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Making the most of teaching at the chairside

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Abstract

This paper examines the chairside as an opportunity for teaching and learning. It sets out to understand how students learn in the dental clinic so that they can better be supported in their clinical learning. The paper draws on current theories of learning to establish a rationale for effective chairside teaching. Current theories highlight the active role of learners in 'constructing' their own knowledge of a field, and emphasize the importance of active learning and reflection in this process. The paper is practical is nature. It weaves evidence from empirical studies of medical and dental clinical teaching, as well as 'best practice tips' from the literature, with theory to suggest a strategy for effective teaching in the clinical context. The paper concludes with a caveat, warning that effective clinical teaching requires an investment in time.

There is a large body of literature that sets out to understand teaching at the bedside. In contract, the literature that examines the chairside as an opportunity for learning and teaching is limited. This paper sets out to make a contribution in this regard. It responds to the call by Sweet *et al*.[1] for an understanding of how students learn in the dental clinic so that they can be supported in their learning through good chairside teaching. The paper is theoretical in nature. It draws on current theories of learning to establish a rationale for effective chairside teaching. Evidence from empirical studies of medical and dental clinical teaching, as well as 'best practice tips' from the literature, are woven with the theory to suggest a strategy for effective chairside teaching.

Teaching for learning

Students learn by constructing their own knowledge

According to current theories of learning, students learn by "constructing" their own knowledge of something[2,3] – so knowledge, therefore, cannot be imposed or transmitted by direction instruction. Such an understanding of learning is in direct contrast to traditional notions of teaching and learning[3,4] where learners are passive recipients and the teacher is perceived as the "expert dispenser of knowledge"[4] (p. 17) and controller of learning and assessment activities.

Within a constructivist paradigm, students play an active and responsible role in their learning.[4] They are required to make choices about what and how they learn.[4] The teacher acts as guide and mentor, mediating the learning environment, and facilitating learning through interaction with the students.[3,4] In

the clinical context, construction of knowledge comes when students are active in their learning, and when they have opportunities to reflect on what they are doing and what they are learning. Active learning and reflection encourage further learning, and are promoted when students are directed to outside reading and practice opportunities.[5]

Learning is an active process

If it is the learner's perspective – and not what the teacher intends should be learned – that defines what is learned,[6] then teaching needs to be targeted at changing the learner's perspective.[2] Empirical evidence from a chairside study by Sweet *et al.*[7] suggest that when students work together and talk about their activities, they are more likely to learn in a way that changes their perspective. This insight suggests that peer learning has a role to play in the clinical context, with students discussing and critiquing each other's cases, diagnoses, treatment plans and techniques. Students might work in teams, taking on the differing roles as clinicians, teachers and critical peers. Student-student interaction as an active learning context leads to elaboration, awareness of the interpretation of others, deriving standards for acceptability and meta-cognitive awareness.[2,3]

Learning is constructed as a result of the learner's activities.[2] Biggs[2] emphasizes the role of action and activity in the process of learning – as he puts it, "what the learner has to do to create knowledge is the important thing". (p. 12) Quite literally, being active in and of itself provides general alertness and efficiency.[2,8] Further, using different sensory modalities (reading, hearing, seeing, seeing and hearing, talking over with others, using and doing in real life, teaching someone else) provides multiple opportunities to access what is being learnt.[2] An empirical study by Sweet *et al.*[7] confirms that students believe that they learn best when they are actively involved.[7] This involvement moves beyond completion of procedures, and includes such activities as communicating with the patient, discussing diagnoses with peers and clinical supervisors, and planning and defending treatment plans – and later thinking about, and discussing, what could have been done differently or better.

A further mechanism for students to participate actively in the learning process is by helping to set appropriate learning objectives.[9] Jenkins *et al.*[10] warns that what learners and the teacher feel should be the outcome of an education session is not always the same. Jenkins *et al.*[10] suggest meeting with the student before the clinical session to negotiate requirements and expectations, and to discuss the kinds of learning the student wishes to get from the clinical experience and the kind of feedback that would be helpful. Similarly, this is an opportunity for the teacher to set out the learning outcomes that s/he wishes to achieve during the

session. This meeting shifts the emphasis in the clinical encounter from completing procedures against a clinical quota to emphasizing the chairside as an opportunity for learning for the novice dentist. Implicit in the negotiation of outcomes is that time will be set aside after the chairside activity to discuss the extent to which the outcomes were achieved and what further learning opportunities are required.

