

Educational innovations for dentistry

J. Sweet,¹ J. Wilson² and L. Pugsley³

VERIFIABLE CPD PAPER

IN BRIEF

- Theories of learning can help us understand how dental education could be improved.
- Understanding learning as a social activity can help us arrange and group learners in a dental practice, clinic or hospital.
- Scholarship of dental learning and teaching brings research and clinical practice together into a dynamic which allows us to preserve professional values and challenge preconceptions.

Over the past four decades, teaching and learning in higher education has been informed by a variety of educational theories. The various initiatives that have been introduced as a consequence have all sought to improve students' educational experiences. However, such moves have not always been successful, as a series of three articles that the authors produced on dental chairside teaching have demonstrated. The first of these investigated the stakeholders' perceptions of this teaching at one dental school.¹ The second evaluated chairside teaching on a UK wide scale,² while the third provided educational tools to encourage collaboration among clinical educators to share good chairside teaching practices.³ What this paper seeks to do is to locate each of these themes within the wider context of a theoretical frame highlighting the need for dental education to be underpinned by such constructs. The aim of this paper is to help ensure that an informed learning experience is achieved for all students engaged in clinical dental education.

Introduction

This paper highlights some of the innovations that have been implemented in learning and teaching in higher education over recent decades and suggests ways in which these strategies can be adapted as useful resources for learning

in clinical dentistry. Historically, educational practices focused on the individual learner. Increasingly the significance of social learning is being acknowledged. We argue that these theories make a vital contribution to an understanding of dental education.

It must be acknowledged that financial constraints will impact adversely upon the infrastructures available to support student learning, especially in the clinical context where a complex infrastructure is required to support chairside teaching and learning. Nevertheless, neither the value of quality teaching, nor the need for scholarship in dental education can be overlooked given the potential contributions that each can bring to this specialty subject. Clinical dental education is not merely concerned with teaching a range of techniques; it is a complex exemplar of situated learning⁴ drawing on a whole raft of educational theories and practices in order to produce competent, skilled and autonomous dental practitioners.

In this paper we consider some of the theories underpinning dental education and explore the role of education research into stakeholders' perceptions of good practice in chairside teaching. This allows us to consider the ways in

which scholarship can be developed to enhance the student experience and encourage reflective practice.

Theories of learning

Much of the groundwork towards understanding learning and teaching was derived from cognitive psychology. For example, Ausubel⁵ showed that giving students an initial overview of a topic helped to enhance their learning. Similarly, van Ments⁶ showed the educational value of debriefing following teaching sessions. These findings have direct application to learning in dentistry. Clinical sessions could be restructured to incorporate both briefing and debriefing. We recognise that to achieve this the traditional high intensity of undergraduate clinical sessions may have to be modified to maximise learning opportunities, since repetitive clinical tasks will impact on opportunities for critical thinking. The single dental school study reported in this series noted that where a systematic, focused debriefing session had been introduced and retained, students found it particularly useful as an aid to their learning.¹

Gagne equates learning with 'performance change'⁷ and identifies eight phases of the learning process. Given the appropriate positive environment,

PERCEPTIONS OF CHAIRSIDE TEACHING

1. Stakeholder perceptions of chairside teaching and learning in one UK dental school
2. Chairside teaching and the perceptions of dental teachers in the UK
3. Tools to share good chairside teaching practice: a clinical scenario and appreciative questionnaire
4. Educational innovations for dentistry

¹Associate Clinical Professor, Postgraduate Dental Education Unit, Institute of Clinical Education, Warwick Medical School, University of Warwick, Coventry CV4 7AL; ²Clinical Senior Lecturer, School of Dentistry, Cardiff University, Heath Park, Cardiff CF14 4XY; ³Senior Lecturer, Academic Unit of Postgraduate Medical and Dental Education, Wales College of Medicine, Biology, Life and Health Sciences, Cardiff University, Heath Park, Cardiff CF14 4XN

