Higher Education Research Network Journal

Special Issue: Chairside & Bedside Teaching

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Higher Education Research Network (HERN)

This special issue of HERN-J represents the inaugural activity of the special interest group for chairside & bedside teaching.

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Editors' Introduction

We would like to welcome you to this “Special Issue” of HERN-J – an issue that focuses on Bedside & Chairside clinical teaching and practice. The eight papers bring together some very interesting and quite different perspectives on teaching and learning in the clinical environment. That said, we think it is possible to follow a thread through the narratives, one that is both fascinating and perhaps uncomfortable for the reader, as concerns regarding clinical education and practice feature strongly.

Katie Ward starts with a rather powerful account of her “Frustrations in Bedside Teaching.” Katie highlights her concerns with medical assessment procedures that drive student learning along unintended trajectories, and the difficulties she observes in aligning teaching strategies with student learning preferences. Clearly an enthusiastic medical teacher Katie is echoing the sentiments of many of her clinical teacher peers as she argues for a system of medical education that encourages students to aim for excellence rather than just focus on passing the next examination.

Chris Holland takes Katie’s arguments a stage further. He is concerned that in clinical teaching, patient safety is not necessarily presented as a priority. Chris suggests that there is a skills deficit in the arena of patient safety and he presents a very convincing argument for developing a formalized training programme in the skills that are necessary to practice safely. He proposes that educational paradigms can be utilized to identify the skills that clinical teachers themselves require so that they are able to deliver appropriate safety skills teaching.

Lynette James continues this theme of concern in medical education/practice, this time with regard to medication errors and “accuracy checking” training in Pharmacy. Lynette’s elegantly novel study compares competence determined by an accuracy checking task with understanding, determined by asking the participants to concept map the task and assess the design of the map in terms of knowledge structure. The results of Lynette’s study are very interesting, but perhaps a little worrying.

In her paper “Injecting Expertise” Fiona Clarke focuses down on one very important safety related aspect of clinical education. She argues that by adopting a model of teaching dental local anaesthesia based on “Expertise”, the essential relationship between theory and practice will be strengthened. This will allow undergraduate students to relate their ‘chains of practice’ to the underlying “networks of understanding.” Here is a model that has utility beyond the dental profession. We suggest that Fiona’s paper can be viewed as a practical application of Lynette’s study and one that has the potential to address the concerns that Katie and Chris outline in their accounts.

Marta Kobus introduces the application of Threshold Concepts to dental education as a possible model to inform curriculum design. She argues that through the visualization of knowledge structures Threshold Concepts can perhaps offer an integrative function between the linear knowledge structures that characterize clinical practice and the hierarchical knowledge structures that are typical of the underpinning conceptual knowledge. As with Fiona’s work, whilst Marta embeds her research in dentistry, quite clearly there is scope for a wider application of her theory, an application that can address, on a curriculum wide level, the concerns that we have discussed so far.

It could be argued that in these first five papers, we are attempting to move toward patient-centred care and student-centred learning. Camille Kandiko and her colleagues present a convincing argument that we have to appreciate that in our world of inter-professional working, there is a need for change in clinical education. Using examples of interprofessional education from Pharmacy and Dentistry, Camille’s group offer us what could be considered as an exciting new pedagogical model of healthcare education.
Enabling university-based clinical students to have experience of clinical practice in a Primary Care setting is exceptionally valuable, not least because this is the arena in which most will spend their practising lives. David Radford’s paper outlining the development of the new Portsmouth Dental Academy from the existing School for Dental Care Professionals, demonstrates how inter-disciplinary education can be hugely successful when an appropriate framework for that education is in place and there is a will for it to succeed. Quite clearly, both King’s College London Dental Institute and Portsmouth University have benefited from this exciting liaison – as have the students involved in the venture and the patients in their care.

The final paper of this edition from Liz Gruber is absolutely fascinating in that we have an experienced and well qualified medical practitioner presenting her experiences, having embarked on an undergraduate dental programme. And it is no ordinary programme; it is a bespoke accelerated programme specifically for medical graduates. We see how different medicine and dentistry are as programmes of study; Liz also gives us a glimpse of some of the issues faced by mature applicants on intensive programmes such as medicine and dentistry.

The eight papers presented in this volume are a first for the HERN-J special interest group on chairside and bedside teaching. We feel that they enable us to see some of the key issues and concerns facing clinical teachers in the 21st century. We also suggest that the papers provide us with some elegant ways forward; based on a sound pedagogy of clinical education. That said, we sincerely hope that this is just a beginning and this volume will stimulate those who have similar interests to produce similar accounts of their experiences for future editions of the journal. This has to be the way forward to enhance the clinical education of our students and with that the care of the patients in their charge.

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Frustrations in Bedside Teaching: Opinion.

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Keywords: clinical competence education, medical methods education, medical assessment

Abstract
In this paper I offer a personal perspective on some of the sources of frustration that arise from my role as a Clinical Research Teaching Fellow teaching medical students. The paper considers issues such as the difficulties in aligning student study preferences with the teaching approach that may be offered within an institution; the way in which assessment can be seen to drive student learning along strategic trajectories that are not intended; and the tensions created between the acquisition of experiential and formal knowledge. It is hoped that asking fundamental questions about bedside teaching will initiate a scholarly discussion and allow a re-examination of some of the fundamental assumptions and beliefs that underpin the medical curriculum.

Introduction
I am a practicing doctor and medical researcher and I teach undergraduate clinical medical students for three or four hours a week. I am not a member of the medical education faculty and I work in a large busy teaching hospital geographically removed from the medical education department of the medical school. The medical education department is situated in a hospital which no longer provides any acute medical services, three miles distant from my workplace.

Like the majority of providers of bedside medical education I am paid by the NHS to do clinical work, and for the next few months (winter 2010-11) by a fellowship award to carry out medical research. Doctors typically spend much of their time educating others; medical students of course but also peers, patients and other health professionals. Most of us have little or no training in doing this and we may not always be provided with any information about the current undergraduate medical course.

I studied for the Postgraduate Certificate in Academic Practice over the last eighteen months, which gave me the opportunity to learn more about the theories and practice of education and reflect on almost ten years of my own practice teaching medical students. The views expressed below are entirely my own. They are based mainly on my experience of teaching students from one London medical school over the last five years and I offer few solutions. However I have been encouraged to air some of my rather strong views of undergraduate medical education in the hope of provoking further discussion.
One Style Doesn’t Suit All Students and Situations
The establishment of several new medical schools in the UK since 2000 has led to much discussion and comparison between different schools regarding teaching, learning and assessment methods. Although the same Subject Benchmark Statement is used at each school the learning and teaching strategies used may be very different; this is encouraged by the General Medical Council to allow for differences in students’ own learning styles (Quality Assurance Agency for Higher Education, 2002, General Medical Council, 2009).

Given the competitive nature of the medical school application process, many students will accept a place at whichever medical school offers them a place, regardless of the learning and teaching styles offered at that institution. They may previously have been exposed to a limited range of styles of teaching in schools, and may be unaware of what their preferred learning style will be at university. So whilst the variety of learning and teaching styles across schools is welcomed, the school cannot expect the in-house style to suit all of their students. Many students need lots of support and guidance when they are required to work in new ways such as with problem-based learning, and this may not be readily available in these times of library cuts and academic job losses.

Graduation from Medical School Is Not the Endpoint
Medical undergraduates are not just studying for a degree; they should be learning to do an extremely important job. I want my students to become competent, thoughtful, professional, forward-thinking, innovative doctors of the future. Students and perhaps some of the medical school faculty give the perception that they see undergraduates’ graduation from medical school as the end point should be give instead of giving maybe give the impression rather than give the perception of their medical education. Of course, it should be just the beginning. We must reinforce this by aligning the assessments to the job of being a doctor rather than them being tests of knowledge of the delivered curriculum and past papers.

Appropriate Assessments
Ramsden described how students must to want to learn if teaching is to have any impact upon their progress, (Ramsden, 2003). If I want students to learn more about being a doctor and spend less time studying alone with their books and computers, I believe we have to assess them in more appropriate ways. Current methods of assessment only seem to undermine practising clinicians’ efforts to encourage students to spend more time on the wards seeing patients and becoming involved in their care.

Clinical Assessments
As a clinician with ten years of hospital experience, it can take me up to half an hour to take a full history from an unfamiliar patient and fully examine them, although I acknowledge my GP colleagues can do this somewhat more quickly. I want my students to be able to take a full history from and examine a patient and come up with some kind of differential diagnosis and management plan by the time they leave medical school. This is the “competency” I want them to gain. One way of assessing is the so-called long case, which evaluates performance with real patients but this kind of assessment has been largely eradicated, perhaps due to problems with reliability, recruiting patients and expense (Smee, 2003).

The students I teach are fixated with demonstrating their “competency” in six minutes, as this is the length of time they get to complete a single station in their clinical exams. Taking a history in six minutes is not a skill I particularly want them to gain and I do not believe this is a valid assessment of whether the student is competent to take a full history or not. By assessing them in this way however, we seem to be reinforcing the idea that this is the outcome we want them to achieve. Such atomization of the curriculum
for assessment has led some observers to doubt that typical assessment structures in medical education contribute to the development of expert practitioners (eg. Hodges et al., 1999).

This leads to a tension between my goals in a ward teaching session and those of the students. Students ask, why should they learn to take a complete history when the assessment requires them to do it in six minutes? Why should they do something one way when their logbook checklists, used as the blueprint for their clinical exam stations, tell them something different?

**Written Assessments**

Although the clinical experience has been shown to be a very powerful tool for medical students’ learning, the way students are assessed means those studying at home, learning from past papers and revision books are well rewarded at least in the short term. Almost half (45%) of marks for third year assessments at our London medical school are based on multiple-choice questions (MCQs). This encourages students to think that “hanging around” the wards is not a productive use of their time and means they want to rush off home to learn MCQs off by heart passed would be better than got through. What do the results of MCQs tell us? I already know that the students I teach are skilled at memorizing huge amounts of information. They have passed GCSE and A-level examinations with the highest marks by learning thousands of “facts” by heart. Memorisation can lead to great success in medical school assessments and these are what drive students. However, observers have described how a reliance on memorization can be considered as the default setting for university teaching in which the outcome is typically non-learning (Kinchin et al., 2008), that is the acquisition of information without any parallel development in the quality of understanding.

**A Research Base To Teaching Content**

In my own teaching, I tend to shy away from giving out “facts” and “answers” although it often seems that is what students want. I feel strongly that medical students should understand where the “facts” come from; they need to understand that medical practice is continually evolving based on audit and research evidence. This research base to teaching is a focus of Tomorrow’s Doctors (General Medical Council, 2009) and is emphasized in the latest School of Medicine Learning and Teaching Strategy. (King’s College London, 2009) Rather than learning “facts” students I feel need to know the sources of medical information, how data is collected and how doctors use the data to develop practice. This is extremely important for when the undergraduates become doctors.

I try and encourage my students to think around the management options in each individual clinical situation. For example, the best drugs to treat pneumonia in a twenty year old African male with HIV/AIDS may not be the best option for a seventy year old with emphysema who is allergic to penicillin. (British Thoracic Society Standards of Care Committee, 2001). Research and evaluation skills are difficult to teach, acquire and to assess. The best way for students to acquire these skills may well be through completion of an original research project, yet tragically many students complete the medical course with no research experience at all. Some schools (for example Oxford, Cambridge and University and Imperial Colleges in London) attempt to address this by making intercalation compulsory but this is not the case for most.

The proposed introduction of GP budget holding and the rumoured abolition of the National Institute of Clinical Excellence (which currently evaluates and makes recommendations on new treatments) means that GPs need to be able to understand published papers on clinical trials of new high tech therapies, to best decide how the healthcare budget should be spent (Department of Health, 2010). Those students who do not participate in or learn about research because they “only want to be a GP” may become the doctor with the final decision as to whether the only drug available to treat your kidney cancer is worth paying for or not.
Delivering the Curriculum is Not ‘Educating’ Students

There is a certain amount of factual knowledge students need to gain and some anxiety on the part of some medical teachers that the curriculum is “delivered”, especially with the increasing demands of paying students who may believe that is what their fees are paying for. In an attempt to provide lots of curriculum material to students, many colleges make resources such as handouts, lecture notes and information sheets available online. In the school where I teach a vast amount of curriculum content is provided on the school’s own website. It seems near impossible to keep all the material on the website up-to-date, but because the information is provided by the school the students believe that a) the material is all factual and correct and b) that they have to learn it all. The sole benefit to students seems to be that the information is all in one place and can be accessed from home.

Curriculum delivery on a plate should not and cannot be what medical education is about. I believe that students may learn more if there were less internal website content; by finding things out for themselves. There is an unlimited amount of high and low quality medical information available on the web. Tutors could direct the students to and through reliable sources of information. It is important students are equipped with the skills to assess the quality of information and evidence presented to them (General Medical Council, 2009). Students need to learn to use the internet as a resource in the same way as they would when they start work.

Credit to Students Who Spend More Time in the Clinical Environment

Many clinicians including myself believe the best place for students to learn medicine is in the clinical environment whether this is on the labour ward, in the Accident and Emergency Department or in the GP surgery. The US philosopher and educator John Dewey is quoted as saying “learning is based on discovery guided by mentoring rather than on the transmission of information” (Boyer Commission, 1998). Medical students are free to interview patients and observe doctors twenty-four hours a day in hospitals, if they want to, and doctors and patients are often delighted to have them around. Research into clinical reasoning from the 1970s onwards found that those perceived as being clinical experts made good use of both experiential and formal knowledge in their approach to patients (Norman, 2002). It has been suggested that where there is a dislocation of experiential learning from formal learning, the subsequent development of expertise may be inhibited (Wheelahan, 2007). The type of experience gained from observing and practicing real life medicine is invaluable but difficult to assess, although some schools use in-course assessment and student portfolios in an attempt to address this issue.

We don’t push the high achievers

The medical schools and the GMC have a responsibility to the general public to turn out competent doctors. The Medical Act of 1886 stated that the aim of medical education was to train the “safe general practitioner” (The Editor of the BMJ, 1957). UK medical schools still aim to turn out a basic, generic doctor who is able to go on and train in a medical speciality of his or her choice (General Medical Council, 2009). Medical degrees are not classified into first, second and third class and graduates are not given honours status.

With the assessments currently in place in most medical schools we seem to be trying to weed out the incompetent students from the back of the class rather than pushing the ones at the front to demonstrate their excellence. The last government recognised this was a problem in state schools and set up a national strategy for teaching so-called Gifted and Talented children.
I get very frustrated that we have such bright and intelligent students but the way the assessments are set means we are not giving them a chance to shine; we are merely reinforcing their idea that to be a doctor they have to learn lots of material in a very superficial way. It seems to be very difficult for excellent candidates to stand out in the medical undergraduate course. We need creative thinkers for the future of medicine but we are not fostering this, indeed I think we are encouraging students to cram their brains with so much information there is no room left for them to think. An intercalated degree may provide them with an opportunity to shine as well as gaining research skills difficult to acquire elsewhere.

**Conclusion**
Teaching medical students is an extremely rewarding but often frustrating experience. Students are extremely bright and keen to learn and we need to encourage their enthusiasm for clinical medicine. Clinicians’ attempts to train students to become competent practising doctors may be undermined by inappropriate assessment methods, as students often focus on the next exam rather than gaining clinical experience needed for their future careers.

As medical science moves forward, we should consider whether we really want our medical schools to be turning out a single grade of basic, competent doctor or should we be encouraging them to reach for higher goals? Students may be ill-equipped to cope with less instructional types of teaching medicine and resources may not be in place to support them. I understand that many practices I find frustrating are in place for pragmatic reasons; to provide a high quality medical education for 500 students in each medical school year with limited resources is very challenging. In addition colleges have to try and demonstrate to the public that graduating students are competent to practice, although I am unconvinced that many currently used assessments are valid assessments of competence.

I will continue to teach with enthusiasm whilst expressing my frustration with the system and hope that with scholarship and discussion we can continue to improve standards of medical education for students, doctors and of course our patients.

**References**


Teaching Safely, Teaching Safety: Opinion.

Chris Holland

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Keywords: patient safety, clinical supervision, safety curriculum

Abstract

The unacceptably high incidence of preventable adverse-events has become a topic of concern for providers, managers and consumers of healthcare alike. One of the basic tenets of medical practice is “primum non nocere” (above all, do no harm), yet pre and post qualification trainees still seem to receive minimal formalised training in the skills required to practice safely. It is suggested here that educational paradigms can be utilised to clarify what skills clinical supervisors themselves require so as to enable them to deliver safety-skills training in an integrated, effective and efficient way.

