
MASTERCLASS

Using problem-based learning during student placements to embed theory in practice

Gaynor Sadlo

University of Brighton, UK

Corresponding author:

Professor G. Sadlo, School of Health Professions, 49 Darley Rd, Eastbourne BN20 7UR, UK

Email: g.sadlo@brighton.ac.uk

Abstract

Practice placements, a prominent part of the education of health and social care professionals, are strongly validated by theories of adult learning. Being situated in authentic workplaces in contact with people in need, motivation to learn is strong. However, it is not always easy for students to realise the knowledge that practitioners are using in the setting, as it becomes tacit. Problem-based learning (PBL) is a form of student-centred university teaching deliberately structured to support development of students' theoretical understanding, critical thinking, professional reasoning and team skills. PBL is recognised world-wide for its applicability to health and social science curricula, but to date its potential as a method to activate theoretical learning during placements has not been realised.

The aim of this masterclass is to inspire and encourage placement educators and students to use PBL as an effective, enjoyable way to structure knowledge development during placement. The outcomes of this paper include appreciation of the rationale and stages of the PBL cycle in a practice environment, and sufficient understanding about how PBL can be used to embed theory in practice to give it a try. Case studies and supervision sessions need to be adjusted a little to explicitly include a self-directed learning stage to develop students' knowledge, illustrated here through a case example. Students identify their own learning needs to guide their independent learning, maximising use of placement time. PBL in practice settings is a flexible approach, applicable to one-to-one situations, with pairs, groups (including inter-professional), and within work-based learning for staff development.

Keywords: problem-based learning, practice placements, implicit knowledge, explicit knowledge, evidence-based practice

Introduction

Practice placements for health and social care students have always been a highly valued and important component of their professional education (Baldry Currens & Coyle 2013, Gidman 2013). Placements immerse students in real-world situations, provide hands-on experience for skill development, offer immediate application of knowledge and professional

socialisation, qualities that enact theories of situated learning (Lave & Wenger 1991, Knowles *et al.* 2011). Through their own actions students come to realise the knowledge they need for future practice (Marshall & Cooper 2001). "The defining characteristic of work-based learning is that working and learning are coincident" (Boud 2001, p34).

Placements nevertheless need careful planning to identify their specific theoretical fields, to match learning to the student's level and to assess what has been achieved. This masterclass presents problem-based learning (PBL), as a particular, structured approach that reveals the theoretical requirements of a placement. PBL is an evidence-based educational process designed for campus learning but its processes match the needs of practical settings (Ehrenberg & Haggblom 2007). PBL can increase the effectiveness of placements by narrowing potential theory-practice gaps, and through some small but important adjustments to case study work, their self-managed learning periods and to mentoring meetings.

A major purpose of PBL in practice, as emphasised in the masterclass, is to reveal and imbed theory into the daily activities of the setting. The richness of learning in placement environments can be threatened by today's busy practice conditions, in the face of many pressing service needs, such as higher caseloads and fewer treatment sessions (Gordon *et al.* 2000). This can reduce the time to build bridges between practical and academic knowledge.

Research into expert knowledge indicates that a specific complexity of practice learning is in force during encounters between educators and students (Biggs 1999), which PBL can address. Each role apparently uses different *forms* of knowledge (Hanberg & Brown 2006). Students are more familiar with *book* knowledge – also called factual, descriptive or propositional knowledge (knowing that, knowing a fact), whereas practitioners, as experts, mostly use procedural knowledge (knowing how) and functioning knowledge (performance of an understanding) (Biggs 1999). Practitioners can genuinely find it difficult to explain work decisions or to express the theoretical basis of their actions to students, because expert knowledge becomes so tacit, or embodied; it is used so often that it guides professional action in an unconscious manner (Eraut 2007). Educators' knowledge becomes implicit after years of application, and it then is more difficult to access consciously, that is, explicitly (Dietrich 2007).

These different types of knowledge have a neurological basis - propositional and procedural knowledge are classified respectively as explicit (frontal lobe) and implicit (other cortices and motor pathways) (Dietrich 2007, Fugill 2011). The relevant issue is that implicit knowledge is *by its nature non-verbalisable*. When teaching a new practice skill "words make a relatively small contribution" (Fugill 2011, p3). This relates to a special property of PBL – through structured discussion of the case it seems to act like a conduit, guiding students through the different stages of thinking or reasoning, helping reveal the implicit knowledge needed, until it becomes gradually more explicit (Biggs 1999). PBL involves specific identification of the multi-subject knowledge required to work with a particular case while enhancing the integration of the different forms of knowledge within practice environments (Biggs 1999). In this masterclass, practice educators and students will learn how to apply PBL in practice settings to enhance the learning of theory within practice.

PBL has a long heritage. It has been described as "the most influential innovation in medical education during the last forty years" (Wood 2008, p336). "*Problem-based learning is defined as the learning that occurs through the process of trying to solve or manage a real-life problem*" (Barrows 1979, p39).