Promoting 'deep' learning

What people construct from a learning encounter depends on their motives and intentions, on what they know already, and on how they use their prior knowledge.[2] Biggs[2] highlights that learning is thus a "way of interacting with the world". (p. 13) He[2] suggests that the acquisition of information in itself does not bring about learning. Rather, learning is about the way that information is structured and used for thinking.[2] It is about conceptual change.[2] Deep approaches to learning facilitate conceptual change.[2,3] Students adopting a deep approach come with questions they want answered.[2]

A deep approach to learning is in contrast to a surface approach where the learner focuses on the 'signs' of learning – the words used, isolated facts, items treated independently of each other – in a way that prevents him/her from seeing the relationship between these signs and their meaning and the relationship of these signs to the structure of what is being taught.[11] Students adopting a surface approach use learning processes such as acquiring information through mechanical memorization. This involves remembering information without understanding it, then reproducing it on demand in a test.[4] A surface approach to learning is predominantly motivated by concern to complete the course or by a fear of failure.[4] Anxiety and low self-esteem are associated with surface approaches.[4]

While a surface approach to learning is usually associated with theoretical learning, it has a 'knock-on' effect in the clinical context. It is difficult for students to access information that has been learnt in a rote or fragmented fashion. Further, students (especially those who are anxious, fear failure or have low self-esteem) may continue a surface approach to learning in the clinical context. Empirical studies and guidelines for effective clinical teaching suggest helpful supervisory behaviours that reduce student anxiety, and so promote a deeper approach to clinical learning.

These behaviours relate to inter-personal conduct, communication, and the learning environment. Interpersonal behaviours that are deemed useful in clinical teachers are enthusiasm,[12] empathy,[13] "putting yourself into their

shoes",[14] approachability,[14] reassurance,[13] and compassion and caring.[13] Effective communication that supports learning includes listening to students,[5] attentive silence (which communicates that the teacher is paying attention and gives the learner time to think),[9] purposeful eye contact (to engage learners who require special teacher attention),[9] tracking (nods and grunts that indicate understanding and general approval),[9] and encouraging students to participate actively in discussion.[5]

A clinical learning environment that counters fear of failure is created through showing students respect,[5] encouraging students to bring up problems,[5] being available and receptive (encouraging students to ask questions and seek assistance),[15] 'getting off the pedestal' (relates own learning experiences to students, including problems),[15] being fun and easy to work with (cooperative, positive attitude, enjoys teaching),[15] understanding and remembering sources of stress in students' lives,[15] and refraining from 'having favourites'.[15] Providing support in a non-threatening way is helpful.[14] Ramani[16] suggests that learners should be challenged without humiliation – "augmented by gentle correction when necessary". (p. 113) Admission by the teacher of his/her own lack of knowledge might set the tone for students to admit their limitations and engenders a willingness to ask questions.[16]

The challenge for the teacher, then, is twofold – to prevent students from adopting surface approaches to learning and to provide learning activities that encourage deep approaches. To some extent, these two conditions are inter-related. It becomes the teacher's role to design learning activities that stimulate the learner to 'want to know' and thus want to engage with learning tasks at a deep level. Motivation is at the heart of this process.[2,17] Feather[18] argues that in order for someone to engage in an activity, s/he needs both to value the outcome and expect success in achieving it. To promote a deep approach, therefore, the learner must perceive the new learning to have value and be important[2,19,20] and must believe that success is possible.[2] Biggs[2] argues that assumptions of value and expectations of success are particularly important in the early stages of learning before interest has developed "to carry continued engagement along with it". (p. 58)

A number of teacher behaviours encourage students to perceive new learning as valuable and important. These include teachers who are knowledgeable and enthusiastic about what is happening in the clinical context.[13,21] They are admired and readily identified with,[2] and thus act as role models. As Biggs[2] reminds, "We can usually trace the beginning of our interest in something to someone else who exhibited that interest to us". (p. 61)

Helping students 'put it all together'

Learning is about the way that different kinds of information get structured and used for thinking.[2] Deep approaches to learning are stimulated when students engage with meaningful tasks[2] – when learning activities encourage students to think about underlying meaning, main ideas, themes, principles or successful applications.[2]

Building on the known

A deep approach to learning connects new learning with old.[2] Structuring learning around a real patient case is an effective strategy for helping students to make connections between old and new learning. This is really what chairside teaching is – the opportunity to use a patient case to help students associate existing knowledge with new applications, and to link apparently disparate bits of existing information. A number of teacher strategies help students get the most out of their chairside learning.