Introduction

The Department of Health (DoH) and The World Health Organisation (WHO), amongst others, have concluded that 1 in 10 of all patient hospitalisations in the developed world results in a serious, preventable adverse event (Department of Health, 2000; World Health Organization, 2004). Healthcare is an environment where the sheer complexity of practice means that organisations are increasingly adopting an approach of accepting that human error is inevitable and that, while systems should be designed to prevent mistakes as much as possible, practitioners should be trained to identify errors early, trap them before they have an effect and mitigate any effects they might have already have had. Other risk-adverse industries, such as the nuclear industry, the armed forces and the civil aviation security industry, have spent the last 20 to 30 years designing systems that eradicate opportunities for latent error without impairing function. If one accepts that despite these advances mistakes are inevitable we must require human practitioners within these environments to be one of the main barriers to committed error becoming catastrophic.

The mining industry, the petrochemical industry, the military, the forestry and logging industry and the London Metropolitan Police have developed specific training for individuals to utilise when they are about to embark on potentially risky undertakings (Taylor-Adams et al., 2008). Many of these programmes attempt to make professionals “harm absorbers”. That is, they are able to anticipate error and use error recovery techniques (Reason, 2004).

How this training is incorporated into pre and post qualification training varies according to context and because the lack of much empiric evidence of how best to achieve such training. The example of the aviation industry’s Crew Resource Management (CRM) programme is often referred to in medical practice. CRM was developed in the 1970’s in response to detailed analyses of the non-technical errors that resulted in a series of commercial and passenger aircraft disasters. It has been transferred to many aspects of medical training, most notably Anaesthetics simulation training by Gaba et al (2001).
CRM is based on the psychological finding that human beings behave predictably in many situations and that training and practice in certain behaviours can make operations significantly safer.

This comparison of the aviation industry with the healthcare industry has utility but is not perfect and is possibly becoming hackneyed (British Medical Journal, 2011). The World Health Organisation supports specific research into patient safety through the WHO Patient Safety Programme (World Health Organization, 2011) and the US and the UK are not alone in creating National Patient Safety organisations.

In the National Patient Safety Agency the National Health Service (NHS) is attempting to imbue itself with an attitude to safety which mirrors that of other high-reliability organisations such as those mentioned above (National Patient Safety Agency, 2011). A high-reliability organisation is one which has successfully avoided catastrophes in an environment where accidents can be expected due to reasons of risk or complexity. The creation of a culture of safety-in-healthcare that results in a high-reliability organisation requires practitioners to be equipped with the knowledge, skills and behaviours they need to do so. They can only do this if they are taught to recognise and react to threats to safety. Clinical educators should not only be able to teach safely therefore but also teach safety.

Safety in a complex system

The discipline of safety in healthcare encompasses human factors research, medical engineering, social behaviours, epidemiology, actuarial science, risk and probability, organisational behaviours, business, chaos theory, anthropology, complexity science and more. Few of the disciplines just mentioned are specifically mentioned in healthcare curricula amongst the anatomy, pharmacology and biochemistry of undergraduate years or the technical and professional, specific and generic skills acquired during the post-qualification years. Hippocrates (Edelstein, 1996), the CanMEDS competency framework (Royal College of Physicians and Surgeons of Canada, 2010), the General Medical Council’s (GMC) Tomorrow’s Doctors (GMC, 2009) all refer to Patient Safety. Modern models of professionalism frequently blur the line between regulation of unsafe practitioners and the task of safely instilling knowledge and behaviours. As described by ten Cate et al., (2010), one of the prima facie decisions that a trainer must make about a trainee’s competence to perform the task is whether or not they are sufficiently safe practitioners at that task to be entrusted with it. In order to understand what it is about their own practice and that of trainees that might be unsafe, practitioners need to appreciate that the subject of patient safety is more complex than it might seem at first glance. As a result, acquiring an appropriate level of knowledge about the topic should receive explicit teaching and training time. Taylor-Adams et al., (2008:141) refer to the “skills needed by clinicians ... to work safely” as safety skills. “They are the activities and behaviours that underlie safety awareness and can aid active error prevention... These skills develop with experience but are seldom made explicit or formally taught; they are seen as intuitive and as a mark of long service.”

Competence

Dall’Alba and Sandberg (1996: 424) have argued that “professional education is, first and foremost, concerned with the way in which students learn to experience the field of human practice to which they are being introduced”. A decade later they argued that “the knowledge and skills that professionals use in performing their work depend on their embodied understanding of the practice in question.” (Dall’Alba and Sandberg, 2006: 390).

The most recent reorganisation of post-graduate medical education in the UK was called Modernising Medical Careers (MMC). DoH (2008) changed the concept of assessing the competent practitioner as an experienced master of an eclectic set of knowledge, skills and behaviours to one where they have demonstrated competent performance of a much more proscribed set of behaviours to a satisfactory standard. One of the aims of MMC was to situate learning and assessment alongside each other in the joint
arena of professional practice and in-service training. A plethora of workplace-based assessment tools were introduced that allowed the trainee to provide uniform objective evidence of the acquisition of competence. The contingent and reflexive nature of much clinically-situated teaching means that historically much medical knowledge is obtained as a result of reactive learning (Eraut, 2000). MMC has meant that opportunities for obtaining these documented competencies are now also mostly opportunistic.

One of the main arbiters of documented competence has become the clinical supervisor. Prior to its merger with the General Medical Council the Postgraduate Medical Education and Training Board defined a clinical supervisor as “a trainer who is selected and appropriately trained to be responsible for overseeing a specified trainee’s clinical work and providing constructive feedback during a training placement” (Le Rolland et al., 2009). The London Deanery defines clinical supervision as follows: “Clinical supervision relates to day-to-day oversight of trainees in the workplace and is an activity that involves all clinicians that come into contact with trainees. Clinical supervision involves being available, looking over the shoulder of the trainee, teaching on-the-job with developmental conversations, regular feedback and the provision of a rapid response to issues as they arise.” (London Deanery, 2011). For a large number of clinical supervisors and their trainees this, and the resources and time permitted for this new model of training, resulted in a perception that a single isolated demonstration of competence in a discrete skill was sufficient for a trainee to progress to obtaining the next competency outlined in an overly detailed, bulky and fragmented curriculum. In the process, an opportunity for socialisation into and a social context for the profession was potentially lost.

One model frequently used to describe the acquisition of expertise during experiential learning is that of Dreyfus and Dreyfus (1986). Using this model one can speculate that once competency is certified in the modern system of medical training the acquisition of expertise becomes an added bonus. ten Cate et al., (2010) recently proposed re-formatting the Dreyfus and Dreyfus model as a trajectory plotted against time. This is not the first attempt to graphically represent the progression of a trainee from novice to expert (Dall’Alba and Sandberg, 2006; Kinchin and Cabor, 2010) but the particular utility of the ten Cate et al model is to facilitate the conceptualisation of how trainers can integrate safety and competence into the current model of assessment of medical trainee progression. If one of the markers of competence should be that the practitioner can perform the task independently and routinely without compromising patient safety, the point at which competence is said to be achieved becomes a safety line; below this line a practitioner should not perform the task without supervision. Conversely a trainer could benchmark the acquisition of competence against an opinion that the trainee is a safe independent practitioner under routine circumstances – they can be entrusted with the task in a clinical situation according to ten Cate.

Figure 1: General curve of skills acquisition using the stages of Dreyfus and Dreyfus. Dotted lines signify hypothetical moments at which a trainee reaches a competence threshold level for a given activity. (after ten Cate et al., 2010) with permission.
Eraut (2000) proposes that when codified knowledge, procedural knowledge and process knowledge have been integrated into an individual’s personal knowledge competence is achieved. Therefore, at least one of these domains of knowledge must contain instructional or codified knowledge about safety.

Teaching Myocardial Infarction
Any physician in training will receive significant amounts of codified knowledge relating to a single clinical subject such as Myocardial Infarction (MI). This particular condition has a UK incidence of 273 per 100,000 for men below 65 years and 1,349 per 100,000 in age-groups 65-79 years (Neil, 2003). It is unlikely that the time devoted explicitly to the topic of patient safety, related to the prevention of a condition with an incidence of 10% of the hospital population, is anywhere near the same. In fact it is this author’s experience of medical training that it is extremely rare for safety to be the topic of an explicit or didactic teaching episode. It is clearly feasible to create discrete instructional learning opportunities about a topic such as MI within a module focusing on cardiovascular medicine. Conceptually ring-fencing a topic in such a way facilitates its acquisition of the status of codified knowledge but may make it more difficult to accord elemental topics such as patient safety the same status. If one wishes to accord patient-safety the same status then perhaps an explicit curriculum in the subject becomes necessary. Otherwise, the practitioner may be left to acquire a largely personal knowledge-base on the topic which may not conform to the knowledge-base of other practitioners. Yet, a physician would not countenance this state of affairs for a similarly elemental subject such as anatomy; leaving something so intrinsic to medical practice to a process of implicit, hidden and unconsciously modelled pedagogy.

Explicit patient safety curricula
Is an explicit curriculum in safety-skills feasible? Attempts have been made to create such a programme and review the impact of such curricula on trainees in medicine. These were recently the subject of a systematic review by Wong et al., (2010). They found that authors often reported that teaching interventions resulted in learners acquiring knowledge. Some studies reported that evidence of significant improvements of processes of care could be identified. Still fewer studies demonstrated changes in behaviour or improvements in patient outcome however. In their discussion Wong et al., noted that the search for empiric evidence of this nature is challenging because few qualitative interventions in healthcare have ever succeeded in demonstrating actual improvements in patient outcome.

Given the desirability of practitioners acquiring the highest levels of expertise in safety-skills and the necessity of constant reinforcement of such social conventions the ideal might be for patient-safety training to be delivered from the beginning to the end of their training. This training can last for up to two decades before a practitioner acquires the title of Specialist or Consultant and encompasses a further 20 to 30 years of continuous professional development thereafter. In the light of this lifetime of development it does not seem possible to achieve this without some form of learning, teaching and training that will be ubiquitous and accessible. The Lucian Leape Institute in its white paper recommended that safety training should be “embedded in all teaching activities” (Leape et al., 2010: 2). The Institute recognised that this would require drivers for change that might include modifying standards of accreditation for Schools and individuals, or expanding “Common Program Requirements” to articulate expectations that patient-safety would be emphasised, more residency program faculty, evaluation of school educational priorities regarding patient safety and use of financial, academic and other incentives. The fact that the paper proposes utilising such wide-ranging and numerous levers for change is indicative of the recognition that the change itself will have to be cultural and huge.

Teaching safety safely
Professional educators are often familiar with the theories of Vygotsky (Vygotsky and Kozulin, 1986) and Dreyfus and Dreyfus (1986) and other such theories of expertise and professionalism. The everyday clinical supervisor is less likely to have had formal training in these theories but will have rationalised, at
least tacitly, the confounding *sine qua non* of medical training that skills must be acquired but that patients must never be placed in harm’s way while trainees develop their practice. Many would probably recognise therefore the conceptual stages Dreyfus and Dreyfus use to summarise the main stages of progression from beginner to proficient practitioner and beyond. By training trainers in these models and ways and means to integrate them into their personal training practice the profession could utilise the current models of medical training and the ubiquity of supervision in the process of achieving competence, while achieving a generalised uplift in the knowledge-base about safety-skills in the extant pool of competent practitioners.

One might illustrate to a trainer a conceptual model of the training-skills required to incorporate safety-skills into their day-to-day teaching practice as described below. The text in italics highlights some of the domains faculty-development for such clinical supervisors would have to focus on. Before undertaking a specific skill trainees usually require some introductory, information-based teaching. Boonyasai et al., (2007) found in a systematic review of Effectiveness of Teaching Quality Improvement to Clinicians that learners’ knowledge can be increased by the application of sound adult learning principles. As learners acquire this knowledge they become yet more aware of issues of safety and can start to conceptualise more sophisticated approached of managing these issues. For example, many of the safety-skills that practitioners need knowledge are encompassed by two discrete arenas - *Non-technical skills and situation awareness* (Flin et al., 2009).

Instructional training is often followed by *demonstration-based teaching* that allows the trainee to contextualise each piece of codified knowledge they have obtained within each stage of the skill or competence in question and to conceptualise the integrated whole. The generic professional capabilities considered necessary to practice as a healthcare professional (of which safe practice might be considered one such capability) are partially acquired by a process of socialisation into the trainee’s chosen profession. For example, if a trainee routinely experiences or witnesses demeaning or humiliating episodes then this selfsame process of *continual reinforcement* may lead them to believe that such behaviours are acceptable and effective ways to teach, train and learn. This process of *modelling behaviours* we have seen demonstrated and reinforced can be applied to more positive behaviours, such as safe practice, that those doing the modelling may wish to promulgate.

When they begin practising any skill, trainees will make many mistakes in their performance and the act of completing the task will require a lot of conscious thought making multi-tasking impossible. Progression is achieved by more practice, *feedback* informed by close *supervision and reflection*. It is therefore desirable that, if they do not possess them by this stage, students are taught skills in reflective practice. Without them the student may adopt a temporarily successful but ultimately dangerous unreflective recipe-following approach to task performance (Kinchin and Cabot, 2010).

Once a trainee becomes more practised they will construct a personal model generally applicable to the performance of the task. Some conscious thought is still required to carry out the task. Errors are possible, but they are addressed by either returning to the general principles the trainee has constructed for themselves or those created by others in the form of *care pathways, protocols and Standard Operating Procedures (SOPs)*.

One can conceive that, at this stage, a trainee might be expected to be able to demonstrate competence. Trainers will need to additionally highlight to trainees that, after more practice and time spent performing the task independently, practitioners begin to be able to complete it almost automatically. The performer can multi-task and often has little memory of successfully completing a task according to routine. Errors at this level often relate to *attention and memory deficits*. A practitioner may acquire the level of expertise to practice at this level for the majority of the time but, even if they do, they cannot know everything, thus occurrences will arise when they might have to default to *general principles or even didactic knowledge*. In
reality, practitioners frequently move between these approaches during their continuous practice.

The non-technical and situation-awareness skills referred to above illustrate the faculty-development designed to ensure universal awareness of this sort of codified knowledge that would be needed before the integrated teaching of safety-skills just outlined would be possible. Many of the faculty development training opportunities already in existence make reference to many of the topics highlighted above. It is easy to see how clinical supervisors might use them to develop their teaching methods in particular technical skills, especially those of the craft specialties. Clinical supervisors are the workhorses of the medical training establishment however and as such they are a cross-section of that same medical industry in which patient-safety is not yet sufficiently inculcated. Therefore they may require the utility of these teaching skills in the matter of safety-skills training to be made explicit, just as their learners are waiting for their teachers to do for them.

Conclusion
There is a general skills-deficit in the arena of patient-safety. If there was not such a deficit then healthcare would approach levels of safety that have already been achieved in other high-reliability organisations. Over the past 30 years these organisations have inculcated an attitude to safety to which the healthcare industry increasingly aspires. Wong et al., (2010) found that, of the many barriers to the implementation of safety-skills training reported, a common one was the lack of faculty with the requisite expertise or time. Before clinical educators can incorporate training in safety skills into their routine educational practice a programme of faculty-development for clinical supervisors is required. This should provide them with the skills and techniques to imbue their training with specific safety-skills knowledge, skills and behaviours and would result in a generalised uplift in the profession’s collective practice of safe healthcare and, ultimately, a reduction in the inexcusable incidence of patient-harm cause by the unsafe practice of healthcare. Faculty will have to be explicitly aware of many of the recent developments concerning safety in healthcare and sophisticated theories of pedagogy such as the phenomenon of modelling. This will require time and resource to achieve, both in terms of faculty development and programme delivery. A cultural change is required to effect the sort of changes seen in other safety-conscious industries. As ever, educators must be at the vanguard of this change.

References


Are Trainee Pharmacists and Qualified Pharmacists Competent at Accuracy Checking Dispensed Medicines?

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Keywords: competency, understanding, concept mapping

Abstract
In recent years there has been a considerable drive towards a competency-based model for educating healthcare professionals. However, it has been suggested that the development of professional skills depends on understanding. This paper explores the competency and understanding of undergraduate pharmacy students, pre-registration pharmacy graduates and qualified pharmacists at accuracy checking dispensed medicines. Study participants were required to complete a simulated accuracy checking task, involving the checking of eight dispensed medicines containing 13 different dispensing errors (assessment of competence) followed by the construction of a concept map (assessment of understanding). Forty-one undergraduates, 71 pre-registration pharmacy graduates and 78 pharmacists participated in the study. Pharmacists detected more dispensing errors than undergraduates and pre-registration graduates. The majority of concept maps produced by participants were chains (undergraduates: 46%, n=19; pre-registration graduates: 30%, n=21; pharmacists: 45%, n=35) and spokes (undergraduates: 54%, n=22; pre-registration graduates: 70%, n=50, pharmacists: 54%, n=42). One pharmacist produced a network structured concept map. The competence of trainee pharmacists and pharmacists at accuracy checking dispensed medicines is questionable. This may be attributed to lack of understanding, illustrated by the chain and spoke shaped concept maps. Accuracy checking training needs to be improved to ensure future pharmacists have the skills to be proficient accuracy checkers. Such training should integrate the practical process of accuracy checking and academic theory to ensure future pharmacists have both competence and understanding.