Below, the general background of PBL shows that its educational rationale evolved from practice-based learning (Barrett & Moore 2011). This is followed by an illustration of the method of practice-based PBL. The discussion section considers its potential and

recommends the application of PBL within workplaces generally. The conclusion summarises the main points to be gained from this masterclass, highlighting future possibilities for PBL in student practice settings.

Background literature: PBL

BL was developed by clinical teachers in medicine in the 1960s in Canada (Barrows & Tamblyn 1989, Sadlo 1997, Savin-Baden 2003) to make university courses more meaningful. The key was to focus curricula entirely on real-world cases (Barrows 1980). PBL campus curricula consist of the presentation of a series of professionally-relevant situations designed to activate problem-solving and critical reasoning, but meanwhile inspiring the learning of applicable subjects such as anatomy or sociology by setting them in context. PBL is validated by research into how students learn (Schmidt & Moust 2000, Ramsden 2003, Biggs 2003), and it has spread globally particularly in health and engineering (Dochy *et al.* 2003, Sevilla 2012).

PBL and placements thus share their educational rationale (Dewey 1938, Barrows 1979, Spencer 2003, Cross *et al.* 2006). Real-world learning-through-doing is regarded as the natural way human beings have learnt throughout history (Barrows 1980, Wilcock 2006). From an evolutionary perspective being confronted with real-life problems leads to adaptation to different environments (Wilcock 2006). Problems activate thirst for new knowledge, and have led to an explosive growth in science and technology (Firestein 2012). Placements enact Knowles' (1984) humanist theories of learning, drawing on Maslow's motivation theories (Maslow 1954). They match Knowles *et al.* (2005) theories of adult learning, such as meaningful purpose. Interacting with real problems fosters reflection-in-action (Schon 1987). Carl Rogers (Rogers & Freiberg 1993) showed how real environments are vital to students' learning, while to Lave & Wenger (1991) high-quality *situated learning* occurs best within communities of practice, such as work settings.

Problems in real contexts re-ignite ancient educational approaches (Savin-Baden 2003). Five thousand years ago the philosophical writings 'The Upanishads' recommended learning through discussion of everyday problems (Mascaro 1965). Socrates taught so powerfully through questions that arose from everyday living, that he was executed for being too influential (de Botton 2001, Wang *et al.* 2008). In the 20th Century, Dewey argued that children learn more in a kitchen than a classroom (Dewey 1938), while Piage, Montessori and Steiner developed progressive and practical educational methods through real-life engagement rather than theoretical, teacher-led desk-based lessons (Sadlo 2011). Robinson & Aronica (2010) showed how passion for learning can be destroyed in classrooms, further supporting the value of real-world placements.

Learning *in situ* and through solving troubling situations is justified through research evidence. Neuroscience reveals that learning new professional skills demands "effortful rehearsal" *in context* (Dietrich 2007, p155) if they are to be gained and retained. Situated learning provides complex social, cognitive and emotional experiences (Cope *et al.* 2000). Research into apprenticeships demonstrates that direct work activities merge understanding and skills (Lucas *et al.* 2012). Workplaces are proved to be the most effective environments for stimulating professional development, and for offering continual, life-long learning opportunities (Boud 2001). For instance, a phenomenological study revealed how role-emerging placements enhance students' personal efficacy and their professional identity (Clarke 2012). In another qualitative study, student nurses identified the benefits of practice placements as responsibility, independence and direct feedback (Lofmark & Wikblad 2000). In PBL, practice is viewed as the source of knowledge, whereas in traditional academic programmes science knowledge is seen as being 'applied' to practice. A study of nursing students found that PBL in a practice setting built the skill of seeing the theory

within everyday practice (Chikotas 2009), which is the first stage of being able to perceive gaps in one's own knowledge (Firestein 2012). An excitement towards gaining new understanding is a prerequisite to meaningful learning (Wang *et al.* 2008). The supportive culture of PBL enables students to acknowledge what they do not know, to activate further learning (Dangerfield *et al.* 2007).

PBL has been adopted in many health and social-care professions on campus (Reeves *et al.* 2004): in medical education (Gordon *et al.* 2000), social work (Wong & Lam 2007), dentistry (Yiu *et al.* 2011), physiotherapy (Ekstein & Slabbert 2001), occupational therapy (Sadlo *et al.* 1994, Royeen 1995), speech and language therapy (Visconti 2008) and radiology (Thurley & Dennick 2008). However, it is mainly within nursing that using PBL in practice settings has received some attention, the findings of which are predominately positive (Tiwari *et al.* 2006, Ehrenberg & Haggblom 2007). Chikotas (2009) conducted a phenomenological study of nurses from PBL university courses who then used it during practice, finding that PBL motivated learning, encouraged teamwork, and facilitated holistic practice.

