Creating an authentic learning environment in the chiropractic classroom: A problem-based learning approach

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Abstract**:** *Problem-based learning is recognized an as an important strategy for the education of health professionals. This paper describes how problem based learning is used to create an authentic learning environment for chiropractic students at RMIT. It also demonstrates how learning experiences may be embedded in different frameworks along the problem-based learning continuum.*

Keywords: *Problem-based learning, chiropractic, professional education*

Introduction

Chiropractors practice as primary contact practitioners. In addition to providing manual care characteristic of their profession, chiropractors serve as portals of entry into the Australian health care system. See Figure 1. In order to fulfil the latter role, chiropractic students need to acquire and demonstrate the general clinical knowledge and skills characteristic of all primary health professionals. They need to both competently screen for disease appropriately referring patients to other health providers, and serve as a health information resource for promoting wellness. The challenge facing educators is to provide a training program that meets the specialist chiropractic and 'medical' generalist objectives within a 5 year course. The dilemma is to provide a vocationally oriented learning experience that graduates practitioners who are self-directed learners capable of staying abreast of developments in an ever changing field. One approach to addressing this challenge is to use a problem based learning format.

Problem-based learning has emerged as a viable alternative to the traditional curriculum. Distlehorst and Robbs(1998) found that students in a problem based curriculum perform particularly strongly in the clinical situation. Hmelo(1998) found they demonstrated enhanced reasoning skills in applying science based concepts to their explanations, while Ozuah, Curtis and Stein (2001) like Khan and Fareed (2001)found they were more enthusiastic about self-study than lecture based groups. Such skills are fundamental to continuing self-education. However as clinical reasoning is based upon factual information there is concern that those in a problem-based curriculum may fail to assimilate sufficient factual information. Research suggest such fears may be groundless e.g., Khan and Fareed (2001); Enarson and Cariaga-Lo (2001). Furthermore, Schmidt and Molen (2001) reported that graduates from a problem-based medical curriculum perceive their ability to work independently, run meetings, cooperate and solve problems as greater than that of conventionally trained colleagues. Problem-based learning would seem to be well suited to vocational education.

Implementing problem based learning in the chiropractic curriculum

In view of the necessity that health professionals are competent problem solvers and committed lifelong self-directed learners, a problem based learning approach appears well

suited to undergraduate chiropractic education. This paper discusses how three distinct problem solving formats may be used to prepare chiropractors as primary contact practitioners (See Table 1).

A personal nutritional health assignment for 2nd year students

Second year chiropractic students are required to submit a nutrition assignment as part of their assessment for Contextual Health 1. Before students are permitted to enroll in this subject they have had to successfully complete a number of credit points in chemistry and physiology. Within the context of the problem-based learning continuum, the nutrition assignment can be construed to initially exemplify a problem-orientated learning exercise in which students are provided with information and protocols. They are provided with the information necessary to implement a balanced diet and made aware of globally accepted nutritional recommendations for minimizing the risk of chronic disease. They are also provided with a detailed protocol of how to undertake dietary analysis and given access to a computer based dietary analysis program. The nutrition assignment requires that the student analyze their usual diet with respect to the Five Food Groups and also undertake a detailed nutrient analysis using a weighed dietary approach and computer based dietary program. They are then required to compare their usual dietary habits and nutritional intake both with the Australian guidelines for dietary health and with global recommendations for reducing the risk of osteoporosis, heart disease and cancer.

Starting from the lowest level of the problem based learning format continuum described by Harden and Davis (1998), the learning experience then progresses to a higher level with students being required to undertake problem-solving. Students are challenged to identify and implement modifications to their diet in order to more closely conform to health recommendations. Learners are asked to report on the changes made and indicate how successfully they adhered to their new self-determined dietary changes. Solving the problem of how to modify their diet to meet health guidelines rather than merely gathering nutritional information transforms the learning goal.