*Correspondence to: Mr John Sweet
Email: john.sweet@warwick.ac.uk

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the early phases of motivation, apprehending, retention, recall and simple generalisation may be achievable by the students themselves. Later phases, relating capabilities learned at one level to higher levels, and performance and feedback, are far more easily achievable with help from a tutor or mentor. What value then has this articulation of learning to clinical dentistry? It could be particularly useful for dental tutors to understand precisely where, when and how in the learning process they could be of most help to students. Recognition of the need to improve clinical performance may be even more important when designing clinical dental courses where self-directed learning is emphasised. Our studies reveal that, at certain stages of learning, dental students prefer help from peers or dental care professionals (DCPs).¹ Also, at an organisational level we show that dental tutors need to be appropriately matched to different clinical situations.² We were able to identify five categories of dental tutor: part-time practitioners, senior academics, intuitive teacher practitioners, teacher-trained academics and dental educational developers. The range of different skills, such as having wide general practice experience, subject specialty knowledge, teaching ability and educational skills that such diversity brings to clinical teaching, will, if properly channelled, enhance students' learning experiences.

There is an extensive literature on the development of student learning, Perry⁸ traces a path of cognitive development for students from a simplistic categorical view of knowledge of right and wrong to a more complex view of their world, their relationships and of themselves. He came to the conclusion that student development is enhanced as much by the processes of learning as by the curriculum content. He argues that tutors commonly think they have only two options, either to praise or blame. In fact, there is a third and more powerful, option of 'recognition': the acknowledgement of the learners' engagement with the learning process. This, he suggests, creates conditions of respect and encouragement for the students that can help them to integrate new knowledge and improve their practical skills.

Similarly, King and Kitchener⁹ have identified seven stages that lead to maturity in student thinking. They developed a system of rating scales that can be applied to written assignments to determine the level of reflective judgement that students have achieved.¹⁰ Newly qualified dental surgeons will need to have developed the skills necessary to allow them to identify and address the complexities of decision-making in dental practice. Using the King and Kitchener^{9,10} approach throughout undergraduate training can help equip graduate dentists with these skills. For Baxter Magolda¹¹ a key function of higher education is to equip students with the knowledge, skills and attitudes that they will need in their future professional roles. With regard to clinical dentistry, this highlights the importance of the dental tutor role in facilitating professional behaviour in the student body.

There is also a literature, stemming largely from the work of Knowles,¹² on andragogy that characterises adult learning. The key feature of this is that students play an increasingly large part in determining the content and objectives of their course.¹³ In dentistry, although the content of the course is largely determined by General Dental Council requirements,¹⁴ there is still great scope for changes to be made in the ways in which learning outcomes are written so that there is transparency and linkage across all elements of the curriculum. This can enhance student motivation and allow them to see how they can deal with tasks or problems in real life situations.¹⁵

A further breakthrough in understanding 'learning by doing' came from the experiential learning literature. Kolb¹⁶ argued that learners, if they are to be effective, need abilities that correspond to four stages in a learning cycle:

- concrete experience abilities
- reflective observation abilities
- abstract conceptualisation abilities
- active experimentation abilities.

Many commentators on Kolb appear to emphasise learning as a rigid movement around this cycle¹⁷⁻¹⁸ and fail to credit Kolb's¹⁶ insistence that much learning involves a struggle and possible

resolution of opposites across the centre of the circle. For instance, in a situation of 'research' learning inquiry there will be a continual grasping of the *concrete experience* of observations towards *abstract explanations*, whereas clinical practice will make demands for *reflection on findings and evidence* reaching towards *active treatment planning*.¹⁹ From this viewpoint any individual will have strengths in particular parts of these dimensions and will need to develop the skills to operate across the full range if they are to be effective.

We have shown that, in practice, reflection is poorly developed in undergraduate clinical dentistry in the UK.¹⁻² Skills based theories currently prevalent in dental school thinking argue that reflection is of little value to both beginners who have little to reflect upon and experts who work intuitively anyway.²⁰ Fortunately there are alternative theories of educational development as discussed later in the section on the Social Approach to Education. A learning style inventory to enable learners to discover their own characteristics can be useful.²¹ However, there is a danger that students may feel constrained by the results of these findings, trapped by what they may incorrectly perceive as innate traits rather than modifiable characteristics. In reality all dental graduates will need to demonstrate a whole range of capabilities in order to effectively communicate with and treat their patients. Gardener²² proposed broader curricula to foster more rounded educational talents. A call to enlarge both the repertoire of intelligences and the styles of engagement with learning could lead to a revolutionary shift in undergraduate dental education that would follow the medical example. This would ensure that in addition to a core curriculum, discretionary modules could be selected that would provide a level of creativity and excitement for the students during their training.