Theoretically, PBL encourages deep approaches to learning, through meaning, challenge and collaboration, creating an ideal balance between teacher-led, student-led and independent learning activities (Biggs 2003). Over the last half-century there have been hundreds of research papers showing the effects of campus-based PBL; there are strong positive findings for the transferable skills, enhanced approaches to learning, and the development of practice skills. However, some authors claim that it has yet to be firmly established that PBL is educationally superior overall; for example, in a meta-review of controlled evaluations of PBL therapy courses, O'Donoghue *et al.* (2011) found no proven evidence that it increased knowledge, improved practice performance, or enhanced student satisfaction. They found a weak effect for enhanced approaches to learning, whereas Sadlo (1997) discovered a close effect - the more wholly PBL is used, the higher the quality of learning. Students who attended a 'fully' PBL programme spent a lot less time focusing on learning just for exams, unlike students from traditional programmes.

Thus, both practice placements and campus-based PBL can promote quality learning experiences for students. Bringing them together seems to offer further potential. However, within the prolific PBL literature there is a lack of papers providing practical information to educators and students regarding how to actually adjust PBL to placement settings. The purpose of this masterclass is to begin to fill that gap.

Method: how educators and students can implement PBL during practice placements

All parties clarify at the beginning how the placement will apply PBL. The best place to begin, when using PBL with one student, is to use a selected case study that becomes a focus to guide the learning for several weeks, or even the whole placement, depending on the desired depth. It needs to include time for critical evaluation of the learning, and evidence of chosen practice. The PBL case discussion – called the PBL tutorial – is purposefully used to structure some of a student's mentoring time and the achievement of some of the placement goals in general, and for embedding the theory and practice links in particular. The process is as follows.

- The educator or student identifies a person from their caseload, who becomes the PBL case study.
- Working together in a discursive way, the student identifies their learning needs, following the PBL format below – designed to reveal the range of subject knowledge

that is required to work with a person in a particular setting, making the implicit knowledge explicit. Questions are formed.

- The student seeks out, learns, reviews, or revises this knowledge during their study time and in spare moments within the placement. This new knowledge, applied to the case, is shared and discussed with the educator during their next (hopefully weekly) meeting.

The PBL format structures the *theoretical* aspect of a placement, making it more overt, but skill development can also be included within the learning needs. It constantly activates professional reasoning and provides and guides tasks for students throughout the placement. Students become more self-reliant, which may relieve some of the perceived responsibility on educators to 'deliver' a lot of teaching to students.

The four main aims of PBL guide the learning actions:

1. to expand and deepen knowledge;
2. to facilitate clinical/professional reasoning;
3. to develop self-directed learning skills;
4. to promote teamwork skills (especially communication, self awareness and compassion).

In essence, PBL requires some small but important re-structuring of supervision meetings, guiding the knowledge to be learnt. About thirty minutes is recommended for the PBL activity within any session. PBL becomes rather like a Model for Enhanced Clinical Supervision (Ehrenberg & Haggblom 2007).

PBL provides *two nested processes*:

1. each tutorial follows a strict sequence of case analysis, following the reasoning of the particular profession;
2. each tutorial is part of the PBL cycle, each meeting having a specific purpose.

A cycle has a minimum of two tutorials – one to initially discuss the case from a theoretical perspective, ending in agreed learning objectives, and another where the student specifically reports the learning back to the educator and discusses the case again in this light. At least four meetings are recommended for each case, giving more time for depth of learning. Table 1 outlines the activities of the PBL tutorials.

Between each tutorial the student engages in self-directed learning – searching, finding, selecting, reading, understanding, and preparing to share this new understanding or evidence. This self-regulated work may take place during any period on placement when there are no relevant patients or clients with whom to work, or when the supervisor needs to be otherwise engaged, to maximise the learning potential of the placement and elaborate the learning (Gordon *et al.* 2000). The student prepares to feed back the new learning to the educator during the next session.

This process is now illustrated through an example.

A case example

The following brief outline of a situation encountered by a healthcare student during a hospital placement is used here to give a practical illustration of how PBL can be used on placement.

Outline

Marjorie Brown, 79, has been admitted to the rehabilitation unit in a regional hospital three days ago following a stroke four weeks ago. She is unable to use

Table 1 Activities of the PBL tutorials.