Introduction
Medication errors are a major burden on the NHS accounting for 72,482 incidents reported to the National Patient Safety Agency between January and December 2007 (NPSA, 2009). Accuracy checking medicines is the process of verifying that a medicinal product selected, prepared, labelled and assembled by a healthcare professional conforms to the details specified in a prescription (James et al., 2010). The Royal Pharmaceutical Society recommends that all medication dispensed by a pharmacy undergo an independent accuracy check prior to being issued to patient (RPSGB, 2006). Therefore, pharmacy undergraduates and pre-registration pharmacy graduates are required to demonstrate competence at accuracy checking prior to qualifying as a pharmacist (RPSGB, 2002, 2009).

Clinical competence was defined by Miller as “the quality of being functionally adequate, or having sufficient knowledge, judgement, skill or strength for a particular duty” (Miller, 1990, pS63). Miller illustrated his theory for assessing clinical competence as a pyramid (Figure 1). In accordance with Miller’s theory individuals are expected to demonstrate that they have developed the knowledge underpinning an activity.
(“knows”), have the knowledge to undertake the activity (“knows how”) and can successfully undertake the activity in a simulated setting (“shows how”) and in practice (“does”) (Miller, 1990). Thus, Miller’s pyramid implies that competence in a simulated setting predicts successful performance in practice. Critics of this model suggest that assessment of competence alone promotes surface learning by encouraging students to regurgitate facts and replicate skills and techniques (Ramsden, 2003). However, Talbot (2004) argues that to demonstrate performance and expertise in clinical practice an individual must have an understanding of the subject such that they can apply their knowledge to novel situations and decision making becomes intuitive.

Figure 1: Miller’s pyramid for assessing clinical competence and performance (Miller, 1990: S63)

This paper explores the use of a simulated accuracy checking task and concept mapping exercise to determine the competence and understanding of undergraduate pharmacy students, pre-registration pharmacy graduates and registered pharmacists at accuracy checking dispensed medicines.

Assessment of Competence – Simulated Accuracy Checking Task

Simulations are widely used in medical education, allowing healthcare professionals to develop and practise skills through experiential learning (Bradley, 2006). Furthermore, they are often used within objective structured clinical examinations (OSCEs) to assess trainee competence at undertaking various clinical tasks (Bradley, 2006). Simulated accuracy checking exercises have been incorporated into undergraduate dispensing classes at some schools of pharmacy and are sometimes used in clinical practice to validate pre-registration pharmacy graduate and pharmacists competence at accuracy checking (Savage et al., 2006, WCPPE, 2004).
Table 1: Dispensing errors included in the simulated accuracy checking exercise.

<table>
<thead>
<tr>
<th>Dispensing Error Type</th>
<th>Error Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Drug Content Errors</strong></td>
<td></td>
</tr>
<tr>
<td>Wrong drug dispensed</td>
<td>Insulatard (human isophane insulin) dispensed instead of Pork Insulatard (pork isophane insulin)</td>
</tr>
<tr>
<td>Wrong strength dispensed</td>
<td>Ramipril 2.5mg dispensed instead of 5mg</td>
</tr>
<tr>
<td>Wrong strength dispensed</td>
<td>Amitriptyline 25mg tablets dispensed instead of 50mg tablets</td>
</tr>
<tr>
<td>Wrong formulation dispensed</td>
<td>Ramipril capsules dispensed instead of tablets</td>
</tr>
<tr>
<td>Expired medicine dispensed</td>
<td>Expired prochlorperazine 3mg buccal tablets dispensed (expiry date 2008)</td>
</tr>
<tr>
<td>Wrong quantity dispensed</td>
<td>28 prednisolone 5mg tablets dispensed instead of 30</td>
</tr>
<tr>
<td>Wrong quantity dispensed</td>
<td>32 co-codamol 8mg/500mg dispensed instead of 30</td>
</tr>
<tr>
<td><strong>Labelling Errors</strong></td>
<td></td>
</tr>
<tr>
<td>Wrong patient name on label</td>
<td>Prochlorperazine 3mg buccal tablets labelled with incorrect patient name</td>
</tr>
<tr>
<td>Wrong directions on label</td>
<td>Prochlorperazine 3mg buccal tablets labelled 2 tablets twice daily instead of 1 tablet twice daily</td>
</tr>
<tr>
<td>Wrong directions on label</td>
<td>Paracetamol 120mg/5ml suspension for a child labelled with the directions 5.5ml to be taken four times daily instead of 7.5mls to be taken four times daily</td>
</tr>
<tr>
<td>Wrong strength on label</td>
<td>Clarithromycin 250mg tablets labelled as 500mg</td>
</tr>
<tr>
<td>Wrong formulation on label</td>
<td>Clarithromycin tablets labelled as modified release tablets</td>
</tr>
<tr>
<td>Wrong drug name on label</td>
<td>Amitriptyline tablets labelled as atenolol tablets</td>
</tr>
</tbody>
</table>

A simulated accuracy exercise was undertaken to evaluate the competence of undergraduate pharmacy students, pre-registration pharmacy graduates and registered pharmacists at accuracy checking dispensed medicines. Between 02 June 2009 and 06 October 2010, third year undergraduate pharmacy students from a London University (n=41), pre-registration pharmacy graduates (n=71) and registered pharmacists enrolled in a taught post-graduate diploma (n=78) were recruited to the study. To determine the study participants’ ability to detect dispensing errors, each participant was provided with five baskets containing a prescription and a dispensed medication. Some prescriptions had more than one prescribed medicine. Therefore participants had eight items to check containing 13 different dispensing errors (Table 1). The participants were given twenty minutes to check the medicines and record details of errors detected on a standardised data collection form. The data collection forms were reviewed by the researcher and data on errors detected/undetected were entered into SPSS for analysis.
Table 2: Details of dispensing errors detected by undergraduate pharmacy students, pre-registration pharmacy graduates and pharmacists during the simulated accuracy checking exercise

<table>
<thead>
<tr>
<th>Dispensing Errors</th>
<th>% Error detection by undergraduate pharmacy students</th>
<th>% Error detection by pre-registration pharmacy graduates</th>
<th>% Error detection by pharmacists</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Drug/content errors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wrong drug dispensed</td>
<td>79% (30/38)</td>
<td>64% (32/50)</td>
<td>96% (70/73)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Wrong strength dispensed (ramipril)</td>
<td>100% (39/39)</td>
<td>94% (66/70)</td>
<td>98% (76/77)</td>
<td>0.23</td>
</tr>
<tr>
<td>Wrong strength dispensed (amitriptyline)</td>
<td>98% (40/41)</td>
<td>74% (52/70)</td>
<td>86% (66/77)</td>
<td>0.004</td>
</tr>
<tr>
<td>Wrong form dispensed</td>
<td>46% (18/39)</td>
<td>54% (37/60)</td>
<td>26% (20/77)</td>
<td>0.002</td>
</tr>
<tr>
<td>Expired medicine</td>
<td>25% (10/40)</td>
<td>59% (42/71)</td>
<td>77% (60/78)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Wrong quantity dispensed (prednisolone)</td>
<td>89% (32/36)</td>
<td>89% (57/64)</td>
<td>91% (58/64)</td>
<td>1</td>
</tr>
<tr>
<td>Wrong quantity dispensed (co-codamol)</td>
<td>100% (38/38)</td>
<td>92% (60/65)</td>
<td>95% (57/60)</td>
<td>0.27</td>
</tr>
<tr>
<td><strong>Labelling errors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wrong patient name</td>
<td>50% (20/40)</td>
<td>75% (53/71)</td>
<td>86% (67/78)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Wrong directions on label (prochlorperazine)</td>
<td>100% (40/40)</td>
<td>94% (67/71)</td>
<td>89% (70/78)</td>
<td>0.08</td>
</tr>
<tr>
<td>Wrong directions on label (paracetamol)</td>
<td>39% (11/28)</td>
<td>64% (39/61)</td>
<td>99% (73/74)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Wrong strength on label</td>
<td>92% (35/38)</td>
<td>94% (66/70)</td>
<td>96% (72/75)</td>
<td>0.71</td>
</tr>
<tr>
<td>Wrong formulation on label</td>
<td>68% (26/38)</td>
<td>76% (53/70)</td>
<td>89% (65/74)</td>
<td>0.04</td>
</tr>
<tr>
<td>Wrong drug name on label</td>
<td>63% (26/41)</td>
<td>83% (58/70)</td>
<td>81% (62/77)</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Only one undergraduate (2%), five pre-registration pharmacy graduates (7%) and seven pharmacists (10%) detected all dispensing errors in the simulated accuracy checking and were therefore considered competent checkers. The pharmacists (median=85%) detected significantly more dispensing errors than undergraduate pharmacy students (77%) and pre-registration pharmacy graduates (77%). This would be expected given that the undergraduate pharmacy students and pre-registration pharmacy graduates have yet to complete their training. Table 2 summarises the different dispensing errors detected by the study participants. Pharmacists detected significantly more errors involving supply of the wrong drug, expired medicine and incorrect label details (patient name, directions and drug form) (Table 2). Undergraduate pharmacy students detected significantly more errors involving supply of the incorrect drug strength and pre-registration pharmacy graduates detected more errors involving supply of the wrong form of medication (Table 2).
Assessment of Understanding – Concept Mapping

Novak and Cañas (2008: 1) define concept maps as "graphical tools for organising and representing knowledge." Concept maps are widely used in education to plan teaching sessions and to deliver knowledge (Hay & Kinchin, 2006). Furthermore, concept maps can be used to assess student knowledge and understanding of a subject and provide an indication of deep or surface learning (Hay & Kinchin, 2006). Kinchin and colleagues (2000) identified various structural typologies to qualitatively describe the features of concept maps that were indicative of deep or surface learning (Table 3). Network structured concept maps indicate an in-depth understanding of a subject characteristic of deep learning. In contrast chain and spoke structured concept maps show a lack of understanding and superficial learning.

After completing the accuracy checking exercise the undergraduate pharmacy students, pre-registration pharmacy graduates and pharmacists were required to create a concept map illustrating their accuracy checking process. The study participants were given an introduction to the concept mapping methodology and shown a DVD describing the mechanics of constructing a concept map (Hay & Kinchin, 2009). In accordance with Novak’s principles of concept mapping the participants were required to identify and list the key concepts involved in accuracy checking (Novak & Cañas, 2008). Each concept was written on a separate adhesive note and arranged on a piece of A3 paper. Participants were informed that the concepts must be linked using directional arrows and arrows must be labelled with explanatory notes to demonstrate the relationship between the different concepts.

Table 3: Characteristics of the chain, spoke and network concept map typologies

<table>
<thead>
<tr>
<th></th>
<th>Chain</th>
<th>Spoke</th>
<th>Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure</td>
<td>Linear sequence of concepts</td>
<td>Single core concept with subordinate concepts</td>
<td>Several concepts at different hierarchical levels</td>
</tr>
<tr>
<td>Links</td>
<td>No cross-links</td>
<td>Explanatory links often limited and simple</td>
<td>Extensive linking and cross-linking with detailed explanatory notes</td>
</tr>
<tr>
<td>Evidence of learning</td>
<td>Represents: • lack of understanding and superficial learning or • a network of understanding described as a linear chain for expediency</td>
<td>Indicative of learning in progress</td>
<td>Scholarly structure indicative of deep and holistic learning</td>
</tr>
</tbody>
</table>
Analysis of the concept maps revealed that the majority produced by undergraduate pharmacy students and pharmacists were chain structures (undergraduates: 46%, n=19; pharmacists: 45%, n=35) and spoke structures (undergraduates: 54%, n=22; pharmacists: 54%, n=42). In contrast, the majority of pre-registration pharmacy graduates (70%, n=50) produced spoke-shaped concept maps. Spoke-shaped concept maps are indicative of learning in progress. Undergraduate pharmacy students and pre-registration pharmacy graduates have yet to complete their training. The study findings confirm that these students and graduates require further training in accuracy checking such that they develop a deeper understanding of the accuracy checking process. It is rather disconcerting that only one participant (pharmacist) produced a multilayered networked concept map indicative of expertise.

**Competence vs. Understanding**

"Hilda" the pharmacist was the only study participant to produce a networked concept map and she detected all dispensing errors in the accuracy checking study. Her map was based on the three core concepts of product, prescription and label from which numerous subsidiary concepts emerged (Figure 2). The concepts were linked and cross-linked with explanatory notes detailing the relationship between the different concepts. This concept map structure demonstrated that Hilda had in-depth knowledge and understanding of the accuracy checking process, indicative of expertise (Hay, 2007).

![Figure 2: Hilda's (pharmacist) concept map on the process of accuracy checking dispensed medicines.](image-url)
In contrast, ‘Josephine’ (pharmacist) and ‘Beatrice’ (pre-registration graduate) produced a spoke structured concept map with several subsidiary concepts emerging from a core concept (Figures 3 & 4). Josephine had a limited range of concepts within her map and notably excluded the concepts of “prescription” and “dispensed product/medicine.” These concept maps were characterised by a limited range of explanatory notes and cross-links explaining the relationship between concepts. This suggests that both Josephine and Beatrice had superficial knowledge and understanding of the accuracy checking process. However, Josephine detected 92% of dispensing errors and Beatrice detected 85% of dispensing errors. This suggests that individuals can accuracy check dispensed medicines with a degree of operational competence without fully understanding the accuracy checking process. Hay and Kinchin (2006) suggest that a limited understanding of a subject is achieved through surface and rote learning. Therefore individuals can memorise and execute the accuracy checking process without integrating knowledge and understanding of the subject. Spoke shaped concept maps are characteristic of learning in progress and would be an acceptable level of development for Beatrice who has yet to complete her pharmacy training. However, as a qualified pharmacist Josephine would be required to accuracy check dispensed medicines on a daily basis. A lack of knowledge and understanding of the accuracy checking process could result in Josephine failing to detect a dispensing errors resulting in patient harm.

Figure 3: Josephine’s (pharmacist) concept map on the process of accuracy checking dispensed medicines.
“Gaynor” (pharmacist) and “Sam” (undergraduate) produced chain structured concept maps consisting of a linear sequence of concepts (Figure 5 & 6). Both concept maps included the core concepts of “prescription”, “label” and “product”. These maps were characterised by very few explanatory notes and there were no cross-links. In Sam’s case, this is indicative of superficial learning and understanding. However, Gaynor used examples to illuminate the concepts indicating that she had a rich body of knowledge of the accuracy checking process. Kinchin and colleagues (2008a; 2008b) report that experts, depending on the situational context, will oscillate between chain and network knowledge structures. In practice, experts will adopt a linear sequence of practice for expediency. This is evident in Gaynor’s concept map as the start and end of the checking process are clearly labelled. However, she has neglected some concepts within her map, notably confirming the drug name on label. Consequently, Gaynor only detected 70% of dispensing errors in the simulated accuracy checking exercise. Sam detected 58% of dispensing errors.

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**Figure 4:** Beatrice’s (pre-registration pharmacy graduate) concept map on the process of accuracy checking dispensed medicines.

**Figure 5:** Gaynor’s (pharmacist) concept map on the process of accuracy checking dispensed medicines.
Conclusion

Competency-based education has been widely promoted amongst healthcare professionals for decades (GMC, 2003; Leung, 2002; Plasschaert et al., 2004). Yet this study shows that the competence of trainee pharmacists and qualified pharmacists is questionable. This has been attributed to a lack of knowledge and understanding of the accuracy checking process. Critics of competency based education suggest that the use of competencies promotes surface, rote learning as only a limited range of predefined standards must be attained and demonstrated (Ramsden, 2003; Talbot, 2004). Competence also consists of a monolayer of thought and precludes discussion and debate (Talbot, 2004). In contrast, teaching and learning which encourages understanding of a subject promotes deep learning. Individuals with understanding demonstrate command of a subject; embrace dialogue, critique and debate (Talbot, 2004).