A discovering learning style is probably most useful for dental tutors as it reinforces the need for them to broaden their style of delivery and interaction to be able to engage most effectively with a wide range of different students. Adopting a more learner centred approach²³ where the focus is on helping the student

Table 1 Five perspectives on teaching

1. **Transmission** - Effective delivery of content
2. **Apprenticeship** - Modelling ways of being
3. **Developmental** - Cultivating ways of thinking
4. **Nurturing** - Facilitating individual responsibility
5. **Social Reform** - Seeking a better society

adapted from Pratt²⁴

Table 2 Six steps for learning

- 1) Get motivated by getting into the right mood for learning
- 2) Gain the necessary information in the ways that best suits you
- 3) Explore the material sufficiently to understand it
- 4) Organise the material so that it can be triggered from memory
- 5) Exhibit what you know by testing or teaching someone else
- 6) Reflect on how you learned, so you know how to go about it next time

Adapted from *Accelerated learning for the 21st century*²²

learn, rather than the teacher focusing mainly on the delivery and content of their discipline, can really enhance the student experience. Even more comprehensive is the Teaching Perceptions Inventory designed to allow teachers to summarise their ideas about teaching,²⁴ and so adapt their style of teaching over time in a more student focused way. Pratt²⁴ proposed five styles of teaching (Table 1) that vary from a transmission mode of delivery to a student centred focus which encourages self directed, autonomous learning. This model has been modified to relate more specifically to dental clinical teaching.²⁵ However, our study showed that a majority of dental tutors had not analysed their teaching in this way.¹⁻²

To maximise learning students need to know why and how they learn and that learning can be more effectively achieved by active engagement. Learning can be further enhanced by building elements of reflective practice into the course. Writers such as Schon²⁶ and Boud, Keogh and Walker²⁷ cover the use of reflection in depth. Mullins *et al.*²⁸ describe how reflective journals can be used with individual clinical dental

students. Such use of reflective journals can help widen learning perspective and support the achievement of personal development goals.²⁹ Cowan³⁰ has advocated the use of more public reflections to enable students and staff to share their experiences of the learning process. This is a useful strategy to circumvent barriers to learning. Encouraging staff and students to share views on learning and teaching in a periodontal clinic has resulted in a greater understanding of how student clinics can be improved.³¹

The significance of this whole literature has been brought together into a sequence of simple recommended steps for learning³² (Table 2). Dental tutors in our single school study¹ did not emphasise the point that students must get into the right mood and get the overall picture before moving into the specifics of content.³² Whilst some clearly wanted to organise the material for their students, most did not generally give guidance on how students could organise the material for themselves and so demonstrate that they had learned. Where reflection was encouraged the focus was generally concerned with things that had gone wrong, rather than on what was *then* learned, so that the student could be encouraged to take this learning forward to the next clinical encounter.

Social approach to education

For many theorists, learning encompasses more than can be explained using the psychological approach. Some views are that learning is not only based on activation of past knowledge³³ but rather is socially based and culturally determined.³⁴ Taken to extreme, this would mean that learning is not so much about individuals simply acquiring new knowledge, but is about the process of social adaptation - of adopting the accepted patterns of behaviour of a discipline or profession. The added value of small group working in co-operation and collaboration³⁴⁻³⁵ could be explained from this viewpoint. Dialogue in small groups is critical for students' learning. By talking together in groups, students experiment with being new professionals in an 'intermediary culture' that supports the transition into a completely new culture of discipline or professional

practice. Clinical briefing and debriefing sessions could play a useful part in this acculturation.³⁴ Successful teaching needs to take place as an open dialogue, in a supportive environment that enables critical constructive feedback to be both given and received.³⁶

If the curriculum is sufficiently flexible there are also opportunities for students from the different dental care professions to learn and practise together, creating interprofessional educational communities of practice that mimic real life working environments.³⁷ Also, encouraging opportunities for 'learning communities'³⁸ of students who may not normally work or learn together, may produce valuable learning outcomes. For instance, a study of physiotherapy, occupational therapy and dental students working together in the dental clinic revealed that the working postures they adopted in the laboratory, had not prepared dental students for the clinical environment. There were multiple individual variations (such as height and handedness) that impacted directly on their working postures. Ergonomic assessment tools enabled the dental students to become more aware of potentially dangerous static postures involved in their routine dental working.³⁹