First tutorial	Turn focus of thoughts onto the chosen person/situation.
Student writes ideas on whiteboard or paper	Discuss first reactions to the situation (acknowledging emotions too). Identify the basic information we already have about the person (age, social situation, diagnosis). Identify what further factual information is needed about the person, for example what her medication might be, what type of home she lives in, previous medical history, family status). Try to define in words the actual problem faced by the person from the perspective of the particular profession. Brainstorm causes of the problems, current reasoning, ideas, and any personal experience of the matter (Barrett & Moore 2011). Consider how the (particular) profession would try to manage this situation, that is, already express thoughts about the possible intervention. THEN identify what new knowledge, or revision is required to inform and manage the problem. Refine these, turn them into a list of questions that need answering. Prioritise these questions and choose one or two for independent study during the following week. Consider where/how to find this information.
Second tutorial	Student shares and explains what s/he has learned, with the educator. Student critiques the knowledge source, eg is it evidence-based? Where was it found? Both consider the relevance of this knowledge to the case management, through discussion. Discussion provokes more questions, and another round of self-directed learning occurs during the next week to answer these.
Third/fourth tutorial (repeated)	Same as above, with knowledge deepening throughout, including basic sciences such as psychology, sociology. Student encouraged to struggle to explain difficult concepts, and may write concept maps or diagrams to reveal new understanding. Seek research papers for the evidence of practice in the setting.
Final tutorial	Student shows plans to manage the situation, in light of the recent learning. Decisions are justified through an explanation of the new theory or information that has been acquired, including the evidence-base for the chosen intervention. A typical ending might be an assessment plan, or management/treatment programme for the client/patient. Student considers, identifies and reflects on growth in learning.

her right hand nor can she stand, and her speech is rather incomprehensible.
Her husband visits her daily.

Table 2 indicates the format of the reasoning structure adopted during the tutorials. The columns structure the student's reasoning. The student writes thoughts and ideas down (ideally on a whiteboard or flipchart) using the four columns format, or, concept maps may be more fun, using the column headings as guides. The prompts are used in sequence, or

as ideas occur. Here Mrs Brown's situation is used as if by a novice occupational therapy student during a placement in first year.

The list of questions, which need to embrace the full range of academic subjects, can be almost endless, and need to be prioritised and then gradually worked through over the weeks of the placement. They do not all need to be listed like this during the first meeting, but can evolve during the subsequent weeks. The prioritised questions form the basis for self-directed study, integrating the various diverse subjects, structuring the placement learning, and making the knowledge that is usually implicit, more explicit.

Putting PBL learning into the heart of mentoring meetings should reveal the specific theoretical (implicit) knowledge that any case study embodies activating learning. PBL is a thinking process that can be used anytime, anywhere, in any workplace, and even within everyday life, to stimulate learning and reasoning. It can enhance supervision through enabling an educator to see how a student is currently reasoning, to know more finely how to guide the developing understanding, and to provide a more accurate assessment of the student's learning.

Discussion

This masterclass proposes that the educational advantages of practice placements can be even further enhanced through merging it with PBL approaches. All health and social care stakeholders realise that practice settings are key to the education of high-quality practitioners, and PBL can maximise theoretical learning during supervision and during study time. The value of real-world learning-by-doing has been appreciated throughout human history, and is supported by recent pedagogical research and by the latest neuroscience.

PBL is relevant to the nature of expertise, which uses implicit knowledge, a potential barrier to students' appreciation of the information used in daily practice (Dietrich 2007). PBL provokes clinical reasoning during every tutorial discussion, which helps students to recognize what needs to be revised from campus studies and what needs to be learnt during placement. Further advantages are the development of transferable skills, such as critical reasoning, self-management of learning, communication and collaborative behaviour (Dangerfield *et al.* 2007).

Although the structure of the tutorials needs to remain firm, having been developed over many decades, PBL offers flexibility across different settings, professions, levels, and numbers of students. It can be used with all students, whether or not they attend campus-based PBL and marries well with 1:1 placements, or even better for 2:1 or more students because peer learning enhances its productivity (Martin & Edwards 1998). Uni-professional or multi-professional groups can use PBL as an effective tool to share their special reasoning, knowledge, and roles for the same client (Donaldson & Carter 2013) PBL offers an ideal format for inter-professional learning in practice settings. It can easily structure continual professional development for evidence-based practice for staff teams, creating a workplace university (see <http://eisneramper.com/A-Workplace-University.aspx>).

Case studies, already a popular way to build theory and reasoning during practice placements, can be enriched through PBL techniques. Two nested structures enable students to methodically discover the theory and skills that they need for their active independent study and peer teaching. PBL is recommended by major organisations such as the World Health Organisation (1991) for its capacity to develop collaborative team skills and self-regulated learning, both essential elements of contemporary practice when knowledge changes so rapidly.

Table 2 How to use Problem-based learning to structure thinking within one case study (occupational therapy example) (after Barrows 1980). (The second column, in particular, needs to be adjusted to the clinical reasoning of the student's prospective profession.)

