using sound pedagogy is still necessary.</td>
</tr>
<tr>
<td>Larin et al. (2010)</td>
<td>Students’ perceptions of PBL in a transitional doctoral program</td>
<td>Physical therapy students ((n = 63)); USA</td>
<td>Reflective journals</td>
<td>Inductive approach (Creswell, 2007)</td>
<td>• A single PBL course within the curriculum was well accepted by students. • Students appreciated the benefits of learning in a group.</td>
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<tr>
<td>Hendry (2009)</td>
<td>Tutors’ conceptions of their development as tutors</td>
<td>Tutors ((n = 29)); Australia</td>
<td>Written responses</td>
<td>Inductive approach (Åkerlind, 2007)</td>
<td>• Four conceptions of the PBL tutor role were identified. • There was homogeneity in the relations between levels of sophistication.</td>
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<td>Author &amp; year</td>
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<td>Lin (2005)</td>
<td>Medical students’ perception of good PBL tutors</td>
<td>Tutors ( n = 29 ) and undergraduate medical students ( n = 49 ); Taiwan</td>
<td>Tutor evaluation forms</td>
<td>Deductive approach (De Grave et al., 1999)</td>
<td>• Students valued personality aspects of a tutor, an area that had been neglected in previous studies.</td>
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<td>Solomon &amp; Crowe (2001)</td>
<td>Perceptions of student peer tutors</td>
<td>Physiotherapy students ( n = 59 ); UK</td>
<td>Reflective journals</td>
<td>Open-coding technique (Strauss &amp; Corbin, 1990)</td>
<td>• Students struggled with basic facilitation skills and had difficulty separating the role of student from that of tutor. • 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</td>
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<td>Author &amp; year</td>
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| Skinner et al. (2015) | Students’ understandings of the purpose and value of PBL groups for their learning | Year 1 undergraduate dental students; Australia & Ireland                        | Classroom observations; interviews                                          | Ethnography using inductive thematic method (Liamputtong & Ezzy, 2005) based on a grounded theory approach (Charmaz, 2000) | • Students constructed PBL as individual knowledge gain and group purpose as information gathering and exchange.  
• Few students acknowledged the learning potential of group processes.  
• Group value depended on assessment and curriculum context. |
| 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, Dixon, & Zaharlick, 2003; Rex, 2006); Thematic analysis (Monrouxe, Rees, & Hu, 2011; Ritchie & Spencer, 1994) | • Use of students’ personal mobile devices with online searching capacity is considered a dynamic pedagogically and socially constructed process.  
• Online searching during the PBL process was identified as a “site-of-struggle” for first-year undergraduates. |
| 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-portfolios                                | Ethnographic case study using classroom discourse analysis (Tsui, 1994; Eggins & Slade, 1997); thematic coding of e-portfolios (Strauss & Corbin, 1998) | • Two patterns of knowledge construction were identified:  
(a) coconstructions between students from different disciplines and (b) elaborations between students from the same discipline. |
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<td>Lee et al. (2013)</td>
<td>Tutors’ behavior in facilitating group dynamics</td>
<td>Tutorial groups from various medical disciplines ($n = 40$); Taiwan</td>
<td>Videotaping of PBL tutorials and tutors’ explanations of their interventions</td>
<td>Grounded theory and constant comparative method (Pope et al., 2000)</td>
<td>• Tutors’ intentions of their interventions were identified 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.</td>
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<td>Paige &amp; Smith (2013)</td>
<td>Faculty participation in PBL</td>
<td>Nurse faculties ($n = 50$); US</td>
<td>Interviews and observation</td>
<td>Interpretive phenomenological analysis (Smith, et al., 2009)</td>
<td>• Epistemic doubt happens when action and intent toward PBL teaching perspective do not match underlying beliefs.</td>
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<td>Anderson &amp; Reid (2012)</td>
<td>Students’ perceptions of a PBL scenario</td>
<td>Year 1 dental nurse students ($n = 21$); UK</td>
<td>Open-ended questionnaires regarding students’ perceptions</td>
<td>Inductive approach (Braun &amp; Clarke, 2006; Silverman, 2005)</td>
<td>• PBL could be valuable in the acquisition of deep knowledge and improved patient care.</td>
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<td>Frambach et al. (2012)</td>
<td>How culture challenges SDL</td>
<td>Year 1 &amp; 3 medical students ($n = 56$), tutors ($n = 17$), and curriculum leaders ($n = 15$); Middle East, Hong Kong, and Netherlands</td>
<td>Interviews; observations; document analysis; contextual information</td>
<td>Thematic approach using template analysis (King, 2004)</td>
<td>• Cultural factors can pose a challenge to the application of PBL in non-Western settings.</td>
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<td>• Contextual factors can inhibit or enhance SDL.</td>
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<td>Lee et al. (2009)</td>
<td>When a problem-based learning tutor decides to intervene</td>
<td>Medical tutors ($n = 8$); Taiwan</td>
<td>Videotaping of PBL tutorials; stimulated recall</td>
<td>Grounded theory, constant comparative method (Pope, et al., 2000)</td>
<td>• Identified 3 types of tutor interventions: (a) tutorial group process; (b) quality of discussion; and (c) quality and quantity of the materials discussed</td>
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<td>Moore (2009)</td>
<td>Lecturer as facilitator within PBL context</td>
<td>Nursing lecturers ($n = 12$); UK</td>
<td>Observations; interviews; memo writing</td>
<td>Open coding and constant comparative analysis (Boychuk, 2004; Corbin, 1986; Glaser &amp; Strauss, 1967)</td>
<td>• Personal pedagogical beliefs and values influenced lecturers’ interpretations and applications of their roles as facilitators</td>
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| Cooke & Matarasso (2005) | Promoting reflection in mental health nursing practice | Student ($n = 1$); Australia | written analysis of 5 cases; interviews | Thematic analysis (nonspecified) | • The case illustrated the students’ reflections on the theme of “hope” for the clients and identified three obstacles.  
• Reflective learning strategies can be incorporated in on- and off-campus learning environments. |
| 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) | • There was no direct evidence to suggest use of WebCT affected teaching behaviors.  
• All facilitators showed a moderate increase in comfort with the technology during the semester, and one participant showed remarkable gains in technology skills. |
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| Valaitis et al. (2005) | Students’ views about learning and group process in the online environment     | Undergraduate nursing and midwifery 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)          | • Conducting PBL online is feasible.  
• Students felt that it increased their flexibility for learning, enhanced their ability to deeply process content, and provided access to valuable learning resources.  
• Students experienced a period of adaptation to the online environment, perceived a heavy workload, and had difficulties making group decisions online. |
| Bland (2004)           | Teaching statistics to medical students using PBL                              | Medical schools using PBL ($n = 10$); Australia                                  | Interviews; emails               | Thematic analysis (specified)                             | • Difficulties in implementing an integrated approach were identified; however, not integrating is detrimental to statistics and research methods teaching, requisite for evidence-based medicine. |
| 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)            | • Student learning was socially agreed upon among the peer group and directed by faculty-given resources.  |