Various other models of learning have been used in clinical education to describe the acquisition of skills. The Dreyfus and Dreyfus model (1986) proposed that as a practitioner develops a skill they pass through five stages of proficiency: novice, advanced beginner, competent, proficient and expert. In accordance with this model, the undergraduate students within this study could be considered “competent” practitioners as they should be able to undertake the standardised, ritualised task of accuracy checking. The pre-registration pharmacy graduates could be considered “proficient” practitioners as the accuracy checking task should be less laboured and the pharmacists would be considered “experts” as they would undertake the task intuitively. This model is founded on experiential learning. However, the training of trainee pharmacists to accuracy check is unstandardised with some pharmacists reportedly never receiving any formal training in accuracy checking and self-developing these skills by trial and error whilst working (Alexander, 2000, Savage et al., 2006). Dall’Alba and Sandberg (2006) criticise the Dreyfus and Dreyfus model for overlooking understanding. They suggest that “the knowledge and skills that professionals use in performing their work depend on their embodied understanding of the practice in question. The professionals’ way of understanding their practice forms and organises their knowledge and skills into a particular form of professional skill” (Dall’Alba & Sandberg, 2006: 390).
Kinchin and Cabot (2010) proposed a model for promoting the development of professional skills amongst university students which encompassed both competence and understanding. The model focuses on the illustration of competence and understanding using concept maps (Figure 7). It proposes that students may learn material in a linear, rote fashion. This form of learning may be appropriate in specific disciplines for example when students are learning specific clinical procedures and skills so that they can execute them accurately and competently (Kinchin & Cabot, 2010). However, expertise relies on the development of understanding characterised by network structured concept maps. Within vocational subjects networks of understanding must be explicitly linked to chains of practice. An understanding of a subject enables an individual to select the most appropriate chain of practice for a given situation. Therefore, students must integrate chains of professional practice and academic theory to demonstrate competence and understanding respectively (Kinchin & Cabot, 2010). As students develop expertise the oscillation between chains of practice and networks of understanding become smoother. Within this study, only a few participants detected 100% of dispensing errors and were therefore considered competent at accuracy checking. Furthermore, review of the concept maps revealed basic chain and spoke shaped concept maps indicative of a superficial level of understanding of the accuracy checking process. However, one pharmacist did produce a networked structured concept map. This research suggests that accuracy checking training needs to be improved to equip future pharmacists with the knowledge, skills and understanding to be proficient accuracy checkers, thereby safeguarding patient safety.
References


Injecting expertise: Developing an expertise-based pedagogy for teaching local anaesthesia in dentistry.

Fiona Clarke

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Keywords: expertise, pedagogy, local anaesthesia, concept maps, assessment.

Abstract

The ability to provide safe and effective local anaesthesia is an essential tool in everyday dentistry and therefore a key skill for dental undergraduates to practice and develop during their training. However the integration of didactic teaching with clinical practice remains a challenge for dental students and educators. By exploring various “models of expertise” I aim to deconstruct the teaching of local anaesthesia, in order to demonstrate the potential utility of these models in designing a course that promotes the development of expertise. By applying a teaching approach based on expertise I suggest that the relationship between theory and practice will be strengthened by allowing students to relate chains of practice to underlying networks of understanding. Some of the challenges in the assessment of local anaesthesia are highlighted and an increased use of feedback is proposed as a tool for student reflection, development and communication. As practitioners our students will require the skills to continuously update their current knowledge base and respond effectively to change – and so both their teaching and assessment need to encourage this ability. This expertise based pedagogy aims to meet some of the challenges currently faced by teachers of local anaesthesia in dentistry.

Introduction

From a patient’s perspective effective anaesthesia can be the thing that differentiates a good dental experience from a bad one. The ability to provide safe effective local anaesthesia is thus an indispensable tool in the everyday practice of dentistry and a key skill for dental undergraduates to practice and develop. During their training the transition from didactic teaching to the first injection on a patient is often a difficult time for students as they confront having to merge their theoretical and practical understanding of local anaesthetic techniques and deal with their own anxiety of administering the injection itself (Jenkins and Spackman, 1995). There is very little in the literature about the instruction of local anaesthesia to dental students and many newly qualified dentists indicate that current courses do not provide adequate preparation for the initial demands of general practice (Levine, 1992). Perhaps even more concerning is that in one study 19% of dentists reported the administration of local anaesthesia caused them distress (Simon, Peltier and Chambers, 1994). A recent review of the teaching practice of European dental schools indicates a wide variation in teaching methodology and a number of common issues and areas for improvement in the way local anaesthesia is currently taught (Brand, Kuin and Baart, 2008).

The integration of didactic teaching with clinical practice is a continuous challenge for dental students and educators. By exploring various models of expertise we aim to deconstruct the teaching of local anaesthesia, in order to demonstrate critically the utility of these models in designing teaching and assessment tools that will promote the development of expertise amongst our students. If we believe that the way we impart...
knowledge is as critical as the knowledge we impart, then a pedagogy\(^1\) (or strategy of instruction) is required which supports the needs of our students on their path towards becoming tomorrow’s experts.

**Skill development**

I will use the influential model of Hubert and Stuart Dreyfus as a starting point. They describe skill development taking place in a stepwise cumulative manner and proceeding through five stages (see figure 1), progressively accumulating knowledge and skills with an emphasis on learning from experience (Dreyfus and Dreyfus, 1986). If we apply this model to the current teaching of local anaesthesia in most institutes the novice stage relates to first and second year undergraduate students who have some theoretical knowledge of the subjects of anatomy, physiology and anaesthetics from didactic instruction but very little understanding. Our year three students have some practical experience of providing local anaesthesia, but do not yet know how to handle difficult situations (or what to do if the injections fail), and so could be considered advanced beginners. By the fourth year most students should have reached the stage of competence. I would propose that by fifth year our students are able to reach the level of proficiency in local anaesthesia so that as practitioners, specialists and educators they will then be able to attain the level of expertise.

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Novice is a beginner with no experience and little understanding but with some theoretical knowledge. They follow rules they have been instructed to apply without reference to the overall situation in which they occur.

**Advanced** beginners have acquired some context-related rules through practical experience however situational perception is still limited. All attributes and aspects are treated separately with equal importance.

**Competence** is reached when the student can set priorities and planning is conscious and deliberate.

**Proficient** is when situations are viewed holistically and what is most important is identified.

**Experts** no longer rely on rules or guidelines; they have an intuitive grasp of the situation based on a deep tacit understanding and analytical approaches are needed only when problems occur.

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What I will propose is a methodology which encourages the development of expertise. For students to become experts however they require more than didactic knowledge. As practitioners they will require the skills to effectively acquire, process and apply new information in order to be able to continuously update their current knowledge base and respond effectively to change - and so their teaching needs to encourage this ability. A recent paper considering the use of alternative methods of mandibular anaesthesia concluded that if students had not learnt alternative techniques during their undergraduate education, they were unlikely to ever learn the skills (Johnson, Badovinac and Shaefer, 2007). Therefore “what” and more importantly “how” we teach our undergraduates will influence their ability to adapt to new knowledge and ultimately influence patient care.
How do we define expertise? The Dreyfus model focuses on understanding of professional development by highlighting progression that often accompanies experience, however experience alone does not define expertise. It has been suggested that the cognitive ability to correctly structure experience is necessary to define expertise. In seeking to overcome this limitation of the Dreyfus model, Dall’Alba and Sandberg (2006) propose a model (outlined in figure 2) which incorporates a progression with increasing experience of skill development as a horizontal dimension but also includes a vertical dimension termed an “embodied understanding of practice”. An interesting element of this model is that although students all start essentially as novices they may come with various levels of prior experience or skill as demonstrated in the figure. Some students will arrive at a practical teaching session having fully understood the underlying theory and have naturally good motor skills and so grasp the required techniques very quickly (person 1) while others may have less understanding and so take longer to develop their skill (person 3). They are however both moving forward and advancing in terms of developing their expertise but at different rates and following different paths. This may well reflect partly a preference for certain learning styles among students and these differences and preferences need to be acknowledged and considered when developing materials to support student learning (Rayner, 2007).

Figure 2. Model for the development of professional skill (Adapted from Dall’Alba and Sandberg, 2006).

A blended approach to learning in which a variety of teaching tools and methods are made available is certainly one way to ensure we are not simply utilising the learning style preferred by the teacher or what is most cost effective for the institution. Applying the Dreyfus skills acquisition model in her work on the development of nursing education, Benner (1982) believes students are more receptive to specified models of teaching dependent on their stage of development. Hence the models of teaching employed need to be those that best suit the learner, occur at the correct time, are used in an effective manner and are appropriate for the subject material.
Can the expertise model help structure a new pedagogy?

I propose to use concept maps to aid the planning and development of a local anaesthesia course with a focus on expertise. Concept mapping was developed by Joseph Novak as a means of representing the emerging science knowledge of students (Novak and Gowin, 1984). It is essentially a graphical tool used to represent links between ideas that requires the learner to consider their understanding of a topic and the way in which the elements of that understanding fit together. Ideas are written in boxes and linked with arrows carrying explanatory phrases. It has been suggested that construction of a concept map is an excellent way to help organise knowledge and so aid understanding (Kinchin, Baysan and Cabot, 2008). One of the difficulties in developing a pedagogy of expertise using the Dreyfus model is the central position given to intuition and tacit knowledge. An individual’s knowledge cannot be useful to others unless it is expressed in such a manner as to be interpretable. It has been argued that if this tacit knowledge cannot be explained the idea of “knowing more than we can tell” means it is probably not an ideal basis for a pedagogy for clinical education (Kinchin, Baysan and Cabot, 2008; Polanyi, 1967). Concept mapping has been suggested as a means of verbalising this knowledge so that it can be viewed by others (Chang, 2007). It has also been argued that concept maps can provide a means of opening dialogue between teaching and learning in a way that is transparent (Kinchin, Baysan and Cabot, 2008). The first stage is eliciting the knowledge structures of the experts involved in teaching. I therefore propose to use concept mapping to make the expertise of local anaesthesia visual.

The teaching of local anaesthesia usually involves a group of experts from various disciplines. This group may include; anatomists, physiologists, experts in pain, as well as full and part time clinical tutors from various clinical departments. In most cases these experts design and teach various elements of the course without discussing the detail of what they are teaching with each other and occasionally without acknowledging where it fits within the overall curriculum. It has been suggested that by spending some time comparing notes on “the nature of the basics” that should be taught might help provide some structure to ensure teaching which promotes deep learning and true links being formed between didactic teaching and practical application (Kinchin and Cabot, 2009). It has been suggested that if university teaching is to be modelled on the “sharing of expertise through scholarly dialogue”, such processes of destructive analysis and personal reconstruction of understanding are essential (Kinchin and Cabot, 2009). Concept mapping could be a useful tool to discuss, define, develop and explore as a group this collective expert knowledge and experience (Sandretto, Kane and Heath, 2002). As well as a having experts with a varying expert content this group are also likely to have various levels of teaching experience and expertise. The benefits of making this tacit knowledge explicit may also be seen as a way of assisting novice academics in their development as teachers (Ecclestone, 1996).

The outcome of this map with its complex network of understanding is a useful tool to allow a holistic view of the subject but it then needs to be deconstructed into stepwise pieces for our novice students. This however does not mean it should again be broken up in to the traditional components allowing the various experts to work independently to teach those components. The teaching needs to be presented in an integrated way to the student. By deconstructing the teaching of local anaesthesia into its various components using concept mapping we may begin to understand how we can reorganise the teaching of its various components and what stages each of the components are appropriate for the student (Figure 3). This complex network as it is presented is not very useful for the novice student being introduced to local anaesthesia. The novice may be able to memorise this map but would have little or no real understanding of how it could be useful clinically. In order to prevent this surface type of approach to learning the complex map must be broken down into sequential chains of understanding which are possible for the novice to comprehend.

An important function of the map is also to help make explicit the overall framework of concepts. The map makes visible some of the demands that the teaching of local anaesthesia places on both student and staff and suggests the use of a variety of teaching methods; lectures, seminars, laboratory practical and clinical
sessions with a focus on the technical orientation early on and a move to problem based, critical thinking scenarios as the students progress (Ecclestone, 1996).

**Figure 3.** Defining local anaesthesia teaching using a concept map. The *concepts* appear in the boxes which are linked by arrows that carry explanatory phrases or *links*.

**Supporting the novice**
First and second year dental students are novice learners of local anaesthesia. It is usually during this stage that they are taught anatomy and physiology and the didactic elements of local anaesthetics. An ability to apply this knowledge is an important component of the teaching however the teaching methods and assessment tools utilised at this stage of the course often encourage superficial learning and so this knowledge is learnt for examinations and quickly forgotten. Using this traditional transmission model where teaching is seen simply as a process of knowledge transfer from teacher to learner does not facilitate a change in understanding as it does not allow students to make the relevant links between theory and clinical practice. Linking the information provided in lectures and seminars with the information gained in the clinical environment is central to a pedagogy of expertise. Our approach therefore needs to be a learner-orientated model (Borko et al., 1997). This means that consideration is given to the timing of this didactic teaching so that it is supported by practical application of this knowledge.

As novices, these students are dependent on their tutors and appreciate detailed direction provided in small steps. They are rule-driven and dependent on immediate and precise feedback because they are unable to assess their own performance. Design of appropriate instruction for preclinical teaching will be more successful if these characteristics of the novice learner are recognized (Hauser and Bowen, 2008). Requiring students to view expert performance before learning a new skill is an effective instructional technique and one often employed. Using technology to enhance this process in local anaesthesia should be considered as the number of students increases.
In other subjects this has been shown to be a useful tool for example students in a prosthodontics course who were exposed to video of a step-by-step expert demonstration performed significantly better than previous years (Aragon and Zibrowski, 2008).

Returning now to the concept map of local anaesthesia (Figure 3), what is required for the novice is separation of the chains of practice from the underlying networks (Kinchin and Cabot, 2009). Chains are indicative of procedural sequences that characterise observable clinical practice (Hay and Kinchin, 2006). A chain of practice appropriate for the novice in local anaesthesia is illustrated in figure 4(A) showing a typical sequence that is followed by dental undergraduates when learning to provide a local anaesthetic injection. However the fact that such chains are embedded in networks of understanding should not be hidden from the student. The ability to visualise the clinical reasoning process is considered to represent one of the first steps in the formation of the cognitive skills necessary for professional practice (Hill and Talluto, 2006). The role of the teacher is then to help direct the student learning and continually make students aware of the larger framework in which this chain of practice belongs. As illustrated in figure 4(B) by introducing various additional elements to this chain the student slowly builds up a more holistic approach. By providing specific and timely feedback about their skill performance throughout the tutor allows the students to begin to build their own knowledge structure. Professional development involves not simply accumulating knowledge and skills but learning to deal with the situations encountered in qualitatively different and more complex ways (Hill and Talluto, 2006). Thus it is crucial that these clinical situations are appropriate for the students’ stage of understanding and are kept at appropriate levels throughout the course.

![Figure 4](image-url)  
*Figure 4. Outlining chains of practice appropriate for the novice in local anaesthesia and how they can be developed as the student progresses.*
Assessment

Feedback and assessment also form vital elements of this model and their role in contributing to active learning should not be ignored. The term *assessmen*t refers to any type of appraisal (judgement or evaluation) of a student’s work or performance (Sadler, 1989). The terms evaluation and assessment are often used interchangeably in the literature. Assessment is broadly divided into formative and summative assessment.

*Summative assessment* provides a measure of achievement, made in respect of a learner’s performance in relation to intended learning outcomes. It usually takes place at the end of a teaching intervention and is directly linked to decisions about progression with the award of a mark or grade. For the most part it is this type of assessment that has dominated research and the guidance given to teachers, with an emphasis on it being reliable and valid (Black, 1986). It is also the form of assessment which one could argue is over utilised in dental education.

*Formative assessment* in contrast can be undertaken at any time during the course of teaching. It is designed to provide learners with feedback on progress and inform development. Performance in formative assessment is not linked to decisions about progression or award. Sadler defines formative assessment further by stating it is concerned with how “judgements about the quality of student responses can be used to shape and improve the student’s competence by short-circuiting the randomness and inefficiency of trial and error learning” (Sadler, 1989). Few skills can be acquired simply by being told about them but require practice in a supportive environment which incorporates feedback.

Feedback is considered a key element of formative assessment and is defined in terms of information about how successfully something has been done. Feedback is valuable to both students and teachers. Students use feedback to monitor the strengths and weakness of their performance so that aspects associated with success can be recognised and reinforced and unsatisfactory aspects modified or improved. Teachers can use feedback to make decisions with respect to student ability, progress and need for additional support.