INFORMATION	CURRENT IDEAS	'BIG' QUESTIONS	RESOURCES
List current information we have about the person referred.	Identification of the 'problem' from the particular profession's perspective.	What revision, or further knowledge/skills/values do I need before I can work with this person?	How and where will I find this knowledge? (what resources?)
Mrs Brown- On rehab ward, in bed most of time	Mrs Brown is experiencing occupational deprivation, currently quite bed-bound, dependent in all activities of daily living - not able to walk, eat, toilet, bathe, dress independently, and has difficulties in speaking. Appears to have low desire to improve abilities at present	- how does a stroke generally affect a person's occupational life?	- discover the hospital library
- Left sided stroke 4 weeks ago	What are the causes of these difficulties?	- what are the overall structures and functions of areas of brain, especially the motor cortex?	- University textbooks
- Weak movement in right arm or hand	Weak grip and range of movement in dominant hand	- how do the motor pathways work? – how to muscles contract, to build strength?	- Anatomy apps
- recently starting to walk again with help	Limited weight bearing and control of right leg	- what are the prognostic factors of CVA, hemiplegia	- Internet searching, university on-line library
- Has a husband who visits daily	Lack of coordination of facial muscles	- are there care pathways for stroke?	- government policies on rehabilitation
- Speech is difficult to understand	Probably anxious about future abilities, and worried about prognosis	- what are the latest theories of motivation?	- visit local stroke charity
- Depressed, seems unmotivated	Above due to diagnosis of left –sided CVA	- how is depression treated medically, or through occupation?	(refine for specifics)
(...+ >)		- role of occupational therapy in neurology	
What further information would I like?	What are her strengths?	- rationale, evidence-base of stroke units	
- Was Mrs Brown quite healthy before this event?	- has support of spouse	- roles, interventions of other professions in unit	
- how is she feeling about her current situation?	- previous good health	- what is the evidence-base for occupational therapy home visits?	
	- secure home situation		

Table 2 (Continued)

- what area of the brain has been affected?		- what resources are available in communities for families, from stroke charities?
- What is her previous medical history?	What interventions would I choose?+.....>
- How is her husband's health?	(liaise with multi-professional team)	
- What is their usual lifestyle?	- initial interview to gain rapport, gain her perspective	
- How are her personal care activities being managed at the moment?	- full assessment of ADLs, including bathroom and kitchen	
- What is her house like, does it have steps?	- home visit to understand her environmental assets and modifications	
- Does she have children?	- dressing practice?	
- What are her interests?	- cooking?	
- is there a local Stroke Association?		
...etc		

Research into the effectiveness of PBL is fraught with complexities, not least by the great variety of interpretations of PBL. Too few studies report how the PBL was played out, which is of course crucial to its outcomes. Like other person-centred interventions in health and social care, the heterogeneity of its practice impedes high-quality comparative research. Another issue that reduces the credibility of some research in this field is that traditional measures are used, such as results of conventional examinations of factual knowledge. PBL students are unfamiliar with such tests because subjects are always tested in the context of real-world problems. Most research identifies that there is a strong need for more PBL research, although 'fully dissociating the findings associated with PBL with those attributable to other influential factors is nearly impossible' (O'Donoghue *et al.* 2011, p69). One study found that a small proportion of graduates felt that PBL did not equip them with sufficient knowledge of practice techniques (Reeves *et al.* 2004). However, qualitative research approaches offer considerable scope in understanding the experiential effects of PBL (Reeves *et al.* 2004).

This masterclass has demonstrated that PBL can fulfil some of the identified need for more strategic planning of placements in the light of so many complexities, pressures and constraints in contemporary practice (Gordon *et al.* 2000). Collaboration and support for practice educators needs to be improved (Beckman & Lee 2009). PBL offers a modification to the usual case-based learning to foster the identification of the specific theoretical knowledge that a particular placement inspires. Meanwhile, it increases student autonomy

on placement and activates personal responsibility for learning, essential traits for life-long learning. This reduces dependence on supervisors as deliverers of knowledge, while enabling students to bring recent knowledge to the setting. Indeed, the rather strict PBL process – a bespoke approach to each profession's critical reasoning processes – reveals the need for most recent knowledge and evidence-base. This can be found by the student to be shared with practice placement educators and their teams. Students have access to academic knowledge and can contribute explicit knowledge to that which is implicit within the community of practice, making students' contribution to practice placements more clearly visible. Verbal expression of new understanding reinforces learning through elaboration (King 1992), while teaching has proven advantages (Boud *et al.* 2001). Practice knowledge may be deepened for the practice community, but this stage also exposes how much else there is to learn. Assessment of knowledge during placements might also be more overtly and accurately graded.

PBL meets the needs of contemporary practice in several ways. Recent emphasis on the development of compassion in care in the UK (Donaldson & Carter 2013) adds relevance to exploring emotional reactions to the person in the case study, but this has always been the first stage of a problem-based tutorial (Barrows 1980). Given the strong pedagogical justifications shared by both practice placements and PBL, PBL can capitalise on a placement's high capacity for enhancing learning through conceptualising, designing, supporting and promoting theory-practice links during workplace experiences.