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| 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 (nonspecified); deductive approach for interview questions (nonspecified) | - The guide was used as an effective tool for augmenting the PBL process in clinical settings and promoting the development of clinical reasoning  
- Tool prompted critical thinking re: own, colleagues’, and other clinicians’ reasoning processes. |
| 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) | - Undergoing PBL as a teaching and learning strategy had positive outcomes for the students.  
- Challenges in the transition to a PBL strategy from the perspective of the students and lecturers were identified. |
| Solomon et al. (2003) | Students’ perceptions of their learning through participation in an interprofessional problem-based course on rehabilitation and HIV | Senior-level students from the occupational therapy, physiotherapy, medical, nursing, and social work programs ($n=9$), tutors ($n=2$), resource tutors ($n=2$); Canada | Journals; interviews | Open-coding technique (Strauss & Corbin, 1998) | - Students gained an appreciation of the roles of others and developed a sense of confidence through justifying their professional roles.  
- Students were able to increase the breadth and depth of their learning and also gained a rehabilitation perspective. |
In PBL, and 9 of the 17 studies in Table 1.4 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

- the dynamics of PBL tutorials (Cooper & Carver, 2012; Woodward-Kron & Remedios, 2007);
- clinical practice in a PBL curriculum (e.g., Heading, Fuller, Lyle, & Madden, 2007; Shankar, Palaian, Gyawali, Mishra, & Mohan, 2007);
- PBL curriculum in general (e.g., Bearn & Chadwick, 2010; Green-Thompson et al., 2012; Landeen, Jewiss, Vajoczki, & Vine, 2013; Spiers et al., 2014);
- the bridging or transitioning between classroom theory and clinical practice (e.g., Gunn, Hunter, & Haas, 2012; Prince, van de Wiel, Scherpber, van der Vleuten, & Boshuizen, 2000); and
- comparison of traditional classrooms with 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, Wolfhagen, & 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, Wolfhagen, & 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

- facilitators’ PBL preparation (e.g., Midla & Coryell, 2010),
- facilitators’ roles (e.g., Dornan, Hadfield, Brown, Boshuizen, & Scherpbier, 2005; Hendry, 2009; Lin, 2005; Mete & Sari, 2008),
- the role of lecturer as facilitator (Moore, 2009),
- facilitators’ interventions (Lee, Lin, & Lin, 2013; Lee, Lin, Tsou, Shiau, & Lin 2009),
- faculty development (e.g., Matthew-Maich et al., 2007) and job satisfaction (e.g., Papinczak, 2010), and
- 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: 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 for their interventions in facilitating group dynamics (Lee et al., 2013; Lee et al., 2009).
Assessment
Only two studies in Table 1.1 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 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 increasing 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 of 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 about 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 1.1 and 1.3) have investigated PBL through interviews, focus groups, 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 in situ, especially when combined with stimulated recall, have the potential to be more powerful in detecting participants’ practices and thinking processes. Audiovisual 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 of the 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 of the 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 suggested 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 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 PBL communication is constructed. He argued that by analyzing patterns of group communication and considering how participants give meaning to PBL talk, problem-solving sequences and facilitation devices can be highlighted.
Likewise, Legg’s (2007) application of genre analysis illustrated 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 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 whereby 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” in which “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**

The 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 chapter 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.
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