The move to encourage lifelong learning acknowledges that in a climate of rapid 'technological' and 'cultural' change higher education cannot provide learners with all the knowledge that they will need for work and life skills.⁴⁰ The use of media⁴¹ can create opportunities to make visualisation easier and transmission of information wider. Students who are routinely using web based social digital spaces such as Facebook are starting to use these as resources to prepare each other for Objective Structured Clinical Examinations (OSCEs) by placing home made videos on procedures such as placing rubber dam or assembling a matrix band. The education literature is still reeling from these kinds of technological innovations and is as yet unsure how to theorise some of them.⁴² Certainly, the commercially available Virtual Learning Environments such as Blackboard have limited file size for uploading multimedia images. They appear to be fundamentally teacher

centred and there are limited examples of upload uses by students. Institutions need to ensure that they provide additional means for inclusive student use of shared resources on the web.⁴³

There must be a change from the traditional views of learning as a solitary and isolating activity that allows for the recognition and acceptance of the fact that students can become directly involved in peer tutoring,⁴⁴ assessment⁴⁵ and even research⁴⁶ activities. This fits with the work of Baxter Magolda¹¹ that sees students as adults who actively contribute to the learning process.

Educational research

Educational research is an enormous field⁴⁷ with a methodology that stretches from quantitative standardised tests to more qualitative approaches that allow data collection of the thoughts, feelings and perceptions of teachers and learners. These paradigms are not mutually exclusive. Some of the best educational research comprises a mixed method approach. For example, qualitative interviews with a relatively few dental tutors about chairside teaching could produce sufficient information to construct a questionnaire to survey a much larger population. In our study, a range of stakeholders involved in chairside teaching at one dental school were sampled using semi-structured interviews and focus groups;¹ the views expressed by representative dental tutors from around the UK were captured in a workshop.² This dialogue and hand written field notes, taken at the time, were transcribed. The text was then analysed in two different ways:

Interpretative analysis, here the text was reviewed in small chunks at a time and common themes were 'coded' using a qualitative analysis software.⁴⁸ The accumulation of themes produced a consensus view of the issues.⁴⁹

In-depth analysis. This was where the text was scrutinised as a whole to produce a number of categories that the whole data could fit into. Although based on individual statements made in interview or transcribed from groups' dialogues, the focus was on collective generality, based on a minimum number of features necessary to produce a category.⁵⁰

Whilst this kind of analysis appears to deliver valuable insights to researchers deeply embroiled in their data,²³ Webb⁵¹ and others⁵² have criticised the private and privileged status of such researchers - hence the value of taking both forms of analysis together.

Evaluation and learning organisations

The terms assessment and evaluation mean very much the same thing in general use and are often used interchangeably. However, in educational terms in higher education, their meanings are very different; assessment tends to be used largely when considering the progress of students. Stenhouse⁵³ was one of the first to contrast summative and formative assessment strategies. The essence of **formative assessment** is that undertaking the assessment constitutes a learning experience in its own right. **Summative assessment** is where a judgement is made regarding students' performance (often with a grade) that can, in dentistry, be used as evidence that they can perform a task. For effective summative assessments to be made it is important to ensure the alignment of assessment with teaching.⁵⁴ From our UK study this is an area for research and development in some schools,² with the possibility of useful sharing of good practice. However, in many schools there is confusion about the precise nature of formative assessment⁵⁵ which, in their teaching practice, amounts to continuous mini-summative assessments. Rather than seeing it as a process for grading each task or component on every occasion, formative assessment could be a more reflective process that recognises the range and extent of the work that has been undertaken as well as looking at the outcomes, and ensuring that students receive clear and constructive feedback on their progress. As professionals, new graduates should be able to *self-assess* and experience *peer-assessment* so there is scope for incorporating both these elements within the undergraduate curriculum.