Conclusion

After nearly fifty years as a campus-based approach to learning, PBL has potential to be used within practice placements, especially to structure the learning of theory relevant to the particular practice. This masterclass has outlined how the PBL process may be used by students and educators in workplace settings, using a modified case study approach. It does not involve radical changes to current methods. This paper has demonstrated that PBL involves a special way of structuring thinking, the purpose of which is to develop a student's clinical reasoning, in accordance with the knowledge of a particular profession. Knowledge can be fine-tuned to underpin the understanding of a particular practice. Having identified a case-study, a student discusses it in the PBL way with their educator, to specifically identify the range of knowledge needed to support that professional practice. The student then takes on the task of self-directed learning, one of the hallmarks of the PBL process. Productivity is maximised during the times when actual patient or client contact is not possible, such as time of day, availability of suitable patients for student contact, or during times when the mentor has to attend to other duties. In these ways PBL can reduce students' dependence on their educators while enhancing student sense of autonomy, and control over their own learning.

PBL can create a community of practice based on workplace learning, to develop fieldwork/clinical reasoning, to embed theory into practice and to raise students' teamwork, collaboration skills and values. Not only the students benefit; the whole workforce can gain through workplace PBL, through more explicit recognition of, and discussion of, the implicit knowledge, and in regard to the scrutiny of evidence on which the current practice is based. Students seek and evaluate the knowledge needed to practice in that setting, using information technology techniques learnt on campus, which can then be shared within the multi-professional teams. In this way PBL actively supports the development of a learning community within health and social care practice (and other) settings.

PBL can enhance the quality of mentoring sessions through specific discussion of what has yet to be learnt. Its flexibility fosters 1:1, 1:2, bigger groups, and inter-professional learning (Martin *et al.* 2004). Practice-based PBL is designed to augment student

independence, freeing educators of needing to 'cover' lots of material. PBL can help practitioners and students analyse, access and increase the complex implicit multi-subject knowledge on which practice depends.

Key messages

- Problem-based learning and practice-based learning share intentions: to develop students' professional capacities through learning in meaningful, real-world contexts. Both are supported by learner-centred, active learning philosophies.
- PBL was developed by practitioners to make university learning more like practice contexts. There is potential now to make PBL a more common way to structure learning in practice settings.
- PBL has a structure that does not require major changes in practice-placement organisation, but its use can support the integration of theoretical and practical learning during placements.
- There is the potential to make implicit, expert knowledge more explicit and accessible for students during placements.

References

- Baldry Currens, J. and Coyle, J. (2013) Practice Based Learning. In *Realising Exemplary Practice Based Education* (eds. J. Higgs, D. Sheehan, J. Baldry Currens, W. Letts and G.M. Jensen). Rotterdam: Sense Publishers.
- Barrett, T. and Moore, S. (2011) Introduction to Problem-based Learning. In *New Approaches to Problem-based Learning: Revitalising your Practice in Higher Education* (eds. T. Barrett and S. Moore). New York and London: Routledge.
- Barrows, H.S. (1979) The Rationale and structure of problem-based learning. *The Learner* 7, 39–41.
- Barrows, H.S. (1980) *Problem-based learning: An approach to medical education*. New York: Springer.
- Barrows, H.S. and Tamblyn, R.M. (1976) An evaluation of problem-based learning in small groups utilizing a simulated patient. *Journal of Medical Education* 51, 52–54.
- Barrows, H.S. and Tamblyn, R.M. (eds.) (1989) *Problem-based learning: an approach to medical education*. New York: Springer.
- Beckman, T.J. and Lee, M.C. (2009) Proposal for a Collaborative Approach to Clinical teaching. *Clinical Teaching* 84 (4), 339–344.
- Biggs, J.B. and Tang, C. (2011) *Teaching for quality learning at university*, 2nd edn. Buckingham: Open University Press/Society for Research into Higher Education.
- Boud, D. (2001) Knowledge at Work: Issues of Learning. In *Work-based Learning: A New Higher Education?* (eds. D. Boud and N. Solomon). SRHE & Open University Press.
- Boud, D., Cohen, R. and Sampson, J. (eds.) (2001) *Peer Learning in Higher Education: Learning from and with Each Other*. Routledge.
- Chikotas, N.E. (2009) Problem-based learning and clinical practice: The nurse practitioners' perspective. *Nurse Education in Practice* 9, 393–397.
- Clarke, C. (2012) Occupational therapy students' experiences of role-emerging placements and their influence on professional practice. A Thesis Submitted in partial fulfilment of the

Requirements of the University of Brighton for the Degree of Doctor of Philosophy. Brighton: University of Brighton.

Cope, P., Cuthbertson, P. and Stoddart, B. (2000) Situated learning in the practice placement. *Journal of Advanced Nursing* **31** (4), 850–856.

