

A brief overview of learning theories in medical education: Using dental trauma as an example

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BRIEF REPORT

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ABSTRACT

The literature identifies that medical student receive little or no formal dental trauma assessment and management teaching during medical school. To bridge this important gap in medical education, medical educators should look to introduce basic dental trauma teaching into undergraduates' final year of medical school. To set up a solid foundation for long-term learning, educators should consider which theories are most suited to transfer knowledge effectively to students in particular contexts. Similarly, medical educators should consider which theory or hybrid of learning theories best fits their teaching goals. In the absence of a dental educator at the medical school, offering an online learning approach is an ideal solution for filling medical students' knowledge gap in assessing and managing dental trauma injuries.

Key Words

Dental trauma, learning theories, medical education, medical educators

Implications for Practice:

1. What is known about this subject?

Several important learning theories influence the pedagogy of medical education, broadly categorized as behaviourism, cognitivism, constructivism, experiential and social learning.

2. What key information is offered in this report?

Reaffirm the importance of a solid theoretical framework for underpinning the design and development of any learning course in medical education.

3. What are the implications for research, policy, or practice?

This article provides an overview of theoretical learning perspectives for medical education and the health professions education community.

Introduction

Several educational learning theories are prevalent in the literature which can be grouped into five broad categories: 1) behaviourism; 2) cognitivism; 3) constructivism; 4) experiential; and 5) social learning.¹ Understanding these different learning theories help educators to provide better environments to motivate students to learn.² A large part of medical education is still taught by medical professionals merely repeating the ways they had been taught medicine or related health topics.³ Through greater understanding of theories of learning, it should be the role of medical educators to apply combinations of these approaches across the medical curriculum.⁴

Behaviourism emerged in the early 1900s.⁵ From a behaviorist perspective, learning is measured by an observable increase, decrease or maintenance of identified behaviours.⁶ In this education theory, the behaviorist believes that rewarding desirable behaviours leads to learning.^{7,8} From a learning perspective, students digest a predefined body of knowledge, supported by repetition and positive reinforcement.⁹ An example of positive

reinforcement is awarding students a certificate of academic performance in examinations. This affirmation aims to encourage students to work and study hard for future tests to gain awards.

Cognitivism evolved in the late 1950s.¹⁰ The cognitive school views learning as an active process, where the learner is an active participant in the process of acquiring and integrating knowledge.¹¹ From a cognitivist perspective, learning is a cerebral process it includes receiving, decoding, storing and recalling information,⁶ and students develop the necessary skills for effective self-directed learning.⁴ Information gathered initially enters the short-term memory. If the information is not “encoded” to pass from short to long-term memory, it will not be recalled later.¹² Long-term memory provides the storage space for information and skills.¹³ There are three different types of long-term memory: semantic (memories stored as images or schemata); episodic (memories related to places and time), and procedural (items take longer to learn but once learnt, this knowledge will be remembered for a long time).¹⁴ From a learning perspective, theoretical foundations of problem-based learning (PBL) curricula conform to a cognitive orientation.¹⁵ For example, a PBL project might involve students pitching ideas on how to treat injuries to a player’s upper front teeth on a football field. Students could work independently or in groups to manage the TDI (traumatic dental injury) case and present their ideas to their classmates and teachers.

In *constructivism*, students learn and adapt their knowledge to develop an understanding of the subject.⁴ Constructivism assumes that people learn better when they control the pace of their learning.¹⁶ This theory focuses on meaningful experiences aiding students’ learning; that is, they assemble the knowledge that is considered useful rather than rote learning facts.⁷ Constructivism can be further classified as cognitive constructivism and social constructivism.¹⁷ In cognitive constructivism, learners actively ingest and accommodate new information into existing cognitive structures.¹⁸ For example, case-based reasoners solve new problems by retrieving past cases describing similar issues and adapting their solutions to fit the new situation. This differs from social constructivism whereby collaborative learning is facilitated and guided by the teacher.¹⁶ An example would be case-based learning in which interactions between teacher and student provide the solution. In 1956, Bloom established a taxonomy of learning, based on a constructivist approach, with six key elements: creating, evaluating, analysing, applying, understanding and remembering.¹⁹ This development essentially moved

learning theory on towards including issues of cognition and developmental psychology.⁶ In a similar respect to Bloom’s taxonomy, Miller’s Pyramid of Assessment looks at ways of ranking clinical competence in both educational settings and in the workplace²⁰ to help educators understand what they are testing, and question whether their assessments are valid.²¹ For example, Miller’s Pyramid provides a framework for assessing clinical competence in dental trauma education and can assist educators to match learning outcomes (clinical competencies in managing TDI) to their expectations of what the student should be able to do at a particular stage of the course.