The nutrition assignment is consistent with the principles of good case design in that the content of the nutrition assignment draws on knowledge acquired earlier in the program and invites students to apply this basic science knowledge in a personal and health promoting context. Students are required to interact with the information. By comparing their dietary behaviour with a health standard and applying this information to achieve a desirable health outcome, students actively integrate prior knowledge with new information. The student is provided with an opportunity to apply concepts acquired in their basic science subjects in a context that has immediate relevance to the clinical situation. In fact not only is the learning experience readily transferred to the clinical setting, the knowledge and skills acquired can be easily modified to meet diverse dietary related clinical problems such as the management of overweight patients.

The problem presented is relevant to the student, both in terms of their own wellbeing and that of their future patients. For example, based upon the Five Food Group analysis from the class of 2000, of the 55 RMIT students who completed the assignment 53% failed to eat 5 or more serves of fruit and vegetables daily. This finding is similar to a recent study in which Jamison (2002) found that 50% of Australian chiropractic patients failed to eat 5 serves of fruit and vegetable daily. In view of the documented health benefits achieved from a diet rich in fruit and vegetables, the Australian recommendation for fruit and vegetable consumption, as reported by Miller, Pollard and Coli (1997) has been increased from the traditional five to

seven serves eaten as two pieces of fruit and five average-sized serves of vegetables daily. As only 18% of chiropractic students and 19% of chiropractic patients meet this recommendation, such a learning experience would seem highly relevant to the student as an individual and a future health professional.

Self-directed learning is stimulated and the students' interest in the subject matter enhanced by creating a scenario of direct relevance to their personal dietary health behaviour and future practice. Almost all students do implement new eating behaviours, however very few report they have maintained the changes some two years later. By experiencing the difficulty associated with successfully adhering to a self-selected dietary change, students are given the opportunity to develop an empathetic understanding of the difficulty their future patients may experience in complying with their professional admonitions. The assignment creates a learning environment consistent with the programs objectives with respect to the students' knowledge and skills, and also provides an opportunity to influence student attitude to their future patients.

The nutrition assignment in the second year enhances student self-awareness, the health promotion assignment in year three provides an opportunity to become more aware of the health needs of others.

A client Health Promotion assignment for 3rd year students

The health care system is buckling under the overwhelming demands of curative health care. Community groups along with concerned health professionals are calling for a more preventative approach to health care. Third year chiropractic students are being asked to address this problem at the micro-level of a health management program. Students in Contextual Health 4 are required to prepare a health management contract for a 'client'. This requires that they approach a 'relative stranger' and gain permission to undertake a health status assessment. This problem-initiated learning experience requires that students develop a management plan to reduce their client's risk of disease. This involves undertaking a health risk appraisal with respect to diseases prevalent in the community. Particular attention is given to screening for risk factors associated with ischaemic heart disease, cancer, diabetes and osteoporosis. As the learning experience is designed to expose them to wellness constructs, it also requires that the client be made aware of health actualizing behaviours. In practical terms, this requires students identify their client's current health status, particularly with respect to lifestyle choices, and compare this to optimal health behaviours. Useful tools for increasing health awareness and enhancing commitment amongst clients are available. See Handouts 14.1 and 14.5. Once the health 'needs' of their client have been identified, the student is then required to catalogue strategies that may be implemented to meet these 'needs'.

In addition to the intellectual activity of formulating a health promotion plan, important elements of this learning experience are engaging in dialogue with and motivating a client. This learning experience is readily converted to task-based learning by modification of the health management plan into a health management contract. The contract incorporates self-monitoring and motivating features such as deadlines whereby particular goals should be accomplished, and rewards for successes achieved.

The assignment provides a particularly good 'clinical' learning opportunity for students during the preclinical phase of their chiropractic program. It also creates a learning environment conducive to self-directed learning. The need for students to consider various options for

health promotion and identify acceptable strategies compatible with their client's lifestyle requires that they actively gather and integrate information. Use of the internet as a resource is encourage both by the patient information sheets made available and the useful internet sites listed at www.jamisonhealth.com . Overall, this learning task provides students with an opportunity to:

- increase their awareness of the dimensions of wellness as opposed to health as the absence of disease
- use and expand their knowledge in a clinically relevant context while still in the preclinical phase of their program
- experience the reality of interacting with patients, negotiating a 'treatment' plan and motivating a client. The importance of incorporating the client's 'wants' and offering a flexible approach to clinical care is emphasised.
- access, evaluate and selectively use health information in a clinically relevant context.

Differential Diagnosis of clinical problems for groups of 5th year students

While chiropractic students inevitably undertake task-based learning in the clinics when confronted the need to diagnose and treat patients, such learning is largely restricted to problems with the musculoskeletal system. Preparation for practice at the practitioner-health care system interface requires a broader knowledge base. Diagnosis 8, which requires that students work in groups and differentially diagnose student-simulated patients exemplifies a problem-centred learning opportunity.

Students are invited to form groups of 4 and each student is given the chance to rotate through the role of simulated patient and clinician. A number of diseases are allocated. Students then prepare themselves as simulated patients using a standard text (e.g., Jamison, 1999). With only the student in the role of simulated patient being privy to their condition, the group is challenged to make a working diagnosis based on history taking. The provisional diagnosis is then refined and a definitive diagnosis determined by working through a system of 'yes' or 'no' responses to closed questions about changes detectable on physical examination and laboratory investigation. By selecting a number of related cases for any session, the instructor can embed the total learning experience in a problem-based learning format. The learning experience can be structured so that the student is given the opportunity to generalize their knowledge from case to case and identify shared principles underpinning diagnosis decision making.

Simulated case discussions create an authentic learning environment that increases the probability that students will recognise various early disease states when first encountered in clinical practice. They also provide an opportunity for students to be exposed to serious conditions rarely seen in chiropractic practice. As diagnosis can lead to intervention that changes the clinical outcome, early detection of disease and appropriate treatment or referral of patients is a fundamental feature of competent primary practice. Preparation as a simulated patient is a particularly useful learning experience as the best simulations result when the student attempts to 'walk in the shoes of the patient'. Furthermore, students in their role of clinician are given an opportunity to work in groups and experience the benefits of 'professional' cooperation and peer case review. Students report they find the learning experience useful particularly insofar as it provides an opportunity to 'synthesize' their previous learning.

Principles for developing problem based learning exemplars

Curriculum planning traditionally seeks to expose the learner to a hierarchy of increasing complexity. Knowledge, skills and attitudes can be developed in a sequential fashion in a

problem based learning program, for which an eleven step continuum model has been described by Harden and Davis (1998). Starting from an information-oriented platform, the model evolves into a problem-based approach. In this model, the learning continuum moves from theoretical learning, consistent with providing information in standard lectures or texts, through a variety of problem-based formats to task-based learning in which the problem is real world and a set of tasks are undertaken as a result of the presenting clinical problem. Between the extremes of theoretical and task-based learning, information processing evolves within a range of problem-based formats along a continuum from problem-oriented, through problem-assisted, problem-solving, problem-focused, problem-based, problem-initiated, problem-centred, and problem-centred discovery to, finally, problem-based learning. Experiential learning supersedes rote learning as students are increasingly challenged to solve problems in a real world context. Previous learning is increasingly activated in a quest to discover new relationships.

In all cases the nature of student learning appears to be strongly influenced by the quality of the cases presented. Seven principles of case design that influence the efficacy of problem-based learning have been identified by (Dolmans, Snellen-Balendong, Wolfhagen and Van der Vleuten (1997). These are:

- The content of the case should be relevant to the student's prior knowledge
- The case should contains several cues that stimulate student elaboration
- A problem relevant to the student's future professional role should be presented
- Presentation of relevant basic science concepts should be couched in the context of a clinical problem
- Self-directed learning should be stimulated
- The learning experience should enhance the student's interest in the subject matter
- The case should meet the objectives of the faculty and/or program

A authentic context appears to be of fundamental importance. Barrington, Latimer and Prideaux (1997) found students particularly valued the realism, practicality and clinical focus of the new learning format. Chiropractic students made similar comments about the examples discussed in this paper.

Using diverse formats problem-based learning continuum and creating cases with different content provides students with diverse and richly varied learning experiences. Nonetheless, all these learning experiences have a common theme characterised by the shared objective of providing a student-centred approach in which the problem acts as a stimulus for learning. As Charlin, Mann and Hansen (1998) concluded, student learning consistent with a problem based learning approach is an active process that activates prior knowledge in a meaningful context and provides opportunities for elaboration or organization of knowledge.

In Conclusion

As shown in Table 1 chiropractic students are offered a variety of learning opportunities within a problem-based learning continuum. While the exact nature of the learning experience differs depending on the stage of the program, the learning objective and the subject content, all the formats discussed seek to enable students to assimilate and integrate information in a clinically relevant context. The benefits of this approach, regardless of the problem-based format used, are deep learning characterized by the vocational application of theoretical knowledge, improved integration of previous learning and a greater appreciation of the nuances of interaction in the clinical encounter. Once students overcome the initial concern of taking increased personal responsibility for their learning, many students consider this is a useful learning approach. Contemporary chiropractic education is less concerned with the

accumulation of facts and more with mastering the thinking processes required for updating and competently utilizing clinically relevant information.

The chiropractor is trained:

- to provide specialist manual care of the musculo-skeletal system
- as a primary contact practitioner

Primary contact practitioners practise at the patient-health care system interface and:

- Screen for disease
- Promote wellness

Wellness is promoted by:

- Providing health risk appraisal and modification
- Serving as a health information resource

Figure 1: The chiropractic practitioner

Subject – year of study	**Contextual health 1 - 2nd**	**Contextual health 4 - 3rd**	**Diagnosis 8 – 5th**
Problem based exemplar	Dietary analysis and modification	Health contract formulation	Simulated clinical consultations
Central theme	Identify & promote optimal diet – unidimensional	Identify & minimise risk Promote health - multidimensional	Recognise disease & refer or treat
Learning outcomes			
Knowledge -content	Diet and nutrition	Dimensions of wellness	Nosology of disease
Problem solving skills	Identify dietary 'needs'	Health risk appraisal	Diagnostic decision making
People skills	Empathy	Negotiation	'Professional' interaction
Progression through course	Self-care	Client care	Patient care

Table 1: Problem-based learning in the chiropractic curriculum

- ☐ Smoking is the biggest risk factor for sudden cardiac death
- ☐ Smokers increase their risk of:
  - ☐ ischaemic heart disease by 30%-300%
  - ☐ lung cancer by 700%-1,500%
  - ☐ chronic obstructive airways disease by 1,000%-3,000%.
- ☐ Smokers reduce their life expectancy by:
  - ☐ around 880 days if women
  - ☐ around 2,250 days if male
- ☐ Passive smoking, ie environmental exposure to tobacco smoke increases the risk of heart disease by 30%
- ☐ Although smokers initially gain weight on stopping, their weight returns to that of the never smoker over time.
- ☐ Feeling more healthy and saving money are the two biggest benefits reported by smokers who quit.

Handout 14.1 Hot tips for smokers(www.jamisonhealth.com)

Tick the benefits you will most value when you quit.

At 20 minutes after quitting nicotine is filtered out of the body and:

- ☐ pulse returns to normal
- ☐ blood pressure returns to normal
- ☐ body temperature returns to normal

After 12 hours:

- ☐ blood carbon monoxide level returns to normal

After 24 hours:

- ☐ circulation improves
- ☐ fine motor co-ordination improves

After 6 weeks:

- ☐ the smoker's cough decreases

After 3 months:

- ☐ taste and smell improve
- ☐ endurance and stamina improve
- ☐ immunity improves

After 1 year:

- ☐ the personal risk of coronary heart disease is halved reducing from four times to twice the non-smoker's risk

After 5 years:

- ☐ halving of the personal risk of oral, throat, and oesophagus cancer
- ☐ the risk of lung cancer is reduced from ten times to twice the 'never' smoker

After 5-15 years:

- ☐ a personal risk of stroke equivalent to that if you had never smoked
- ☐ halving the personal risk of severe facial wrinkling

After 10-15 years:

- ☐ a personal risk of coronary heart disease equivalent to that if you had never smoked
- ☐ compared to the smoking years, a significantly decreased risk of premature death, lung cancer, bladder cancer and peripheral vascular disease

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Handout 14.5 The potential benefits of quitting(www.jamisonhealth.com)

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