Cross, V., Caladine, L., Morris, J., Hilton, R., Bristow, H. and Moore, A. (2006) *The Practice-based Educator: A Reflective Tool for CPD and Accreditation*. Wiley.

Dangerfield, P., Dornan, T., Engel, C.E., Maudsley, G., Naqui, J., Powis, D. and Seston, A. (2007) *A Whole System Approach to Problem-Based Learning In Dental, Medical and Veterinary Science: A Guide to Important Variables*. CEEBL, University of Manchester.

De Botton, A. (2001) *The Consolations of Philosophy*. London: Penguin Books.

Dewey, J. (1938) *Experience and Education*. New York: Collier Books.

Dietrich, A. (2007) *Introduction to Consciousness*. Basingstoke: Palgrave Macmillan.

Dochy, F., Segers, M., Van den Bossche, P. and Gijbels, D. (2003) Effects of problem-based learning: a meta-analysis. *Learning and Instruction* **13**, 533–568.

Donaldson, H. and Carter, D. (2013) The value of role modelling: Perceptions of undergraduate and diploma nursing (adult) students. *Nurse Education in Practice* **13** (3), 155–234.

Drohan, S., Mauffette, Y. and Allard, J.-L. (2011) Employers' Perspectives on Problem-based Learning Initiatives. In *New Approaches to Problem-based Learning: Revitalising your Practice in Higher Education* (eds. T. Barrett and S. Moore) New York and London: Routledge.

Ehrenberg, A.C. and Haggblom, M. (2007) Problem-based learning in clinical nurse education: Integrating theory and practice. *Nurse Education in Practice* **7**, 67–74.

Ekstein, C.A. and Slabbert, J.A. (2001) Problem-based curricula and problem-based learning in physiotherapy: A critical review. *South African Journal of Physiotherapy* **57**, 23–28.

Eraut, M. (2007) Learning from Other People in the Workplace. *Oxford Review of Education* **33** (4), 403–422.

Firestein, S. (2012) *Ignorance: How it drives science*. Oxford University Press.

Fugill, M. (2011) Tacit knowledge in dental clinical teaching. *European Journal of Dental Education* **16** (1), 2–5. doi:10.1111/j.1600-0579.2011.00716.x.

Gidman, J. (2013) Listening to stories: Valuing knowledge from patient experience. *Nurse Education in Practice* **13** (3), 192–196.

Gasper, A. (2012) Developing the NHS workforce of the future. *British Journal of Nursing* **21** (3), 194–195.

Gordon, J., Hazlett, C., ten Cate, O., Mann, K., Kilminster, S., Prince, K., O'Driscoll, E., Snell, L. and Newble, D. (2000) Strategic planning in medical education: enhancing the learning environment for students in clinical settings. *Medical Education* **34**, 841–850.

Hanberg, A. and Brown, S.C. (2006) Bridging the Theory–Practice Gap With Evidence-Based Practice. *The Journal of Continuing Education in Nursing* **37** (6), 248–249.

Higgs, J. (2013) Practice-based education: Professional pedagogy for professional Education. In *Realising Exemplary Practice Based Education* (eds. J. Higgs, D. Sheehan, J. Baldry Currens, W. Letts and G.M. Jensen). Rotterdam: Sense Publishers.

- King, A. (1992) Facilitating Elaborative Learning Through Guided Student-Generated Questioning. *Educational Psychologist* **27** (1), 111–126.
- Knowles, M. (1984) *Andragogy in action: Applying modern principles of adult education*. San Francisco: Jossey-Bass.
- Knowles, M., Holton, E.F. and Swanson, R.A. (2005) *The adult learner: The definitive classic in adult education and human resource development* (6th edn.). Burlington, MA: Elsevier. ISBN 0-7506-7837-2.
- Knowles, M.S., Holton, E.F. and Swanson, R.A. (2011) *The modern practice of adult education: From pedagogy to andragogy*. Wilton, Connecticut: Association Press.
- Lave, W. and Wenger, E. (1991) *Situated Learning: Legitimate Peripheral Participation*. Cambridge University Press. ISBN 0-521-42374-0.
- Lofmark, A. and Wikblad, K. (2001) Facilitating and obstructing factors for development of learning in clinical practice: a student perspective. *Issues and Innovations in Nursing Education* **34** (1), 43–50.
- Lucas, B., Spencer, E. and Claxton, G. (2012) *How to Teach vocational education: A theory of vocational pedagogy*. City & Guilds Centre for Skills Development.
- Marshall, I.S. and Cooper, L.S.M. (2001) Earning Academic Credit for Part-time Work. In *Work-based Learning: A New Higher Education?* (eds. D. Boud and N. Solomon). SRHE & Open University Press.
- Martin, M. and Edwards, L. (1998) Peer Learning on Fieldwork Placements. *British Journal of Occupational Therapy* **61** (6), 249–252.
- Martin, M., Morris, J., Moore, A., Sadlo, G. and Crouch, V. (2004) Evaluating Practice Education Models in Occupational Therapy: Comparing 1:1, 2:1, and 3:1 Placements. *British Journal of Occupational Therapy* **67** (5), 192–200.
- Mascaro, J. (1965) *The Upanishads*. London: Penguin.
- Maslow, A. (1954) *Hierarchy of human needs: Motivation and personality*. New York, NY: Harper & Row.
- O'Donoghue, G., McMahon, S., Doody, C. and Cusack, T. (2011) Problem-based Learning in Professional Entry-level Therapy Education: A Review of Controlled Evaluation Studies. *Interdisciplinary Journal of Problem-based Learning* **5** (1), 54–73.
- Ramsden, P. (2003) *Learning to Teach in Higher Education*. Routledge.
- Reeves, S., Summerfield, Mann L., Cauce, M., Beecroft, S., Living, R. and Conway, M. (2004) Understanding the Effects of Problem-Based Learning on Practice: Findings from a Survey of Newly Qualified Occupational Therapists. *British Journal of Occupational Therapy* **67** (7), 323–327.
- Robinson, K. and Aronica, L. (2010) *The Element: How finding your passion changes everything*. London: Penguin Books.
- Rogers, C.R. and Freiberg, H.J. (1993) *Freedom to learn* (3rd edn.). New York: Merrill.
- Royeen, C.B. (1995) A problem-based learning curriculum for occupational therapy education. *American Journal of Occupational Therapy* **49**, 338–346.
- Sadlo, G. (1995) Problem-Based Learning. "What? No courses of set subjects?" *Tertiary Education News University of Queensland* **5** (6), 7–9.