By encouraging students to continuously make sense or meaning out of their experiences we can develop their ability to make modifications and manage change when presented with new information (Yielder, 2004). The design and application of appropriate evaluation instruments also contributes to effective teaching and calibration of teachers. Rating scales designed with specific criteria related to each step in a local anaesthetic procedure can be a valuable tool for both the learner and the evaluator. It is also important that it is not simply the chains of practice that are assessed as is often the case (and taken as indicators of competence). Simply assessing chains of practice will promote rote learning and promotes a return to the traditional focus on facts and techniques rather than assessing the higher thought processes such as critical thinking (Kinchin, Cabot and Hay, 2008). In the clinical environment the development of chains of clinical reasoning is seen as one of the key aims (de Cossart and Fish, 2005). The goal in an expertise model lies in the development of complementary networks of understanding alongside the chains of practice. The challenge in moving from chain to net structures and back again is a fundamental issue. Indeed expertise may well be characterised by an individuals ability to navigate these underlying networks of understanding and their capacity to select the chains of practice that are appropriate to a given clinical situation.

Figure 5 utilises a concept map to demonstrate the various elements of a feedback approach with the student at its core. Sadler (1989) believes there are three essential elements to effective feedback. The learner has to possess a standard or reference level to aim for (i.e. understand what expert practice and understanding in local anaesthetics techniques means), then be able to compare their own current level of performance against this standard and finally to engage in appropriate action which leads to some closure of this gap (or discrepancy between their performance and that which the expert determines appropriate for their level of expertise).
Figure 5. A concept map of a proposed feedback loop for the development of expertise.

The first element requires students to have an appreciation for what safe effective expert performance in local anaesthesia embodies. How do we define this expert performance or ideal standard? An argument was made earlier for the use of concept maps as a tool for teachers (experts) to clarify and define what is meant by expert performance (thereby helping to make their tacit knowledge explicit). The importance of this step should not be misjudged. In order for us to assess our students and provide effective feedback, teachers need to be clear about what is considered best practice and what constitutes competence and an appropriate level of understanding at various stages in the undergraduate course. For example we can only assess a fourth year student properly if we are clear and specific about what a fourth year student is expected to know and understand about local anaesthesia. A single course outcome stating; “Can administer infiltrations and regional block anaesthesia without direct supervision” is not clear specific or helpful-for staff or students.

The second premise is that for students to be able to improve, they must develop the capacity to monitor the quality of their own work’ (Sadler, 1989). This requires the students to learn to compare their own current level of performance against the expert’s standard. This process is termed self assessment or self monitoring. In order for students to become self reflective and monitor their own performance they require a number of skills. They require the evaluative skills necessary in order to compare with some objectivity the quality of their performance in relation to that of the expert as well as with time developing a “store of tactics” which can be drawn upon to modify their own techniques (Sadler, 1989). As Ramaprasad (1983) points out information about the gap between actual performance and expert performance can only be considered feedback when it is used to alter this gap thereby closing the “feedback loop”. This means that only when an appropriate change is made to improve their next performance-has learning and development taken place.
Effective feedback has been identified as a key strategy in learning and teaching (Ramsden, 1992; 1998) and been shown to produce significant benefits in achievement (Nicol and Macfarlane-Dick, 2006). Some believe it is simply a lack of communication that prevents assessment from serving the needs of the learner (Mory, 2004). The teacher is aware of the learner’s strengths and weaknesses but these are not communicated effectively to them, and without this knowledge the learner is powerless. The aim of assessment should be primarily for the learners and to improve learning. Feedback should enhance motivation, encourage reflection and clarify understanding (Ormond, Merry and Reiling, 2005). Feedback must be seen as an opportunity for learning and indicate how the student can develop in respect to future work (Knight and York, 2003). Innovative assessment is about finding ways to empower students to develop along their path towards expertise.

The use of the word “effective” in the context of feedback has been associated with feedback that is timely and appropriate (Ramsden, 1992; Mory, 2004) and suited to the needs of the situation (Knight and York, 2003). Knight and York also make the point that there should be equity in feedback, meaning a second year student who is just coming to terms with the steps in the sequence of local anaesthetic delivery will need more explicit and frequent feedback than a third year student who has now reached the level of advanced beginner and seeks to improve their technique to reach the next level of competence. The assessment feedback loop however is equally relevant for our novice students as it is for our competent students. Our teaching needs to encourage and support student development of expertise through all of its stages. This requires supporting student progress even when they reach the level of competence to proficiency and beyond.

In the context of student assessment therefore, innovation aims to achieve several specific outcomes. It aims to produce students who are:

- “deep” rather than “surface” learners
- capable of self-criticism and evaluation
- fairly and reliably assessed
- active participants in the learning process

**Current assessment methods**

Methods commonly employed for local anaesthetic assessment include, written examinations, oral exams, less commonly practical examinations or OSCEs (objective structured clinical exams). Most frequently local anaesthesia forms a minor element of these summative style assessments (for example one question in an OSCE examination could incorporate local anaesthesia) with commonly a higher percentage of assessment of didactic elements than practical elements. This assessment information is then often simply recorded and provided as an overall grade for the assessment or included in a term mark for clinical performance. The vital information for change is lost or hidden and the feedback loop cannot be closed as the final grade is substituted for effective feedback and however good or bad that mark may be, the learner is unaware of precisely what aspects of the work were strong or weak. Although students may accept a tutor’s judgement they are likely to “require more than summary grades if they are to develop expertise judiciously and become more self directed in their learning” (Nicol and Macfarlane-Dick, 2006).

Assessments of this kind also tend to test knowledge in a linear format (Figure 6) an approach which has been criticised for encouraging surface approaches to learning and so this knowledge learnt for exams is soon forgotten (Kinchin, Lygo-Baker and Hay, 2008). Using a traditional transmission model such as this often does not require the student to demonstrate their understanding of the relevant links between theory and clinical practice.
Figure 6. A traditional model of learning and assessment (after Kinchin and Cabot, 2009).

Figure 7 utilises a modified Kolb cycle of learning to understand how tutors (experts) and students commonly interact (Kolb, 1984). Each passing through the various stages of concrete experience, reflective observation, abstract conceptualisation and active experimentation, but acting almost independently of each other. Rather worryingly the only area of overlap is when the student is performing the local anaesthetic procedure on a real patient. Most of the assessment of local anaesthesia currently takes place around the student’s abstract concept of local anaesthesia. This occurs before the student has been allowed to test their own understanding of the subject.

Figure 7. The learning cycle of the expert and student.
**A proposal for change**

The goal is an integrated assessment which aims to encourage a deep learning approach, promote self assessment, is fair, reliable and transparent, and allows active student engagement. The proposal is the development of tools for use in the clinical assessment of local anaesthesia (figure 8). An assessment form which facilitates the development of local anaesthesia by prompting the student to think about various elements (defined by their tutors) important during the anaesthetic procedure. This provides staff and students with a shared understanding of assessment criteria (Crisp, 2007) and could be utilised by both novice and competent students alike to support feedback.

<table>
<thead>
<tr>
<th>Feedback Assessment: Local Anaesthesia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student name: __________________________</td>
</tr>
<tr>
<td>Tutor name: ____________________________</td>
</tr>
<tr>
<td>Procedure to be performed</td>
</tr>
<tr>
<td>Level of difficulty (details)</td>
</tr>
<tr>
<td>Communication skills (empathy)</td>
</tr>
<tr>
<td>Knowledge and understanding</td>
</tr>
<tr>
<td>Challenges</td>
</tr>
<tr>
<td>Practical Technique</td>
</tr>
<tr>
<td>Anaesthetic outcome</td>
</tr>
<tr>
<td>Areas for improvement</td>
</tr>
<tr>
<td>Do you feel the student communicated effectively?</td>
</tr>
<tr>
<td>Do you feel you were provided with effective anaesthesia?</td>
</tr>
<tr>
<td>Do you feel there was anything the student could do to improve?</td>
</tr>
<tr>
<td>Patient rating: 1 2 3 4 5 6 7 8 9 10 (1 = poor, 10 = excellent)</td>
</tr>
<tr>
<td>Patient feedback / comments / suggestions:</td>
</tr>
</tbody>
</table>

**Figure 8.** An example of a feedback form for local anaesthesia.
This type of tool aims to assist tutors in providing timely feedback. The assessment tool should be used immediately following the performance - not weeks later as is often the case with progress reports and other forms of feedback. Proving an opportunity for the student to judge their own performance aims to, with time break the students’ dependence on the tutor (Glover and Brown, 2006; Lizzio and Wilson, 2008). It could also help initiate a meaningful dialogue between tutor and student as opposed to the more common “unilateral pronouncements by an assessor” (Crisp, 2007). This tool could be used as a form of continuous assessment permitting wider and more varied sampling of a student’s knowledge and skill as it develops over time. As opposed to a once off pass or fail written assessment. The problem being that current practice puts so much emphasis on those elements which count towards the term mark that students may not feel this type of assessment is worth doing, because it “does not count” (Sadler, 1989).

Local anaesthesia is a key skill utilised and taught by various disciplines within the dental school. A proposed feedback tool such as this would also allow for clear consistent messages to be delivered to students if applied across disciplines. A novel feature of this tool is also the input element from the patient which aims to emphasize the importance of patient-centred care but will not be discussed in detail here (due to space constraints) but is considered an important element which warrants further analysis (see Kandiko et al., 2011).

Current challenges
Many of the current challenges in teaching local anaesthesia are curriculum issues. There is often separation of the theoretical and practical instruction, followed still some time later by clinical application. The model of expertise described here supports the concept of vertical integration of local anaesthetic teaching. This means that the subject is revisited throughout the duration of the curriculum with further information added year by year, a process also termed concentric spiral learning allowing new knowledge to be linked to previous knowledge (Oliver et al., 2008). In order that students’ learning in this area evolves during their training, simply allowing them to continue to practice the practical application with no additional support in terms of didactic information or advanced knowledge is limiting their potential to become proficient performers by the time they reach graduation. It has been suggested that dental schools should consider investing in electronic and flexible learning facilities with increased self-directed learning time to aid this process as electronic learning is a tool they are likely to use later in their continuing professional development (Oliver et al., 2008).

Supporting our novice teachers is also a vital part of this process. There is an assumption that expertise in practice will translate into proficiency in teaching, which is not necessarily the case (McLeod et al., 2004). Often the subject experts and teaching experts are felt to be most useful for the more senior students and the novice teachers are left to teach the novice students without much support. Opposed to that is the idea that an instructor closer to the learner’s skill level may well be more aware of the learner’s readiness (Yielder, 2004). If this is true perhaps we should consider allowing senior students to assist in teaching our novices with the aim of allowing them to reinforce their own skill.

Discussion
A teaching approach based on expertise aims to strengthen the relationship between theory and practice by relating chains of practice to underlying networks of understanding (Kinchin, Cabot and Hay, 2008). By considering some of the current challenges in the teaching of local anaesthesia in an undergraduate environment our aim has been to deconstruct our current practice and review various models of expertise. If students are expected to develop their critical thinking skills during their undergraduate course they should be supported in making this transition and allow them to develop as professional practitioners into our next generation of experts.

Assessment is one of the major drivers of the teaching-learning process. There is no doubt that any
assessment system will determine what students learn. Assessment should not just be about grading and examinations, but also about getting to know our students and the quality of their learning - and to use this knowledge and understanding to their benefit. It is thus important for teaching staff to be familiar not only with the technical aspects of the many different forms of assessment currently in use but also with their advantages and limitations. Students relying upon repeated evaluative judgements made by their clinical tutors does little to promote the concept of self monitoring and reflection. Self-assessment within the context of clinical practice is a key element of sustainable assessment and a necessary element in promoting lifelong learning (Boud, 2000). As future practitioners our students will require skills to be able to continuously update their current knowledge base and respond effectively to change - and so their teaching and assessment need to encourage this ability. By applying an assessment approach based on expertise we suggest that the relationship between theory and practice will be strengthened. This approach could meet some of the current challenges faced by teachers of local anaesthesia in dentistry. As pain management is very often a necessity before most other clinical procedures perhaps we should be aiming for proficiency in local anaesthesia at graduation and not simply competence.

1 The word pedagogy comes from the Greek παιδαγωγέω (paidagōgeō) literally meaning to “lead the child”. The term is often used simply as a synonym for teaching or strategies of instruction. Loughran (2006) however defines pedagogy as not merely the act of teaching but the relationship between teaching and learning and believes one does not exist as separate and distinct from the other but that teaching and learning are ‘linked in powerful and important ways’.

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Mapping threshold concepts within the dental curriculum.

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Keywords: knowledge structures, student learning, theory-practice gap

Abstract
This paper introduces to dental education the application of threshold concepts as a possible model to inform curriculum design. Through the visualisation of knowledge structures, the function of threshold concepts is postulated as offering an integrative function between the linear knowledge structures that characterise the experience of clinical practice, and the hierarchical knowledge structures that are typical of the underpinning conceptual knowledge.

Whilst threshold concepts within the dental curriculum still have to be charted, we offer tentative consideration of the implications of possible patterns of thresholds and how these could affect the delivery of a dental curriculum. The benefits of the future identification of threshold concepts may include:

• A coordination of curriculum elements that support the students’ navigation through successive thresholds within the undergraduate programme.
• Wider recognition of the punctuated nature of student learning.
• A re-conceptualisation of the curriculum as thresholds to be crossed rather than content to be covered – promoting a greater focus on the integration of knowledge and less on the acquisition of facts.
• The explicit surfacing of links between expert understanding and teaching sequences so that teaching may more closely mirror professional practice within the discipline.

Whilst reporting on preliminary observations on this topic within a single clinical school, I predict a wider application of the theory to other curriculum areas.

Introduction
This paper presents a conceptual framework to inform innovation in dental education. The possible role threshold concepts might have within the dental curriculum is considered here, as this has implications for curriculum planning. The theory of threshold concepts directs attention toward learning activities which result in changes in students’ perceptions of a subject. It is suggested that threshold concepts because they are transformative and integrative in their nature, if incorporated into the curriculum could link together the theory represented by hierarchical knowledge structures, and practice illustrated by linear knowledge structures. Learning through threshold concepts becomes a deep and meaningful experience resulting in integration and transformation of knowledge into clinical practice. Acquisition of threshold concepts allows a shift from a novice level towards an expert’s way of thinking within a discipline.
Knowledge structures and nature of students' learning

The division of knowledge into linear and hierarchical structures stems from cognitive psychology as discussed by Ausubel (2000) and the sociology of education developed by Bernstein (2000). Linear structures are acquired by adding context dependant segments of knowledge where there is very little or no connection between topics and without integration of new knowledge to that previously learnt. In contrast, hierarchical knowledge structures acquired by learning meaningfully/ conceptually; by linking new material to the “old” knowledge (Figure 1).

Within dental education linear structures represent clinical procedures and skills learnt through experiential learning (Kinchin et al., 2008b). A student learning how to perform a particular procedure in the clinic has to follow steps which form a chain of practice. The linear chain of practice does not make explicit the underlying network of understanding. What is becoming apparent, in my research, is that chains of practice (i.e. clinical procedures) are often taught in isolation from the underlying conceptual knowledge (e.g. infection control, anatomy, or ethics) which are taught in lectures. Teaching of abstract and context-independent, hierarchically-organised knowledge that builds explicitly on students’ prior knowledge usually happens in lectures (Novak, 2010).

Knowledge structures

Figure 1. The visualisation of complementary linear and hierarchical knowledge structures within dental education.
Novices entering dental education do not know the content of the field and they have little knowledge/experience in order to relate new concepts in what they are attempting to learn. They need to learn to operate and make links between the two knowledge structures, if they are to become experts (Novak & Symington, 1982; Schmidt et al., 1990). Experts organize knowledge meaningfully according to high-level principles (Kinchin & Cabot, 2010). It has been noted that teaching does not reflect what experts do in practice, as practitioners subconsciously link the two complementary knowledge structures (Kinchin et al., 2008a). Linear teaching sequences facilitate rote learning which results in chains of knowledge. Knowledge chains acquired through rote learning are usually not only context dependant, but are also resistant to development as well (Hay & Kinchin, 2006). It appears that curriculum structures and assessment types are constructed on the assumption that students make gradual and even progress in their learning, despite growing body of research that shows this is not the case and that learning occurs in short bursts (e.g. Wandersee, 1994; Mintzes & Quinn, 2007).