Heidenreich *et al.*[22] suggest 'priming' students for tasks and activities by providing a brief orientation to students prior to contact with a patient or performance of a procedure. This activity directs the student to appropriate prior knowledge. It might be included with the setting of outcomes for a clinical session discussed earlier.

Clear and precise explanations – prior to the clinical encounter, at the chairside, and during debriefing – help student to understand.[10] Contextualized, well organized explanations of the relationship between dental knowledge and clinical situations, illustrated where necessary with learning aids (for example, white board illustrations, textbook pictures, web-based resources), promote understanding and retention.[5] Knowledge should be placed in context with descriptions of wider ramifications.[10] Evidence behind the information should also be discussed.[10] These suggestions imply both that the appropriate teaching aids and the time for this contextualized teaching needs to be available in the clinical context.

Questioning helps students retrieve what they know and apply it appropriately in new contexts. "Connect-the-dot" (p. 47) questions help students to think about and verbalise their understanding of the relationships between isolated knowledge:[23]

- decision questions ("What do you think is the best option for this patient?")
- why questions ("Why have you suggested this treatment plan?")

- how questions ("How can we perform this procedure given the patient's condition?")
- what-if questions ("What if this patient was pregnant?")
- dig deeper questions ("That's a good idea, but can you think of any other way to manage this child patient?")

Heidenreich *et al.*[22] argue that the use of thought-provoking questions to teach stimulates students' thinking and allows the teacher to assess students' comprehension by analyzing answers to questions.

Further, questioning during case presentations – ie, 'coaching' students actively with questions and prompts – helps students to make associations that lead to diagnostic pattern recognition, and encourages students to focus on the key facts and formulations of a differential diagnosis rather than on descriptions of non-relevant patient data.[22] Students also need time to think, and to formulate their own questions[21] as questions structure thinking. Birnbaumer [21] reminds of the adage, 'Listen more, talk less' – a delay of as little as three seconds after questioning leads to answers three to seven times longer.[24]

Demonstration at the chairside of technical procedures and clinical reasoning needs careful management.[25] While direct guidance on clinical work may be useful,[26] telling students what to do neglects the linking of theory and practice and joint problem solving implicit in guidance.[14,26] Knowledge underlying demonstration is often tacit and not visible to students, and needs to be clearly communicated as part of the demonstration.[25] Clinical teachers should think out loud as this communicates a general framework for solving the clinical problem.[27] It also exposes students to the ambiguity and ambivalence inherent in clinical reasoning.[27]

Finally, Heidenreich *et al.*[22] warn against data overload. They suggest limiting the teaching points by focusing on one or two essential aspects during each encounter with students.[22] This caveat suggests that teaching (and learning) occur over a period of time, and raises the question of supervisor continuity. Supervisor continuity is vital.[26] A supervisor who is familiar with a student's learning needs can plan teaching that facilitates that particular student's learning.[16] Continuously changing supervisors interrupts the continuity of learning, and may account for the feeling that clinical teachers have of 'needing to teach it all'.

<u>Using error constructively</u>

In knowledge construction, students inevitably have misconceptions that need to be corrected. Mistakes left unattended have a good chance of being repeated.[28] Therefore it is important to confront and eradicate students' misconceptions.[2,3] There are three aspects to this demand – strategies to understand the nature of students' misconceptions, giving feedback that is helpful to learning, and creating a learning environment where error is part of the learning process.

Students' knowledge needs to be probed as it is forming so that misconceptions can be addressed during the formative stage.[2,3] Probing for error should address knowledge of factual information, the student's ability to analyse or synthesise clinical learning, the student's ability to apply dental knowledge to a specific patient, and the student's clinical skills as they are applied to a specific patient.[5] Feedback on error is central to effective learning, and serves to close the gap between current practice or understanding and desired practice or understanding.[29]