In the last two categories, *experiential* and *social learning*, students are involved in apprenticeships where education occurs in a workplace context.⁴ Experiential learning involves reflection on experience to transform experience into learning.²² It is built on social constructivist theories of learning but situates experience at the core of the learning process.²³ For example, a hands-on clinical course that teaches a student how to reinsert an avulsed tooth into the alveolar socket after a dental injury. Finally, Bandura a social learning theorist,²⁴ suggested that people learn best within social contexts, and concepts such as modelling, observational learning and imitation facilitate learning.²⁴

A further learning theory, *online learning*, also referred to as e-learning, internet-based learning, or web-based learning, denotes the use of the internet for education.²⁵ Online teaching, a relatively new concept that emerged in the 1990s, has become widespread in the past decade.²⁵ Most recently, it has crucially supported the continuation of medical education during the unprecedented times of the COVID-19 pandemic.²⁶ There are several different theories and models pertaining to the online learning environment. The three key theoretical perspectives are *community of inquiry (COI)*, *connectivism*, and *online collaboration learning (OCL)*. The COI model, developed by Garrison et al in 2000,²⁷ supports the design of online and blended courses as active learning environments or communities, dependent on instructors and students sharing ideas, information, and opinions. Thus, COIs are designed to be highly interactive. *Connectivism*, on the other hand, is more appropriate for courses with very high enrolments and where the learning objective is to develop and create knowledge rather than to disseminate it.²⁸ Finally, Linda Harasim’s OCL theory²⁹ focuses on the capacities of the internet to provide learning environments that foster collaboration and knowledge sharing. This theory derives from social constructivism since students are encouraged to solve problems collaboratively, with the educator playing a

facilitator role, as well as acting as a learning community member.²⁹

To set up a solid foundation for long-term learning, educators should consider which theories are most suited to transfer knowledge effectively to students in particular contexts. Similarly, medical educators should consider which theory or hybrid of learning theories best fits their teaching goals.^{1,2,30} For example, in the University of New South Wales medical course, the six-year teaching cycle is divided into three phases.³¹ Phase 1 includes lectures, small group work, tutorials, and practical classes held in the laboratory. Phase 2 is based on clinical sessions held in the hospital. In Phase 3, almost all the learning is conducted in hospital settings. From a theoretical perspective, medical students begin their education learning basic sciences through a “cognitivist approach”. This is followed by clinical science learning, through interactions with patients in a “constructivist approach”. Finally, in the senior years of the medical program (Phase 3), the student learning process is influenced by the “social learning approach” via learning in hospital settings.

Introducing dental trauma as a topic into medical education

A review of the literature reports a deficiency in knowledge and confidence amongst medical doctors for assessing and managing dental trauma.³² From an education perspective, the knowledge and confidence gained from learning the essentials of dental anatomy and trauma are crucial for medical doctors to feel competent at diagnosing and treating TDI in emergency situations.³³ Having carefully considered the learning theories described above, the proposed online dental trauma course proposed will largely develop around the constructivist learning model for medical education. The authors propose the introduction of online educational learning modules on the assessment and management of traumatic dental injuries.³⁴ With online modules, the medical students can learn at their own time and this educational intervention will not impact their normal rostered timetable at the medical school.³⁵ In the absence of a dental educator at the Medical school, offering an online learning approach is an ideal solution for filling medical students' knowledge gap in assessing and managing dental trauma injuries.

Conclusion

Medical educators with a thorough understanding of learning theories can connect, combine and apply different theories within their teaching approach to maximize all student learning. To bridge this gap in medical training, the

authors propose a constructivist approach for teaching dental traumatology to medical student's using online educational learning modules.

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