Curriculum content and assessment type both have a big impact on students' learning strategies. Crombag et al. (1985) proposed that students align their learning habits to the way the examination in the curriculum is structured. Similar conclusion can be found in Van der Drift and Vos (1987) research, which demonstrates that as they get nearer the exam, students' study behaviours change. If the content seems to be too wide to be learned in full, students will adjust to the assessment demands and learn only what is perceived as necessary to pass the exam (Gibbs et al., 2006; Brown et al., 1997). Snyder (1971) shows how students negotiate their way through an impossibly large curriculum, trying to work out what is important to learn in order to pass the assessment. There is another serious implication regarding the examinations which reward rote learning. The material learned by rote is less likely to be retained for long term and applied appropriately in different contexts (Semb and Ellis, 1994; Ausubel 2000). A longitudinal study conducted among a cohort of dental students in University of Otago, New Zealand demonstrates the impact of the curriculum on understanding of dental practice. This study reports that students' understanding of professional practice is context-dependent and can change over time. It suggests that comprehensive understandings of dental practice might be difficult to achieve if a curriculum is divided into many narrow parts during the course of study (Kieser et al., 2009).

The visualisation of knowledge structures within dental education has shown the qualitative distinction of the two types of knowledge - segmented and hierarchical (Kinchin & Cabot, 2010; Schmidt et al., 1990). Some concepts are more important than others, so they form a hierarchical structure which is not always explicit in teaching. However, when students move to the clinic, they are expected to put into practice knowledge gained in lectures and tutorials accordingly to an ever changing context. Being able to apply conceptual knowledge in different clinical contexts requires the understanding of the underlying principles. There is a significant weight of evidence indicating that fulfilling the requirements of one competence is not a good predictor of performance on another problem or even a different representation of the same problem (Brown et al., 1997). It is suggested that the more links student can make between chains of practice and networks of understanding, the more he/she understands and the greater is his/her ability to apply that knowledge (Kinchin & Cabot, 2010). Learning with understanding enables the student to develop the best treatment plan for a patient.

Threshold concepts
The “Threshold concepts” theory is relatively new. The term “threshold concept”, described as akin to a portal giving an access to a new way of thinking about something, was constructed by Meyer and Land (2003). According to them, the threshold concept must be understood if students are to progress in their learning (Meyer & Land, 2008). Threshold concepts are ‘a-ha’, ‘eureka’, ‘light-bulb’ moments in learning leading to a previously inaccessible way of understanding, interpreting or viewing something (Meyer and Land, 2008).
Threshold concepts may be:

*Transformativ*e – once they are understood they lead to changes in understanding of a subject. Crossing threshold concepts involves a transformation of understanding, interpreting or viewing something. The student cannot progress to a higher level of learning without this new way of seeing. Before the actual threshold is crossed the learner enters a liminal, suspended state or “stuck place”, which involves oscillation and confusion.

*Integrative* – they expose interrelatedness of concepts within the discipline which previously was hidden. Threshold concepts allow the student to make connections. Things start to form a network of understanding.

*Irreversible* – once learned they are less likely to be forgotten

*Troublesome* – they demand integration of ideas and that requires students to accept a transformations of their own understanding, so coping with the new perspective can cause problems. It is said that threshold concepts may represent on their own “troublesome knowledge”, which is conceptually difficult, “alien”, counter-intuitive, tacit, or causing intellectual discomfort. Bounded-they set conceptual boundaries that constitute a discipline.

Davies and Mangan (2007) suggested that threshold concepts would be best thought of as a web within a discipline; emphasising the connections between ideas rather than looking at single ideas in isolation. This builds upon earlier work on the nature of concepts which concluded that: “No individual concept can be understood without some understanding of how it relates to other concepts.” (Keil, 1989:1)

**The theory - practice gap**

The gap between theory and practice has been discussed by many theorists and it is regarded as one of most important issues in education (Carr 1980; Russell 1967). The roots of this notion can be traced back to ancient Greece, where the theory was associated with different type of knowledge than practice. Both had different purpose; while the theory aim was to contemplate the truth, the practice was focused on “action” and “doing” (Allmark, 1995). Russell (1967) described the theory as “knowledge by description” and practice as “knowledge by acquaintance”. The former can be recognized as “networks of understanding” and the latter as “chains of practice”. The theory taught in lectures or written in textbooks differs from what students experience in the clinical settings. Generalisations offered by the theory give guidance to what should be practiced but they can not be directly applied in various scenarios. The result of it is a gap between the two (McCaugherty, 1992) and educational effort should be made to reduce it (Rafferty et al., 1996). The theory of threshold concepts is focused on discipline specific learning and is underpinned by the idea that there are “portals” to be passed in all disciplines. These portals may represent ways of thinking within a discipline as well as a way of practicing a particular phenomenon within that discipline (Meyer & Land, 2008). It has been proposed that threshold concepts might fill the gap between segmented/linear and cumulative/hierarchical knowledge structures (Kinchin et al., 2010). “A-ha!” moments occur when students are able to see how to link chains of practice and networks of understanding. Filling the gap between theory and practice is possible by application of threshold concepts as they transform and integrate knowledge structures, as shown in Figure 2.
For this model to work, students must develop networks of understanding. The assumption that students always form such networks through conceptual learning cannot be made. Research with the use of concept maps produced by students and their teachers revealed diversity in patterns of learning. It also indicated how important knowledge structures and their transformations may be in the clinical and non-clinical settings (Kinchin et al., 2008a). Jarvis (1992) proposed that learning happens through change in a student’s understanding. This corresponds with the threshold concepts theory because passing the threshold results in the change of understanding of the subject (Cousin, 2010). If teachers do not make underlying networks of understanding explicit and present only fragments of their understanding as chains of knowledge, the students can only be passive observers who will adopt surface learning strategies (Kinchin et al., 2008a). Brown et al., (1997) noted that forms of teaching and assessment affect students’ approaches to learning. When teaching emphasizes acquisition of facts and memorising of information, learners are more likely to adopt mechanical methods of learning. Providing that learner adopts rote learning, which does not seek understanding of what is being taught, and does not require to link prior knowledge with the new information, he/she might not be able to construct networks of understanding. If there are no networks of understanding, the threshold concepts will not be possible to cross. Meyer and Land (2003) stressed the significance of a threshold concept as “a transformed way of understanding without which the learner cannot progress”.

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**Figure 2.** Threshold concepts may have a function in transforming student understanding by integrating chains of practice with networks of understanding.
We can conclude that both teaching and learning must engage linear as well as hierarchical knowledge structures for the students to progress to higher levels of understanding so the threshold concepts can be acquired.

What are the implications for curriculum development?

The successful sequencing of threshold concepts in the curriculum requires that students have sufficient related prior knowledge for the threshold concept to have an integrative function. Integration of prior knowledge is likely to exceed the benefits of acquiring new knowledge. Therefore, the curriculum needs to provide opportunities for segmental and cumulative learning in ways that will allow the two to be complementary (Maton, 2009).

One of the sources of troublesome knowledge might be tacit knowledge which is identified by Polanyi (1966) as mainly personal and implicit. Looking at the characteristics of thresholds concepts proposed by Meyer et al., (2008), we can draw a conclusion that rote learning may lead to troublesome knowledge. It is very simple: the student may not have full understanding of a concept; therefore he/she will not be able to make a meaningful link with that concept and integrate it with what has been learnt previously. Students are usually focused on learning to pass the assessment, to demonstrate how much they have been able to remember but not necessarily what they have understood. Entwistle and Marton (1984:163) noted that some assessment tasks “did not seem to require personal understanding, simply the reproduction of the lecturer’s understanding”. Passing the exam does not correspond to crossing the threshold. Learning by rote (in other words segmented learning), does not allow construction of meaningful connections between concepts and so impedes deep understanding as it operates only on a surface level. In order to move from segmented learning to meaningful learning the student sometimes needs to tackle some troublesome
concepts, which he/she is not sure about. Therefore it is necessary to revisit what has been learnt in order to eliminate any potential misconceptions and integrate prior knowledge with new concepts (Novak, 2010). Studies conducted amongst graduate students of MIT in Boston provide evidence that although learners passed all exams, some of them did not understand key scientific concepts such as photosynthesis (Atherton, 2010). Another example showing the lack of understanding comes from experiment carried out in Massachusetts during which a number of learners failed to apply some basic concept in a different context. The experiment proved to be very informative to the teacher, who was not aware that his students held misconceptions about a subject which, in his opinion, was not difficult to understand (Atherton, 2010).

Students need teachers’ help with adopting new learning approaches. The challenge for teachers is to show relationships between concepts which might seem obvious to them, but not to students who are still learning. Teaching requires integrity in a way that all curriculum elements are connected, especially teaching in a lecture theatre, teaching in tutorials and teaching in the clinic. Lecture themes and learning outcomes do not serve their purpose, if they are not closely related to what students need to learn in the clinic.

Conclusions
The modern dental curriculum cannot remain a list of isolated topics to be delivered. If the curriculum is purely content orientated, then all activities including assessment are likely to be focused on testing, how much of the content was acquired by learners. In this case teaching activities are likely to be reduced to transition of knowledge through lectures. A new curriculum based on thresholds to be crossed will support the students’ construction of productive knowledge structures by addressing the importance of connectedness instead of emphasis on content to be covered (Mintzes & Quinn, 2007).

Threshold concepts, when identified, need to be positioned in the curriculum so that the potential web of threshold concepts is constructed in a logical manner as students pass from one threshold toward the next. It is also important to try to view threshold concepts from the perspective of the novice who has not yet made the transition. Experts might have a problem with that due to the irreversible nature of threshold concepts. Therefore, the curriculum development should take the student voice into consideration as students will view the thresholds from the novice perspective. They can highlight the difficulties that students have in making necessary connections between chains of practice and networks of understanding.

References:


Putting Practice into Theory: Interprofessional education as a pedagogical model to consider student-centred learning and patient-centred care.

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**Keywords:** interprofessional education; student-centred learning; patient-centred care.

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**Abstract**

As healthcare practice increasingly involves interprofessional working, there is need for change in clinical education. Interprofessional education (IPE), in the context of theories of student-centred learning and patient-centred care, offers a pedagogical model for healthcare education. Two examples of IPE, in dentistry and pharmacy, are explored. The paper continues with a discussion of managing change from traditional, discipline-based clinical education to an interprofessional pedagogical model of student-centred learning and patient-centred care. The paper concludes with a discussion of a programme based on IPE, the Master’s in Clinical Pedagogy developed at King’s College London.
The programme is based on a theory that healthcare professionals and academics learning (and teaching) together will be able to work together better, improving students’ educational experiences and the care they can provide patients.

Introduction

“To learn is to participate and contribute to the evolution of the communal practice.” (Keiny, 2002, p. 208)

If we take Keiny’s view of learning as a starting point, then the learning experiences of students’ education and training to become healthcare professionals need to mirror the practice of the profession, allowing students to participate and contribute. This approach of focusing on the needs of students suggests a change to a student-centred learning approach in clinical education. Whilst the practice of healthcare is increasingly interdisciplinary and interprofessional in nature, the education of undergraduates remains largely based within a single disciplinary/professional perspective. However, at the postgraduate level, we feel that it is appropriate (and indeed necessary) for students to broaden their horizons and develop a more interprofessional perspective. As healthcare practice increasingly involves interprofessional working, there is a need for change in clinical education.

However, in the face of these comments, interdisciplinary study has been described by Liu (1989) as “the most seriously underthought critical, pedagogical and institutional concept in the modern academy” (p. 743); an issue recently revisited by Ellis (2009). Policy is starting to change to address the gap between aspiration and practice. For example, Darzi (2007) emphasises the importance of truly integrated patient-centred care and partnership working, maximizing the contribution of the entire workforce as a way of developing healthcare provision.

In this context, academics within King’s College London (KCL) have developed an interprofessional Master’s-level programme on Clinical Pedagogy to serve the needs of postgraduate healthcare professional students across the clinical disciplines and help them to investigate for themselves the possible potential benefits of interdisciplinarity (e.g. Morrison, 2009). The rationale for the development of this programme is outlined in this paper. First interdisciplinarity and interprofessionalism are defined. This leads to a discussion of how interprofessional education (IPE) can be informed by interdisciplinary pedagogy, in the context of theories of student-centred learning and patient-centred care. Two examples of IPE are explored, provided by co-authors who are established practising clinical educators in dentistry and pharmacy and teachers on the KCL MA in Clinical Pedagogy. The paper concludes with a discussion of managing change from traditional, discipline-based clinical education to an interprofessional pedagogical model of student-centred learning and patient-centred care, using the KCL MA in Clinical Pedagogy as an example.

Interdisciplinarity and Interprofessionalism

Interdisciplinary and interprofessional work has become the norm in many health and science fields, and numerous institutions offer students interdisciplinary courses, modules, and programmes. Below we define and explore how interdisciplinarity and interprofessionalism can be used to change teaching and learning curricula in clinical education.

Interdisciplinary work most often refers to work in more than one discipline in academia, including undergraduate and postgraduate training in health fields. Interdisciplinarity provides much of the theory for integrating knowledge and practice from multiple disciplines and perspectives. Interdisciplinary pedagogy often focuses on bringing individuals together as a means of solving problems and answering questions that a single approach cannot fully address (Klein, 1990).
Whilst there is a developing literature on interdisciplinarity (Klein, 1990; 2001; 2008), there is a dearth of research on pedagogies of interprofessional work.

Interprofessional education is a term used to describe teaching healthcare professionals, trained in specific disciplines and fields such medicine, pharmacy and dentistry, together with the goal of improving working together. Interprofessional education has been defined as:

“The application of principles of adult learning to interactive, group-based learning that relates collaborative learning to collaborative practice within a coherent rationale informed by understanding of interpersonal, group, inter-group, organisational and inter-organisational relations and processes of professionalisation” (Barr, 2002, p. 23).

In simpler terms, interprofessional education now carries the following agreed clear meaning:

"Interprofessional Education occurs when two or more professions learn with, from and about each other to improve collaboration and the quality of care" (Centre for the Advancement of Interprofessional Education [CAIPE], 2002, p. 1). IPE pedagogy has traditionally been light on theory (Barr, 2002); there are few theoretical underpinnings in the literature (D’Eon, 2004; Levin et al., 2001). Much of the focus of IPE is on the patient and the place of the patient in the larger community; it has been observed that “patient-centred care is a philosophy, not a system” (Gilbert, 2005, p. 88). Faculty development in IPE often focuses on activities designed to help educators in multiple settings (e.g. hospital, community, university) teach IPE and patient-centred care in a more effective manner and promote organisational change and development (Steinert, 2005). These ideas have provided a basis for the framework for integrating pedagogies from interdisciplinary study in the interprofessional education context.

The stated goal of IPE in programmes at KCL, including the Master’s in Clinical Pedagogy described here, follows the CAIPE definition, listed above, as well as using the term IPE “to include all such learning in academic and work based settings before and after qualification, adopting an inclusive view of ‘professional’” (CAIPE, 2002, p.1). As noted in programme information,

“In order to work towards the above definition it is important that interprofessional learning opportunities encourage students to interact with each other. It is not about simply learning common material or learning about each others roles, although this is also important. It is more about gaining an understanding of each others perspectives, skills and constraints” (Desai, 2008, p. 1).

The benefits of working with and knowing what professionals in other areas do and how it can assist in providing better care for patients is discussed in Box 1 by a practising clinical educator in dentistry.
An Example from Dentistry
The actual practice of dentistry—the direct patient contact, has to be underpinned by an education that requires the input and talents of many professionals. It can be argued that embedding practice in this IPE is what makes a student into a practitioner, rather than a mere technician. It is more than performing a task; it is knowing which task is appropriate and the possible consequences associated with its execution.

The key is to empower students to value the input from professionals they encounter and to continue to appreciate it through qualification and beyond in their practising lives. In the dental curriculum these include infection control, taught initially by general and dental nursing staff, radiology, taught by radiologists and radiographers, and life support taught by doctors and specialist life support dental staff.

As a dentist I am regularly required to write prescriptions for patients. I want advice as to what is best to prescribe in a particular circumstance; I also need guidance on possible interactions with other medications a patient is taking. I am not an expert here, nor usually is the patient’s doctor—it is the pharmacist who knows and can give immediate expert advice. I often need to communicate with a patient’s medical practitioner or hospital consultant because a proposed plan of treatment could potentially affect a patient’s well-being. Faced with a wide variety of materials I often need to seek guidance by a materials expert as to what is best in a particular circumstance.

At dental school staff and students have instant access to these professionals and they are encouraged to discuss issues. Students can then see the key role that these interdisciplinary encounters have in their own practice. It is critically important that teachers ensure that this relationship is maintained and developed beyond qualification and that practitioners realise how important other professionals are in their everyday practice.

A huge step forward in making this become a reality has been the introduction of vocational training, a mandatory 12-month period of post-registration practice-based education. The goal of these programmes is to instil in the novice dentist an appreciation of communication with and learning from other professionals, health care or otherwise, and to take that appreciation with them and hopefully empower others to similarly see its value.

Box 1.
The example from dentistry is further discussed below in the context of placing the student at the centre of learning and the patient at the centre of care. First, challenges in developing IPE programmes are discussed along with the rationale for student- and patient-centred pedagogy and practice.

