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# Active learning in medical education: Strategies for beginning implementation

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## Abstract

Medical educators often deliver complex material in a format that does not allow the positive learning engagement recommended by cognitive researchers and theorists. Intentional engagement and active learning pedagogies change the nature of learning, while simultaneously improving knowledge gain and recall abilities. Students find the work more interesting and thereby put more effort into it. Historical perspective reveals that medical faculty need to make changes in their teaching methodologies. However, transforming pedagogical practice is difficult, as medical faculty have not had much exposure to pedagogical theory or training. While simple steps can be taken to alter basic lecture formatting, these steps may be unfamiliar to medical faculty. Seven methods for adapting parts of lectures are described. Practice with such methods may engender exploration of epistemological and cognitive aspects of deeper understanding.

## Introduction

A growing literature extols the benefits of active versus passive learning in medical education (Carlin 1989; DesMarchais et al. 1990; DesMarchais 1993; Richardson & Birge 1995; Rich et al. 2005; Foord-May 2006). Since the introduction of problem-based learning (PBL) nearly three decades ago (Moust et al. 1997), to the more recent appearance of team-based learning (TBL) in the past few years (Hunt et al. 2003), active learning has become a buzzword for medical educators. This makes sense, as cognitive science and learning theory have shown active learning to be a superior experience in classrooms, creating a deeper understanding of content material (Fink 2003).

Ironically, a concurrent literature is also growing, though this one bemoans the lack of pedagogical change in medical education (Rudland & Rennie 2003; Cohen 2004; Hurst 2004; Iedema et al. 2004; Rajan 2006). Teachers in medical schools, lacking pedagogical training, generally teach as they were taught in undergraduate and graduate school (Hurst). Though the science of medicine has changed tremendously over the past 50 years, the same cannot be said for teaching in medical classrooms. They are still lecture driven, with little critical engagement occurring between students and faculty (Cohen).

At issue is the mechanism of change. Medical faculty understand the complexity of scientific change, regarding it as of paramount importance. When research uncovers evidence for a particular biological function and/or treatment, that knowledge is directed toward patients and students. This change is a natural function of medical education, meeting with little resistance.

On the other hand, pedagogical change is not a natural function of medical education (DesMarchais et al. 1990; Foord-May 2006). With no pedagogical background, most

medical faculty behave like most higher-education faculty and approach teaching as the information-imparting instructor (Kember 1997). This simplistic understanding stems from the mistaken belief that, to be a good teacher, one only needs an exceptional grasp of the material (Fang 1996).

Clearly, an expanded view of teaching needs to be embraced by some medical faculty. Considering the two contrasting literatures just mentioned, what might assist medical faculty to develop more active learning pedagogies?

First, medical faculty may need a primer on active learning. This paper will describe active learning pedagogies, based on the findings of cognitive and education science. Second, faculty may need to compare teaching styles. This paper will describe a set of basic, significant learning activities specially designed to begin the process of transforming lectures into active learning frameworks. Admittedly, these steps are small

## Practice points

- Transforming medical pedagogy is a necessary step for improving learning environments in medical education.
- Pedagogical transformation for medical faculty may be difficult due to no prior pedagogical training.
- Strategies for engendering a more active approach to learning are accessible and applicable to existing content modules.
- Lectures (passive learning) can be adapted into active learning engagements with no loss of content material.
- Active Learning involves both the instructor and the students working cooperatively.
- Active learning pedagogies engages the learner so that knowledge gain and recall are increased.

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in the development of active learning paradigms. Yet beginning the transformation on a scaffold of method establishes a clearer path toward change. Once methods are understood, a more philosophical look at teaching can ensue. This paper will conclude by speculating on that process.

## Active vs. passive learning

Contemporary views of learning posit that people construct knowledge based on previously held beliefs and experiences. This process is an ongoing interaction between the learner and the experience (Bransford et al. 2000). In this sense, active learning is metacognitive, giving the individual a picture of how she/he learns.

Bonwell & Elison define active learning as ‘anything that involves students in doing things and thinking about the things they are doing’ (1991, p. 2). In other words, for learning to be active, learners not only need to do something but also need to reflect on what they are doing. Active learning is learner-centered, where the individual’s needs are more important than those of the group (Duckworth 1987). Once needs are discerned, teachers devise learning opportunities that advance student understanding in the content area (Vye et al. 1998).

Designing active learning engagements means finding ways to merge what the *students* will do with what the *teacher* will do (Chickering & Gamson 1987; Brown & Campione 1994). Not to consider the latter is to remain in paradigms that disconnect the teacher from the student, negating the power of learning relationships. Active learning pedagogies change the teacher–student relationship to a learner–learner relationship.

Active learning falls under many taxonomies (Piaget 1978; Bonwell & Elison 1991; Lehrer & Chazan 1998; Fink 2003; Bulpitt & Martin 2005; