Beyond PBL: Using New Spaces and Learning Design to Improve Student Outcomes

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Abstract

Many universities seek to deliver an authentic learning experience for students by utilizing a Problem Based Learning (PBL) model. Over three years, we redesigned a paramedic pharmacology subject using PBL concepts and, in doing so, found we had journeyed beyond established PBL models. The new approach uses several different student experiences and learning spaces to implement PBL, including collaborative, research, simulation, online and off-campus spaces. Initial data also suggest high levels of student satisfaction. The "multi-space" approach to PBL subject would be suitable for further rigorous evaluation of the educational design and outcomes.

Keywords: paramedic, problem-based learning (PBL), experiential learning, pharmacology

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Background

Many allied health, medical and nursing higher education programs use Problem Based Learning (PBL) to assist future practitioners to "bridge the gap" between theory and practice. Commencing in 2015, a cross-disciplinary team of academic, clinical-academic and educational design staff sought to progressively transform an applied pharmacology subject within a large, multi-campus undergraduate paramedic degree. The chief aim of the educational redesign was to update established subject and graduate learning outcomes and, in doing so, to better prepare students for safe clinical practice, particularly in relation to pharmacological intervention. To achieve these aims, the learning design needed to help students better integrate higher order critical thinking and decision making capabilities into their practice.

Methods

The educational design within this subject was progressively reviewed and improved over a three-year period. The senior lecturer in the subject and the educational designer led the improvement process, which involved ongoing discussions between academics and practitioners from paramedic, pharmacy, and learning & teaching disciplines. Student feedback strongly influenced key design elements. Major subject reviews also occurred on an annual basis between the senior lecturer and educational designer. After a three-year period of progressively implementing improvements, we realized that our approach to PBL in this subject had actually been reconceptualized and now ventures beyond traditional and hybrid models of PBL.

Results

The PBL approach in this subject involves having our students move through various physical, but also cognitive, collaborative, communication and professional practice learning spaces throughout a tutorial, culminating in their implementing group-derived solutions in a real-time patient simulation. In each of eight weekly tutorials, the students are, in effect, taking a journey involving clinical theory and knowledge, social interaction, communication, problem solving, and applied clinical practice.

Stage 1: Team meeting

Students begin the tutorial in a space that fosters group work. Teams of students (about 4 in each team) review the written scenario, which involves a patient suffering a particular illness or injury. They are also provided with a description of other relevant factors relating to the scenario. After reading the scenario, students then review a series of scenario-related questions. These questions require further investigation, and so the team divides the questions among each other, assigning an average of two questions to each student *(Image 1)*.

Stage 2: Individual study

Students then commence a period of individual study, where they are required to answer the questions that were assigned to them in the team meeting. The individual study can occur in the same room, or in other learning spaces that will help the student with their enquiries. The volume of study required within a short amount of time (about 40 minutes) is significant, which means there is limited (if any) discussion among team members during this time. This reinforces the objective of individual self-directed study *(Image 2)*.

Image 1: Commencement of PBL tutorial in the group work room. Photograph: N.Mitchell/CSU

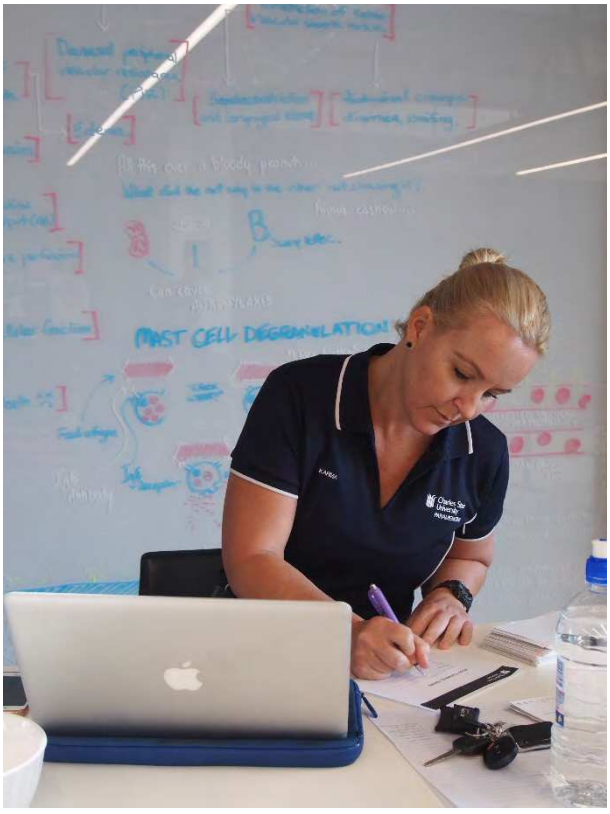

Image 2: Individual study (at place of choice). Photograph: N.Mitchell/CSU

Stage 3: Review of learning

At the allotted time, students reconvene and discuss their answers to each of the questions they were assigned. Team members discuss the way in which the questions relate to the scenario, and the way in which the answers relate to one another. The purpose of this stage in the tutorial is for the team to learn from one another and jointly develop a comprehensive treatment plan for the patient who was presented in the scenario *(Image 3)*.

Image 3: Learning is reviewed by the team and a treatment plan is developed. Photograph: N.Mitchell/CSU

Stage 4: Oral Examination

Once teams have developed their treatment plan, the lecturer draws all teams together as a group. Students then participate in an oral viva exercise (also termed viva-voce) where the lecturer will ask individuals about the scenario, using questions that are aligned with the topics studied earlier in the tutorial.

It is important to note that the oral viva occurs in a group setting at the beginning of the semester, and then as the semester continues and student confidence grows, the oral viva questions occur first in team settings, then in pairs, and then individually between the lecturer and student. For this reason, an additional lecturer is usually required for the Oral Viva sessions, particularly toward the end of the semester *(Images 4a & 4b)*.

Images 4a & 4b: Oral Viva discussions may occur in groups or individually. Photograph: N.Mitchell/CSU

Stage 5: Simulation

At the end of the oral viva process, teams reconvene in a simulation lab, where the scenario they have studied earlier in the tutorial is "brought to life." Students are required to interact with the patient and with each other as they implement their treatment plan in the simulated environment *(Image 5)*. The simulation itself also provides real-time repercussions, which may present new problems that students need to collaboratively solve. The simulation lasts 20-30 minutes.

Image 5: Students implement their treatment plan in a simulated environment. Photograph: N.Mitchell/CSU

Stage 6: Review and repeat

At the conclusion of the simulation, all teams reconvene as a group. The lecturer discusses and debriefs the simulation and treatment plans with the group, inviting feedback and input from individual students and teams. Key principles and lessons are highlighted by the lecturer, and are discussed among the group. Experiences are shared by the lecturer and the students *(Image 6)*. Students then return to the simulation room to repeat the scenario, this time performing the scenario with greater fluency.

Image 6: The simulation is discussed and experiences are shared. Photograph: N.Mitchell/CSU

In 2017, this subject received the highest Subject Experience Survey scores across the School of Biomedical Sciences (the largest school in the university), as well as receiving a university teaching award.

Discussion

PBL is a well-developed, sophisticated pedagogy that has been traditionally characterized by the delivery of an intentionally unstructured problem for students to solve within a group setting. There are usually no lectures, and the educator acts as a facilitator who assists learning across groups. The notion of hybrid PBL was explored by Bevinakoppa, Ray, & Sabrina (2016) which included the use of lectures to provide content and context within a PBL model, thereby changing the educator role toward one of a lecturer and facilitator. In the model that we have described, a semi-structured problem (or scenario) is used. Groups and teams are expected to self-facilitate learning, and an oral viva is used in the tutorial to monitor student learning. Lectures also occur in this subject, which are separate from the PBL tutorial, but which also have the role of reinforcing certain biomedical science content.

As with traditional PBL, the model we use also involves academic staff surrendering "control" over specific learning elements in the tutorial (Schwartz, Mennin & Webb, 2001), as well as investing significantly in the preparation of each scenario (Tsin, 2014). At the same time, the new approach has provided remedies for common existing problems in PBL, such as overcoming barriers associated with technology use in collaborative settings (Jin, Bridges, Botelho & Chan, 2015); as well as addressing concerns that a PBL tutorial may become too unstructured; and even (in the authors' opinion) reducing the preparation required for PBL and simulation scenarios. (This is likely because the eight tutorials are constructed using a simple, repeatable framework —even though their content differs).

PBL has been described as "a combination of cognitive and social constructivist theories, as developed by Piaget and Vygotsky" (Ozer, 2004, as cited in Bevinakoppa, Ray & Sabrina, 2016). Our new model attempts to embrace these foundational concepts, which are of crucial importance for authentic learning in health-related higher education programs. Notions of experiential learning, informal and social learning, as well as meaningful, constructivist learning, are woven throughout the weekly tutorial

structure and delivery. This technique is characterized by student-centered, collaborative, and context-specific learning (Ward & Lee, 2002). Students also become more empowered to be motivated, lifelong learners because the self-directed learning activities in the subject encourage them to take responsibility for their own learning (Kaufman, 2003, p213).

We believe this subject would be suitable for further rigorous evaluation of the educational design and outcomes. Investigation of ways that this 'multi-space' approach to PBL could be applied in other paramedic subjects or health related courses may also be warranted.

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