Challenges of IPE
Despite the described usefulness of IPE and the fact that it is widely practised and promoted, there remain unanswered questions about the effectiveness of IPE programmes, the ideal timing of IPE, and best practices for teaching and learning in an interprofessional setting (Hall & Weaver, 2001). One of the main challenges to IPE is a question of when to introduce it into the curriculum, or whether to try and infuse it into the existing curriculum; these are questions that have not been satisfactorily answered by the literature.

As Byrne (1991) has pointed out, most teachers are products of an educational system that limits their perspective to that of their own discipline. Most teachers within IPE contexts do not train in an interprofessional environment and many do not practice within one either (Steinert, 2005). However, interprofessional working is not an end in itself, but a means for more effective communication and cooperation among health professionals in the service of patient needs (Baldwin, 2007). The position of the patient in relation to clinical decision-making is therefore a key factor in the development of interprofessional patient care, as is the position of the student in IPE. Why this is important and how interprofessional working can be taught is explored below.
Putting Practice into Theory: Student- and Patient-Centredness

Research has shown that the concept of patient-centred care is complex and contested (e.g. Cooper, Smith & Hancock, 2008). Similarly, the evolution of the concept of student-centred teaching has proved a “bumpy road to navigate” (Felder & Brent, 1996). In their review of the empirical literature, Mead and Bower (2000) identified five dimensions of patient-centredness to distinguish it from the conventional biomedical model of practice. These are described below, highlighting the parallels that can be drawn with student-centred teaching:

1. **Biopsychosocial perspective**
   This is associated with broadening the focus of the clinician’s interest in the patient beyond the scope of organic disease to include recognition of other agendas that the patient may bring. The parallel in higher education is the recognition of student factors beyond cognitive dimensions to include the emotional journeys that students make through their studies (e.g. Christie et al., 2008).

2. **The patient-as-person**
   This is concerned with understanding the patient’s individual experience of illness, beyond the application of a diagnostic label. The clinician is expected to understand the patient as an idiosyncratic personality, placed within a unique context. Within educational contexts this is made easier if experts can maintain a beginner’s mind to try to see the student perspective (e.g. Fontaine, 2002).

3. **Sharing power and responsibility**
   This suggests a shift in the clinician-patient relationship from one that resembles a parent-child relationship towards one of mutual participation. The traditional asymmetry of the biomedical model is challenged to encourage greater patient involvement through the voicing of ideas. The same reallocation of power in the classroom is equally a challenge to the traditional transmission model of teaching, with some teachers seeing this as an assault on their professional practice (e.g. Weimer, 2002).

4. **The therapeutic alliance**
   Patient-centred care affords greater priority to the personal relationship between clinician and patient, considering the patient’s perceptions of the interventions offered within the affective dimension. Achieving the desired emotional context becomes part of the clinician’s role, just as it tends to fall upon the teacher to achieve the same result within the educational context (e.g. Beard, Clegg & Smith, 2007).

5. **The doctor-as-person**
   This dimension of patient-centredness includes the clinician’s self-awareness of emotional responses and may be related to the educational notion of reflective practice or the intuitive expert. This dimension highlights the difficulty in measurement (in part or in whole) of patient-centredness and student-centredness (e.g. Winefield et al., 1996).

Just as patient-centredness is influenced by the health professional’s beliefs, values and attitudes towards patients and the planning and delivery of care (Atkins & Ersser, 2008), so student-centred teaching is also influenced by the teacher’s pedagogic framework, composed of beliefs, values and attitudes towards student learning (e.g. Alexander, 2008). For such reasons, it is important that “pedagogy” finds its way into the lexicon of the clinical teacher as it means so much more than the related term, “teaching.”

The problem of using a bipolar construct to describe clinical teaching (or indeed patient care) is that it creates a simplistic dichotomy that is a distraction from the complexity of the situation (Alexander, 2008). At present, “evidence-based medicine” and “patient-centred medicine” appear to belong to different paradigms, presenting a major challenge of bringing them together in a way that can benefit the professional overall (e.g. Bensing, 2000).
This has been recognised by Olesen (2004) who calls for a balance, suggesting dialogue-centred medicine as a more contextually valid approach. Again, parallels can be drawn with the debate around student-centred teaching and the call by Cousin (2008) for a more transactional curriculum.

Whilst the terminology may vary between education and clinical science, the issues and likely resolutions display remarkable similarities (e.g. Skidmore, 2006). Within the clinical teaching arena, this has been drawn together by Kinchin, Baysan and Cabot (2008) through the visualisation of knowledge structures that can be employed to facilitate such dialogue and transaction. The trends towards increased student- and patient-centredness share an additional similarity, as “expertise” becomes more contextually integrated rather than standing apart from students or patients. Within a more dialogue-centred approach, the expert becomes part of the context rather than an observer of it. The integration of student-centred learning and patient-centred care in the context of pharmacy is discussed in Box 2.

An Example from Pharmacy

As a pharmacist and an academic lecturer, I have found that there are interesting analogies between patient-centredness and student-centredness. When working as a pharmacist before entering academia, my practice was in the realms of a large pharmacy in a city centre. As my time in practice progressed, I started to realise that one of the pitfalls in working in isolation was the difficulty in communicating with the other healthcare professionals. Many people often are involved in the care of a patient such as their general practitioner (GP), dentist, nurse, pharmacist, etc. I decided to arrange for someone to cover the pharmacy so that I could go out and visit some GP practices to discuss how we could work together. At times this was difficult, some GPs were wary of my visit, others did not have time but the ones I did get to see eventually started to call me with pharmaceutical queries and problems they had. Thus, this improved the quality of care their patients received.

Doing continuing professional development with pharmacists I saw that communication amongst health care professionals was a barrier to patient-centred care. So, I thought to develop some post-graduate IPE and put the student at the centre of their own learning. Just as healthcare had been criticised in the past for not being patient-centred, academic courses were charged with not being student-centred. If students were in charge of their own learning and could pick and choose what they wanted to study, they could tailor it to their unique situation and avoid the “one size fits all” model of many post-graduate education courses. I see the development of a course around student-centred education in an interprofessional setting leading to better patient outcomes and professional practices.

Box 2: Putting Theory into Practice: Curriculum Change in IPE

As noted in the two examples, shifting to a student-centred and patient-centred pedagogical model is a challenge for educators and healthcare professionals. There is both a need for and difficulties related to managing change from traditional, discipline-based clinical education to an interprofessional pedagogical model of student-centred learning and patient-centred care.

One of the foundational elements of the KCL MA in Clinical Pedagogy is bringing together professionals from a number of different clinical areas and concentrating on interdisciplinary pedagogical research, models and practices. There are further modules on various aspects of pedagogy, including Models of Expertise; e-Pedagogies and Intercultural Education. As highlighted in examples from pharmacy and dentistry, there is often resistance to IPE from both academics and professionals. However, the examples also show the benefits of pursuing IPE for students and patients, as well as academics and professionals.
Curricular Change: (Inter)Disciplinary Perspective

There are many paths that healthcare education can take toward becoming more interdisciplinary and interprofessional, with educational tools often facilitating the process. Changes can be managed from within a discipline by bringing in experts from other areas. For example, in a dental curriculum, there is a mix of contributions from many different specialties with the aim of developing a graduate who has a sound theoretical underpinning for practice; a graduate who is committed to develop practice and enhance patient care and to maintain status as a dental professional. In basic dental training, instructors are drawn from not only the basic sciences such as Anatomy, Physiology and Biochemistry but also from Psychology, Sociology and Nursing.

It is quite possible that such subjects could be taught within the department, but it has been a long held belief that experts from the field are the best to teach these areas. That is not to say everything is always clear and simple. Having developed the interprofessional links, however, what is taught or what is best for the student can be a point of contention. Basic science experts often have a different view than that of the programme leader who can perhaps see the role of that subject in the overall education of the student. To provide a disciplinary and professional focus, the KCL MA in Clinical Pedagogy offers educational context modules in the fields that students come from, such as pharmacy and dentistry.

In common with other professions such as medicine and nursing, as noted in the examples both pharmacists and dentists have a commitment to continuing professional education/development (CPE/D) and lifelong learning. This can be another avenue for creating interprofessional linkages, but the nature of established practices can make interprofessional input into such education problematic. For example, in terms of keeping up to date with the management of medical emergencies, latest prescribing advice, service development, radiology protection, or even the latest up to date clinical and consultation techniques, immediate access to the required expertise is not necessarily available and it is often up to practitioners to identify their own education needs and access. Furthermore, these established programmes often require strong support from educational and professional leaders and associations.

Curricular Change: Organisational Perspective

Patient-centred care and student-centred education necessitate changes within disciplinary and professional academic departments and adjustments within healthcare administration and continuing education. It has to be remembered that change is a process rather than an event requiring careful thought about issues such as the need for change, planning, anticipating difficulties, assigning responsibilities, developing commitment, maintaining momentum, consolidation and review (Heller, 1998).

In this context, the move to patient-centred care and student-centred education can be the desired goal. In pursuing this agenda, it is critical to have support from senior staff. As Horovitz and Jurgens Panak (1992) point out, leaders who demonstrate commitment and conviction are far more likely to be successful in cascading ideas through the organisation and encouraging effective participation. To this end, a focus on development in IPE programmes is essential. The KCL MA in Clinical Pedagogy includes options for modules on Managing People; Professional Development; Personal Development; and Interprofessional Leadership and Learning.
In an on-going process of change, evaluation is an essential practice. In addition to individual and group course evaluations at module, year and program levels, the KCL MA program is evaluated on the following elements:

1. The validity and reliability of the programme in conjunction with the stated aims and learning outcomes;
2. The relative time given to teaching, individual learning and assessment of progress;

Views from External Examiners are also taken into account in the evaluation process. Programme modules are also designed and evaluated in part with professional bodies, such as the Association of Medical Educators.

**Conclusion: Developing a Student- and Patient-Centred Pedagogical Model**

There is a need to ground interprofessional education practice with theory, related to patient-centred care and student-centred education, to move it beyond piecemeal activities and one-off initiatives. This can be done in part through breaking down professional boundaries, in both academia and healthcare, to promote the best education for students and the optimal care for patients.

The advantages of developing a student- and patient-centred pedagogical curriculum model based on interdisciplinarity and interprofessionalism have been outlined and illustrated here through reference to two examples. However, the content-driven, discipline-based tradition of university education is still firmly entrenched in many universities. Recently this conventional wisdom has been challenged, generating greater support for an interdisciplinary and interprofessional approach and the development of programmes, such as the KCL MA in Clinical Pedagogy.

Certainly the point of interdisciplinary overlap would appear to be “the patient” and the essential element for effective overlap between the disciplines and professions can be seen as effective dialogue (Olesen, 2004). This dialogue must be employed to identify common thinking processes across the disciplines, such as the ability to identify context; the ability to recognise organizing principles and the ability to change perspective (Donald, 2009). Such factors may help to create an interdisciplinary focus. This major shift in the underpinning philosophy of clinical education provides a major task for curriculum providers and managers who need to be sensitive to the culture of their organisation if the change that is required for programmes based on interdisciplinarity and interprofessionalism is to be sustained and embedded. The disciplinary basis of teaching approaches is also challenged by the move in academic development from “tips for teachers” towards a more scholarly view of the development of teaching and learning. To facilitate this, a consideration of underlying pedagogic frameworks is necessary. Such a consideration reveals a degree of similarity between healthcare disciplines that is masked to observers if they looks only at the more obvious differences in teaching context (Kinchin and Cabot, 2009).

Therefore, interprofessional education can be seen as part of a pedagogic model that considers underlying assumptions, theories, values and beliefs that direct the observable acts of teaching, and not simply as a teaching strategy. This is why the new programme developed at KCL was named the Master’s in Clinical Pedagogy, rather than Clinical Education or Clinical Teaching. The emphasis is on the underpinning values that can empower course participants to develop their own teaching to suit their local context, based upon a robust interdisciplinary pedagogic framework.
The MA in Clinical Pedagogy is designed for healthcare professionals to inform and develop their pedagogic practice. It is particularly valuable for both clinical and non-clinical practitioners who teach in a clinical environment. The MA in Clinical Pedagogy programme brings together healthcare professionals and educators to deliver student-centred education and patient-centred care from across multiple healthcare and academic disciplines. Hopefully this programme will develop as a model for bringing a strong theoretical base to the established practice of interprofessional care.

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A Personal Perspective: Breaking New Ground in Portsmouth in Integrated Dental Education and Professional Care.

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Keywords: integrated dental education, primary care, residential placement

Abstract
From a personal perspective, this paper will discuss the inception of the new University of Portsmouth Dental Academy and its development from the pre-existing School for Professionals Complimentary to Dentistry. The development has required major changes to the delivery of education both at King’s College London Dental Institute as well as in Portsmouth. These developments have enhanced the education of both cohorts of students and formal evaluation of the outreach programme is planned through this coming year and will be reported subsequently.

Introduction
Undergraduate dentistry has traditionally been taught in dental schools attached to Universities that are primarily in the secondary care sector. It is widely accepted that 85% of graduate dentists work in the primary care sector (Dental Practice Board Review, 2004), either delivering care with funding from the NHS, private insurance schemes or direct payment from patients. Dental schools have for some time placed students in primary care settings (Elkind, et al., 2007; Craddock, 2008), either in community clinics or in teaching primary dental practice clinics, such as the Maurice Wohl General Dental Practice Centre on the Denmark Hill campus. Although this ground breaking development was established at King’s College Hospital Medical and Dental School in 1987, over 20 years ago (Davies et al., 2009), the vast majority of dental education is still undertaken within the confines of dental schools and dental hospitals.

In a break with tradition when the Department of Health commissioned three new UK dental schools in 2004-05, there was a focus of education for graduate entry students within the primary care sector (Mair, 2010). Many Universities put together bids for a new school, including the University of Portsmouth. However, like other institutions, Portsmouth was not selected in a very closely fought competition.

The University of Portsmouth established the School for Professionals Complimentary to Dentistry in 2004, providing education for a cohort of 24 Dental Hygiene and Therapy students (DHTS) on a three year BSc Honours programme. However, it was recognised that training dental hygienist/therapists in isolation, was not ideal. Even though high quality educational placements in established practices in primary care were included in the curriculum, DHT students were only partly experiencing the continuity of comprehensive and holistic care that results from a team approach with contributions from all members of the dental team to delivery high quality care. The University of Portsmouth and King’s College London Dental Institute (KCLDI) investigated the possibility of final year dental students from King’s undertaking a placement in a primary care setting, alongside DHTS in training in the City of Portsmouth. This additional experience would be run alongside KCLDI students attending the Maurice Wohl GDP
Centre at the Denmark Hill campus (Davis et al., 2010) and the 24 chair polyclinic facilities at St Thomas Hospital, London. This arrangement had the advantage that dental students and students training to be dental care professionals, could practice and interact together both on and off the clinic creating strong relationships (Plasschaert, et al., 2005) and inter-professional education communities of practice that mimic real life environments (Barr, 2000). Educators have agreed as part of the skill mix of a European graduating dentist they should be able to work together and have excellent communication skills across the health care team (Plasschaert, et al., 2005). This article will highlight some of the issues from a personal perspective leading up to the establishment of the University of Portsmouth Dental Academy and the opening of the doors with the first cohort of KCLDI final year dental students studying at the Academy from September 2010.

Early issues

Funding
The current School for Professionals Complimentary to Dentistry which was opened in 2005 was housed in a new building in Ravelin Park, part of the University of Portsmouth, which comprised an open plan 24 chair clinic, with two separate surgeries. There was a clinical skills/phantom-head room, a 55 seat lecture theatre, a 30 seat seminar room and student and staff facilities. The plans that had been drawn up for the prospective dental school which included a new 20 chair clinic were adapted to include additional seminar rooms and additional student and staff facilities and funding was sought. To achieve this, an early notable appointment was made in the Director of the Project, (2007-08) who had experience of working in the NHS Primary Care at executive level. He worked together with the Project Board which comprised senior members from the University of Portsmouth and KCLDI. Without the strategic appointment of the Director, the project probably would have floundered due to time constraints on senior staff time. Funding of £9,300,000 was obtained from HEFCE, D.o.H., Local NHS, University of Portsmouth and King’s College London.

Timetabling
A second issue was how the educational time students would spend at the Academy would be used optimally. The overall timetable for dental students in all clinical years at KCLDI was to have 4 days timetabled in clinical practice and 1 academic day, which involved formal lectures/seminars and additional classroom teaching sessions, such as those necessary in oral medicine and dental public health. Unfortunately the academic day for Year 5 students was traditionally a Tuesday and so the entire timetable of all the clinical students had to be moved around, to alter the academic day for Year 5 to a Monday so students could attend on a 4 day a week rotation at the University of Portsmouth. Portsmouth is approximately 1½ hours by train from central London and so the outreach had to be planned on a residential basis. Accommodation that is funded by King’s College London, was provided as a discrete group of 20 en-suite catered rooms catered at the nearby Rees Hall, University of Portsmouth.