- Sadlo, G. (1997) Problem-based Learning significantly enhances occupational therapy students' course experiences. *Education for Health. Change in Training and Practice* **10** (1), 101–114.
- Sadlo, G. (2011) Learning through Problems: perspectives from neuroscience. In *Procedures from the International Conference of Problem-based Learning* Coventry University.
- Sadlo, G., Warren Piper, D. and Agnew, P. (1994) Problem-based Learning in the Development of an Occupational Therapy Curriculum. Part 1: The Process of problem-based learning. *British Journal of Occupational Therapy* **57** (2), 49–54.
- Savery, J.R. (2006) Overview of Problem-based Learning: Definitions and Distinctions. *Journal of Problem-based Learning* **1** (1). doi:10.7771/1541-5015.1002.
- Savin-Baden, M. (2003) *Facilitating Problem-based Learning: Illuminating Perspectives*. The Society for Research into Higher Education & Open University Press.
- Schmidt, H. & Moust, J. (2000) Towards a Taxonomy of problems in problem-based learning curricula. *Journal on Excellence in College Teaching* **11** (2/3), 57–72.
- Schon, D.A. (1987) *Educating the Reflective Practitioner*. San Francisco: Jossey-Bass.
- Sevilla, M. (2012) *Problem-based Learning in the 21st Century Classroom*. CreateSpace Independent Publishing Platform.
- Spencer, J. (2003) Learning and teaching in the clinical environment. *British Medical Journal* **326**, 591.
- Thurley, P. and Dennick, R. (2008) Problem-based learning in radiology. *Clinical Radiology* **63**, 623–628.
- Tiwari, A., Chan, S., Wong, E., Wong, D., Chui, C., Wong, A. and Patil, N. (2006) The effect of problem-based learning on students' approaches to learning in the context of clinical nursing education. *Nurse Education Today* **26** (5), 430–438.
- Visconti, C.F. (2008) Problem-Based Learning: teaching Skills for Evidence-Based Practice. In *Perspectives on Issues in Higher Education*. American Speech-Language-Hearing Association.
- Wang, S.-Y., Tsai, J.-C., Chiang, H.-C., Lai, C.-S. and Lin, H.-J. (2008) Socrates, Problem-based Learning and Critical Thinking – A Philosophic Point of View. *Kaohsiung Journal of Medical Science* **24** (3), S6–S13.
- Wilcock, A.A. (2006) *An Occupational Perspective of Health* (2nd edn.). Thorofare, N.J.: Slack Inc.
- Wong, D.K.P. and Lam, D.O.B. (2007) Problem-based Learning in Social Work: A Study of Student Learning Outcomes. *Research on Social Work Practice* **17** (1), 55–65.
- Wood, D.F. (2008) Problem-based Learning. *Editorial. British Medical Journal* **336**, 971.
- World Health Organization (1991) *Changing medical Education; An agenda for action*. Geneva: Offices of the World Health Organisation.
- Yiu, C.K.Y., McGrath, C., Bridges, S., Corbet, E.F., Botelho, M., Dyson, J. and Chan, L.K. (2011) Graduates' Perceived Preparedness for Dental Practice from PBL and Traditional Curricula. *Journal of Dental Education* **75** (9), 1270–1279.