Evaluation is the term used when considering the overall effectiveness of teaching and courses.⁵⁶ Early evaluations in higher education were designed

to maintain standards and to ensure that institutions were providing good value for money. Evaluations in dental schools include the General Dental Council (GDC) visitation inspections. Unlike research, evaluations are based on judgements that have to be made continuously. Patten⁵⁷ argues that if evaluations are to be meaningful there is a need to ensure a wide range of qualitative data, including interviews with the stakeholders, collected with the specific purpose of determining what and where things could be improved. More recent evaluation literature has suggested that evaluation should not be an external application but that it should be fully integrated into an organisation's work practices since it engages staff, allowing them to use their critical skills and so aid personal and professional growth within the organisation.⁵⁶ There is little evidence in our studies that dental tutors were involved with any degree of integrated evaluation processes.¹ Appreciative inquiry⁵⁶ (AI) may be a useful approach for dental educators to start to engage in evaluation of chairside teaching, because it helps to maintain the necessary dialogue in the dental team. AI avoids focusing on negative issues; rather this 'bottom up' approach to evaluation may be effective because the most important concept in AI is a continuous reference to those elements that are most valued and most successful in a programme or organisation. Applying AI to the clinical situation, the dental team must focus on the primary goal of patient satisfaction and successful dental care, rather than on areas of discontent. The essence of AI is to start with *Discovery* appreciating 'the best of what is'. Reed,⁵⁸ amusingly, says, 'What is important is *Identifying* the relevant *positive deviancy* within each local community and then getting everyone to adopt that behaviour'. The next stage is to *Dream* to imagine 'what could be'. The third critical stage is *Design* determining 'what should be'. This can best come about through asking provocative questions that bridge *Discovery and Dream*. If excellence is demonstrable somewhere - why is it only a dream elsewhere? What needs to be done to make it demonstrate excellence in this setting? The final stage is *Destiny* in determining

what participants can commit to.

There is also an education literature, which approaches learning from a power relations framework where the analysis moves away from individual learners to focus on the context where learning takes place.⁵⁹ Instead of accepting the status quo and insisting that students adapt or leave, this body of literature asks uncomfortable questions such as: Whose interests are being served by the programmes offered? Who can gain access to them? Who holds the power to make changes? This literature, which considers oppression and race, class and gender, can serve to help the dental team to examine their own beliefs, assumptions, prejudices and biases in relation to both the teaching and the provision of dental care.⁵⁹ McLean⁶⁰ gives a worrisome picture of power structures within universities where money and power are overpowering the capacity for rational examination and argument. This affects both those at the top and delivery end of education where there are 'no longer inspiring educational or moral leaders but rather line-managers who brand, budget, market and monitor'. At the delivery end, 'everyday practice teachers have become deliverers of a commodity, testers, technicians and operatives.'⁶¹ We can see these kinds of spin-offs in the clinical dental setting reported in our work.¹⁻² Part-timers at the 'coalface' see themselves supervising procedures, untrained and unappreciated. Managers avoid educational issues by keeping their distance concentrating on quality markers and their research profile.

Scholarship

Scholarship is a multifaceted concept which is currently much in debate; the role of scholarship seems to run through higher education from the most conservative and traditional to the most radical and entails the upholding of what is valued in its community of practitioners, in the broadest possible context.⁶² Scholarship can involve following tradition by simply keeping a topic or way of doing something alive.⁶³ But it is vital to determine what is of value and what expertise there is in the streams of clinical work and teaching which demonstrate mastery and as such need to

be preserved. From the work of Boyer⁶⁴ scholarship of learning and teaching in higher education is implied by peer-reviewed publications that demonstrate that work has been evaluated.⁶⁵ A willingness to share teaching methods and theories and understandings of student learning at the chairside is likely to create an overall improvement in clinical teaching. This is the process that we recommend in our paper presenting tools for dissemination of good chairside teaching practice³ where it is envisaged that dental tutors will be publishing, presenting or discussing aspects of student learning or their teaching in the dental clinic. A further aspect of scholarship that follows on from this is the way in which, by creating a forum for discussion and debate about elements of chairside teaching, ideas and actions are challenged and development opportunities are created.⁶⁶ Providing opportunities to explore different organisational structures and individual approaches to teaching within a clinical environment can help to promote good practices and so enable positive changes to occur.⁶⁷

Conclusion

The aim and purpose of educational theory can be to challenge the status quo and explore and explain new concepts. The education literature continues to show how it has moved on in its understanding of 'communities of practice',⁶⁸ 'reflective practice',⁶⁹ and 'competences approach, by considering variation.'⁷⁰ In fact, Barnett⁷¹ says that the changing milieu of higher education and the wider world is now 'supercomplex'. In consequence, lecturers should continually challenge students with examples of uncertainty to get them used to and capable of dealing with it in the real world. This should never be a problem for those charged with the role of teaching at the chairside.

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