Joint working
The Project Board also wished to make a senior appointment to overview the dental students in Portsmouth and to establish the protocols and guidelines that they would follow at the Academy. This appointment (the author) commenced 12 months before the opening of the Academy in September 2009, although the individual was identified and seconded 6 months before then to allow him to rationalise his commitments in London as well as to build a rapport with his new colleagues in Portsmouth, prior to the formal secondment.
Detailed planning: Laying the foundations
By October 2009, the metal substructure of the new East wing was in place and detailed planning of the educational programme for the dental students and integration with that of the DHTS was taking place. This involved a multi-pronged approach. The aims and objectives were established under four domains (Professional, Personal development, Understanding the practice environment and Clinical skills) and were agreed by the Project Board. Other issues included encouraging the dental students to think positively about attendance at the Academy, as this was a new departure for them and certainly an option that was not considered when they applied to University, 5 years previously. Many students studying at King’s tend to be London based and although it was considered an advantage that they would study in the provinces, this aspirational concept had to be communicated positively to the students. A series of visits to Portsmouth, lectures in London and awareness through the Dental Institute Newsletter was undertaken and the students themselves set up a social networking online site. The School also introduced new web pages to promote Portsmouth as an alternative for some of their clinical studies during Year 5. Dental students were invited to show a preference to attend the outreach programme at the Academy and had to complete an application form similar to those that are currently being developed by regional deaneries for Foundation Training (FT1).

Organisation to give patients continuity of care and the students a sense of belonging
A second major area was the organisation of the dental practices within the proposed new Academy. It was considered an opportunity to reorganise the clinical teaching of all students into four teams (named after local rivers and watercourses, Solent, Langstone, Hamble and Meon) to allow the students to identify with a group of people as well as patients being cared for by a group of “dental professionals in training” within a dental practice. The School piloted these with just the DHTS for the second semester 2009/10. As the pilots were well received by students and staff, they were incorporated into plans for the Academy in September 2010 when the dental students joined. A series of integrated tutorials were developed with prior reading material that allowed both cohorts of students to work together and share experiences of training and education and work experiences prior to qualification as therapists/dentists. These have been focused particularly on contemporary issues within dental practice and FT1 as well as practice management. The pattern of attendance is for 20 students to attend for 4 days in a month rotation, which equates to 80 students, which is half of the final year of KCLDI attending the Academy. All educational experiences have to be delivered 4 times and this is certainly a challenge increasingly faced by many educational establishments.

Appointment of clinical tutors
The desire in the Academy was to have a seamless approach to clinical practice. This was ensured by the therapy and dental students working alongside each other, having joint appointments and assisting each other if there were cancellations. Treatment planning is undertaken by the dental students and detailed treatment plans after discussion with the clinical teachers are recorded on a practice based computerised note system. Further the current staff of tutor hygienists, therapists and dentists of the school were joined by locally appointed KCLDI clinical teachers who were experienced primary care dental practitioners from both NHS and mixed practice backgrounds and so there is a rich mix of teachers across both student cohorts.

Recruitment of patients
Due to the wider scope of dental care that could be delivered by the new Academy, as well as the significant increase in capacity, the contract negotiated with the Portsmouth City Teaching Primary Care Trust included a target number of Units of Dental Activity (UDA) and both nationally and local agreed Key Performance Indicators (KPI) targets. These include:
• Percentage of courses of treatment of new patients accepting a Dental Care Assessment where a record of tooth decay status has been made;
• Where a record of soft tissue assessment has been made;
• Percentage of patients identified as hazardous or harmful drinkers who are given an intervention (brief intervention or referral to an alcohol intervention team);
• Percentage of patients between 15-24 signposted to screening for *Chlamydia*.
• 2,200 new and unique patients to be seen every year.

To achieve these aims, a widespread awareness campaign agreed with the Local Dental Committee, was targeted at the socially disadvantaged and hard to reach patients in the City and the Isle of Wight. The clinics are run on a polyclinic basis with all types of minor oral surgery, simple/advanced restorative and periodontal care, preventive care and care of children and open access patients being undertaken, with only orthodontic, implant dentistry and referral for third molars being referred to other Primary/Secondary care providers in the City.

**Induction plan**
The first week of attendance of each cohort of dental students was devoted to a 3 day induction programme with one day on the integrated clinic. Although the dental students had some experience of joint working with DHT students in London, as this was one of the central themes of the initiative, events were planned to encourage rapid integration of the two cohorts of students. Further, the dental students had to acclimatise to the financial situation of working in a primary care situation, using a live PDS Plus contract with a UDA and KPI value. Last they had to be introduced to a primary care electronic notes system that interacted with the NHS Business Services Authority (Dental Services). Other local rules that were different from London, due to the context of the delivery of care (remote commercial dental laboratories undertaking NHS work), local procedures for the management of medical emergencies and needle stick injuries in a practice setting rather than a large Secondary Care trust Hospital all had to be covered before the students could start to treat patients in the Academy.

**Students to develop Clinical expertise**
At first students were slow getting to grips with treatment planning in terms of NHS treatment planning and computerised note-keeping. Appointment slots of 90 minutes were allocated. However, by the second term students were regularly seeing patients in both 60 and 30 minute slots. This is considered to be a crucial development in the students’ final year in order to make the transition into FT1 in practice a seamless process. This was partly because all students seem to flourish in their final year but also a relationship has developed between the dental students the DTHS, their tutors, dental nurses and reception staff that has allowed more efficient use of clinical time and resource.

**Conclusion**
This initiative has benefited both institutions involved by allowing dental students and DTHS to work together in a integrated team environment. At the time of writing the Academy has now been open for five months. The dental students relish their monthly trip to Portsmouth even in the cold winter months and the Academy still has a buzz of excitement about it everyday. Formal evaluation of the service output and

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the students’ educational experience are planned and will be reported subsequently.
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A Personal Perspective: Reflections on the Dental Programme for Medical Graduates (DPMG).

Elizabeth A Gruber
Liz Gruber qualified in medicine from University College London. After completing her Basic Surgical Training and her MRCS she undertook posts in Maxillo-facial surgery, posts that confirmed that this was the surgical specialty for her. This meant a second degree in dentistry and she is now in the final year of the King’s College London, three year dental undergraduate programme for medical graduates.
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Keywords: undergraduate, dental education, maxillo-facial surgery

Abstract
This paper presents a personal perspective on the undergraduate dental programme for medical graduates at King’s College London Dental Institute. This accelerated three year programme is unique in the United Kingdom and is designed specifically for those wishing to follow a career in Maxillofacial Surgery or Oral Medicine/Pathology where a qualification in both medicine and dentistry is required. The first cohort of students on this programme graduated in June 2010.

Background and application
I qualified as a medical doctor from the University of London (University College London) in 2002. I completed House Officer jobs (now Foundation Training) in general surgery and general medicine and moved on to undertake a Basic Surgical Training rotation. It was during this time that I had the opportunity to work in Oral and Maxillofacial Surgery (OMFS) and discovered a passion for this specialty.

OMFS is a unique speciality in that it requires primary qualifications in both medicine and dentistry. Historically, OMFS has its origins in surgical dentistry and as such required dental training (Langdon, 2006). In 1984 OMFS was also recognised as a surgical specialty of medicine by the Royal College of Surgeons and as a result dual qualification is now required (Mahmood, MacLeod & Lello, 2002).

In order for me to progress to higher training in OMFS, I therefore needed to obtain a dental undergraduate degree (BDS). I researched the available options in the UK and found that several universities offered four-year graduate entry programmes. I was delighted to discover that King’s College London Dental Institute offered a three-year dental degree programme designed specifically for medical graduates. This programme was expressly intended for a limited number of qualified doctors wishing to pursue a career in OMFS or the specialty of Oral Medicine/Oral Pathology. OMFS has seen a recent surge in popularity amongst doctors wishing to pursue this speciality as a career. The length of training has discouraged potential applicants in the past and the Postgraduate Medical Education and Training Board (PMETB) has recommended the possibility of shortening the training pathway, as is the case in other countries (PMETB Report on Training in Oral and Maxillofacial, 2008). Several three-year medical degree programmes for graduates already exist in the UK and the demand for a three-year dental degree programme is now certainly very real.

Application for the Dental Programme for Medical Graduates (DPMG) is through the Universities and Colleges Admissions Service (UCAS). Applicants are not required to sit the UKCAT aptitude test prior to applying to the DPMG. Shortlisted applicants are invited for interview, which comprises questions based on the application form and personal statement and analysis of a clinical scenario. Prior to interview I visited King’s Dental Institute and met with members of teaching staff and students already on the programe.

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I was impressed with the organisation of the DPMG programme and the reputation of King’s College London for excellence in teaching and research. I was interviewed by the Dental School Admissions Tutor and an Oral and Maxillofacial Surgeon. They explored my commitment to OMFS, my receptiveness to learning, my employment history and my expectations of both the programme and OMFS as a potential career.

The students who have been admitted to the programme come from a variety of backgrounds in terms of medical experience. These include doctors who have joined directly from year 2 Medical Foundation Training (FY2), those who have completed Foundation and Core Training including Royal College membership examinations (MRCS or MRCP), and those with additional post-membership experience in medicine or surgery, such as myself.

Students admitted to the DPMG programme are exempt from the first two years of the standard five-year BDS programme, on the basis of their previous studies. A three-week preparatory programme is undertaken in the September of admission, which covers basic material from year one of the standard course. The first year of the DPMG course comprises the same material as year three of the standard programme with incorporation of a great deal of material from year two, including basic and applied dental sciences. Students then continue with years four and five of the usual five-year BDS Programme. DPMG students are required to attain the same academic level as five-year BDS students and meet identical General Dental Council (GDC) requirements prior to qualification.

**Year 1**

Returning to a full-time undergraduate programme of study after six years spent working as a doctor is a significant undertaking. It was inspiring returning to a supportive learning environment and having the time to acquire knowledge, rather than merely service provision, was personally rewarding. The DPMG group was comprised of eight students and as the second intake on this new programme we were made to feel unique and were aware that our progress would be observed with interest.

A significant difference in autonomy between the roles of doctor and dental student was apparent, especially when attending clinical sessions. For example, an everyday task in my role as a doctor such as prescribing paracetamol, became much more protracted as I was required to get countersignatures from the clinical tutor in my role as a dental student. It was important for me to clearly differentiate these roles and adapt my clinical style accordingly.

The ten-year age difference between myself and the majority of undergraduates was interesting and not as significant an issue as I had anticipated. After some initial apprehension, it was fairly easy to integrate. There are clear advantages to having mature students on an undergraduate course, including fostering a mature attitude to learning, and particular benefits associated with medical graduates, such as knowledge and experience of working within a healthcare profession, which is definitely valued by first time undergraduates on the BDS course.

The eight DPMG students were taught as a separate group for much of the first year. We were extremely fortunate to have intensive small group tutorials, laboratory and phantom head sessions and chairside teaching from some of the keenest and most experienced tutors at the Dental Institute. The aim of this accelerated pathway was to bring us up to speed with the undergraduate BDS cohort in preparation for joining year four of the standard course. Our performance was measured through written, practical and oral examinations, which comprised those undertaken by year two and year three BDS students.

The teaching staff at the Dental Institute seem to have enjoyed the challenges associated with teaching the DPMG group. As competitive and ambitious individuals we strive to achieve to a high standard. This has made for some very interactive and vociferous teaching sessions.
Prior medical training and employment has given DPMG students considerable experience in the management of medical conditions.

As a result, this sometimes led to analytical discussions concerning patient treatment and the DPMG group were viewed as more questioning and assertive. Exploring and understanding such professional variances was a new learning experience for both staff and students.

The dental undergraduate degree is a strikingly different experience to the medical undergraduate degree. Dentistry is definitely more hands-on in terms of the necessity to develop practical skills and apply them to patient treatment early on in the programme. Dental undergraduates are required to be directly accountable for the management of their patients, cultivating a professional attitude. This autonomy is not given to medical undergraduate students. The clinical side of dentistry is more demanding of time than medicine, with timetabled commitments for the whole of the working week.

There are of course, similarities between dentistry and medicine also. Both have their foundations within the basic sciences. Some parts of the dental programme such as head and neck anatomy, oral surgery and human disease were very familiar from previous training and experience whilst other aspects, for example, restorative dentistry and prosthodontics were completely unfamiliar. Coming from a medical background, DPMG students are at ease with patient management and the clinical environment.

As is the case for other mature students, the DPMG group has significant domestic and financial commitments. Effective time management has certainly been fundamental. Studying on a full-time clinical programme with considerable time constraints has to be coordinated with locum medical work to provide an income and retain medical skills. In addition to this, it is necessary to continue with professional development activities such as attending courses and conferences.

**Year 2**

The second year of the DPMG course is essentially identical to BDS year 4. The DPMG students were split up and dispersed among the rest of the year. Whilst it was useful having the support of fellow mature students from a similar background during the first year, it was refreshing and stimulating to learn with the other undergraduates and was certainly not detrimental to academic performance.

The second year was a period for consolidation of knowledge and refinement of practical and clinical skills gained in year one. I noticed a vast improvement in my fine motor skills and mastered the art of using loupes. The other main advancement was the dental mode of thinking about patient diagnosis and treatment planning, which is different to the medical way of thinking.

Full-time study also gave me the opportunity and time to chair the Junior Trainees’ Group of The British Association of Oral and Maxillofacial Surgeons (BAOMS) and organise a national conference. This group exists to provide advice and support to second-degree students (either medicine first or dentistry first) and junior trainees in OMFS.

**Year 3**

At the start of the third year I had the opportunity to undertake a dental elective. I was fortunate enough to spend some time with a distinguished cancer surgeon who is the Chief of Head and Neck Surgery at the Memorial Sloan-Kettering Cancer Center in New York. I observed in the operating room, attended outpatient clinics, ward rounds and postoperative patient rehabilitation sessions, including dental restoration in these complex cases. I was also permitted to participate in educational sessions and meetings for undergraduate and postgraduate students and surgeons. My experience at Memorial Sloan-Kettering has allowed me to broaden my knowledge of the management of head and neck cancer and to evaluate the
similarities and differences between professional practice in the US and the UK. The insight I have gained will benefit my own clinical practice and that of the hospitals in which I am working and studying.

During the final year, students are given the opportunity to undertake a selected activity of their choice for which they are allocated one day every fortnight. I chose to carry out a research project based at the Oral and Maxillofacial Surgery Department at King’s College Hospital. This was a study to assess the psychological effects of facial trauma on patients. I recruited postoperative trauma patients from the OMFS outpatient clinic and asked them to complete a questionnaire, which used validated depression and anxiety scoring systems. I am currently analysing the results and hope to present the findings at a national OMFS meeting.

The final year has allowed me to focus on holistic patient care, through General Dental Practice clinics and Acute Dental Care and Primary Dental Care sessions. There is a real sense of cohesion with all the skills learned in various dental subspecialties brought together in the care of each individual patient. Other proficiencies such as management, organisation, leadership and teamwork have been honed in preparation for the working environment.

After graduating with BDS there are various options for medical graduates. Some students choose to do dental Vocational Training (VT) to further reinforce their dental skills and knowledge. Depending on the medical experience and postgraduate examinations attained prior to commencing the DPMG course, students may either apply to a core or a higher surgical or medical training scheme. The choice is necessarily dependent upon further career plans.

The future
The continued application ratio of five applicants per place indicates the ongoing demand for this accelerated programme. This remains the only official three-year BDS programme in the UK approved by the GDC. The fourth intake of medical graduates has now commenced the DPMG programme, which has secured funding for the indefinite future. More medical graduates seem to be entering OMFS, Oral Surgery, Oral Medicine, General Dental Practice and other dental specialities. It will be of interest to see what influence this will have on these professions.

I am grateful to King’s College London Dental Institute for providing a BDS course that meets my specific needs. The return to full-time education has certainly been a life changing experience and I have made lifelong friends and professional contacts. I greatly value the opportunities I have been given and the excellent teaching, which I feel has given me a good grounding in dentistry. I have a deeper understanding of the necessity of dual qualification for OMFS and am excited about making the next transition from dental student to higher surgical trainee.

Acknowledgements
I wish to gratefully acknowledge the advice and support of Dr Lyndon Cabot, Director of Admissions at the King’s College London Dental Institute.
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ISBN 978-0-9558633-4-9