The quality of feedback is important. Feedback is most effective when it is timely – in other words, close to the event[26] because the memory of the performance is still fresh for both student and teacher. It should be positive, specific and descriptive.[26] Kilminster *et al.*[26] suggest that the teacher prioritises the feedback, not giving the negative feedback in "one big bundle". (p. 9) Frequent, brief and targeted feedback is more helpful.[26] It should help students enhance their skills and develop alternative approaches.[22] Neher *et al.*[28] remind that some correct actions are the result of luck, while others are deliberate. It is therefore important to provide feedback that explains what was correct and what was not, and offers suggestions for improvement.[5,25,26,30] Unless the correct behaviours are reinforced, they may never become firmly established.[28]

A learning environment where students feel free to admit error is necessary if they are to learn from their mistakes.[2] Students appreciate feedback that is provided in a positive emotional environment.[25] Grading students at this stage is inimical to learning. Grading will result in surface approaches to learning, with an emphasis on the 'right' answer rather than on understanding the nature of the error. Teaching and assessment needs to help students to feel safe to make mistakes and learn from them,[2] and includes choosing when and where to provide the feedback. Public delivery of negative feedback, whether in front of the patient or peers, creates a learning environment regulated by fear. It is thus important to have a quiet private place outside the clinic where student and teacher can discuss the clinical session. Dunne *et al.*[31] remind that to "do" (p. 155) feedback properly requires an investment in time.

Asking students for an appraisal of their own performance before offering feedback has the potential to develop self-reflective skills – a competence pre-requisite for independent practice. To create a positive learning environment, the student might be asked first to identify which aspects of his/her performance went well; then asked to identify areas of difficulty and possibilities for change and development.[26,28,32] This strategy allows the teacher to alert the student to misconceptions or incorrect practice, and provides the student with time to reflect on that practice/knowledge and the opportunity to address their own learning inconsistencies. It is a strategy that promotes active learning. Further, by allowing the student the first chance to discuss what was wrong and what could be done differently in the future, the teacher is in a better position to assess both the student's knowledge and standards.[28] The teacher should respond to the student's comments before offering his/her own.[26]

The foregoing has highlighted the importance of formative assessment – that of feedback during the process of learning.[4] It is appropriate, here, to touch briefly on the other aspect of assessment – that of assessment for decision about the students' future (ie, summative assessment).[4] Assessment drives learning[2] – in other words, students learn what they think they will be asked about in an examination, test, or clinical assessment. Therefore, assessment can be used to promote deep learning and to help students to integrate their learning – if that is how they are assessed. Biggs[2] suggests assessing for structure of knowledge rather than for independent facts. He [2] also suggests assessment activities that emphasise depth of learning, rather than breadth of coverage. Assessment should be interwoven with teaching, and should occur throughout the learning process.[3] In this way, students have multiple opportunities to demonstrate their competence in a variety of contexts. All aspects of the student's performance should be taken into account – their knowledge, examination skills, presentation clarity and logic.[10] To facilitate a deep approach to learning, students need to believe that success in assessment is possible. To this end, Jenkins[10] reminds to assess the students is a systematic and objective manner. Providing students with the assessment criteria prior to the assessment makes the process of assessment transparent and encourages students to expect success.

<u>Maximizing students' awareness of their knowledge constructions</u>

Since knowledge is constructed by the learner, the student needs to be aware of what they are doing and checking how well they are doing it.[2] Self-management strategies, including self-assessment, promote learning.[2] Some students struggle to self-assess – they are unaware that they are not competent.[23] These students also struggle to learn by simply observing clinical teachers in their interaction with patients.[23] They require precise and frequent feedback from the clinical

teacher.[23] It is arguable that such feedback is pertinent for all clinical learners. The role of feedback, and the importance of providing the student with a chance to comment on their performance, was raised above. This is one strategy to help students to self-reflect.

Further, however, students need to be made aware of the processes that they use to construct and consolidate learning. It is the teacher's role to encourage his/her clinical students to reflect on what they know and understand and what the limits are to these understandings.[33] A number of mechanisms may achieve this – the use of journals to record students' thoughts about their patient interactions, setting time aside after each patient interaction for the student to write down what questions the visit raised, and asking students to record at the end of the week the most important thing they have learned and why it is important.[33] This latter, by forcing students to think of their clinical experience over a week rather than patient by patient/procedure by procedure, also facilitates integration of knowledge.

A further strategy is to make learning explicit by telling the students what they have learnt. Before closing the clinical session with the student, teachers need to summarise what was taught and learnt during the encounter.[10,16] Time should also be allocated once the patient procedure is completed for questions, clarifications, and assigning of further reading. Consolidation of learning may require a non-clinical session away from the patient where facts and knowledge can be reinforced, and theory rehearsed.[10] Lengthy individualized theory sessions will seldom be feasible in the dental context. However, whole class sessions with a theory lecturer has the potential to consolidate the clinical experience in a way that promotes learning. Handouts might be prepared to provide take home summaries that can be used for revision.[10] During these sessions, students should be encouraged to think actively – the teacher will need to provide learning activities that encourage assimilation of information and a search for greater understanding of the subject (for example, to assess the evidence behind a hypothesis or recognize inconsistencies in an argument).[10] Such sessions will have to be planned around the combined learning needs of the class cohort of students, and to assess these needs will require the collaborative effort of all the clinical teachers.

Planning for teaching

"Active planning"[34] (p. 769) of the clinical teaching session facilitates logical acquisition of learning[21] and helps students make connections. Preparation is a key element.[12,16] Aspects that require teacher preparation include familiarity with the clinical curriculum that needs to be taught (in other words, what have

students learnt theoretically and are now required to implement and practice in the clinical context),[10,16,35] insight into the actual knowledge and clinical skill level of the particular students under supervision[10,16,22,36] and some sense of the patient profile (so as to be able to anticipate the learning needs and opportunities, and to critically evaluate a student's diagnosis and treatment plan). The need to set learning objectives with students prior to the session has already been discussed.

Ramani[16] reminds that beyond the teaching for which teachers can plan, there are spontaneous 'teachable moments' – "the ... (chairside) is the perfect venue for the unrehearsed and expected triangular interaction between teacher, students and patient". (p. 114). Such moments include excellent communication by students, or missed clues in history and physical examinations. 'Teachable moments' should be exploited, and used to applaud good work and to address deficiencies in knowledge, skills and professional dispositions.[16]

Teacher self-management during the clinical session also affects student learning.[5,14] Clinical teachers therefore need to pay attention to time management, avoid digression, and discourage external interruption.[5,14] Simply put, the clinical teacher cannot supervise adequately and promote active learning if s/he is answering mobile phone calls,[37] chatting with colleagues, or engaged with other administrative activities.

Finally, Birnbaumer[21] highlights the importance for learning of what happens after the patient encounter. Time needs to be set aside after the clinical session for the learner to reflect on his/her learning.[21] This aspect is particularly important in the dental education context where the student renders service – an emotionally, cognitively and physically demanding activity that allows little time over for 'thinking on the job'. Birnbaumer[21] suggests providing opportunities away from the patient, but contiguous with the patient session, to talk about developing understandings and uncertainties, what happened during the session and what it means, and to link these insights with what others have observed and studied (in other words, synthesizing clinical experience with theory). These activities help students to connect the experiences in the clinical session with previous knowledge and experience. This is also the opportunity to discuss what should be done differently, and what might be the next step for this particular patient.[21]

Conclusion

The foregoing discussion has highlighted 'best practice' in the light of current learning theory. None of the teaching strategies are particularly difficult. Some may require a little practice – waiting, for example, while a student marshals his/her thoughts so as to answer a question. Other behaviours might require some self-reflection on the part of the teacher – for example, the asking of uncomfortable questions like, "Do I create an environment where it's okay to make a mistake?" or "Is there a more constructive way that I could have told that student that what she did was wrong?".

However, the real challenges to implementing the suggestions indicated in this article relate to allocation of adequate time. Scheduled time is required for pre-chairside consultations and for post-clinic feedback and discussion. Further time needs to be available if students are to engage with post-clinic reflective journaling. Inadequate time will result in students and teachers 'going through the motions' rather than actually engaging in active, collaborative learning. Time will also need to be set aside for clinical teachers to discuss the kinds of teaching and learning challenges that have arisen during the week, and for whole class tutorials to consolidate clinical teaching. Faculty timetables will have to accommodate the learning needs of students and the teaching duties of teachers, over and above the time allocated to service rendering.

While it is thus tempting to dismiss the suggestions discussed in this article as 'impossible', it is arguable that dental educators do so at the peril of their students' future patients. Dental education that concentrates on a quota of correctly performed dental procedures has the potential to create future dentists who are technicians – able only to perform a procedure and unable to reason clinically, to formulate differential diagnoses, and to plan appropriate patient treatment. It is arguable that an investment in time during dental education will ensure improved patient outcomes in the future.

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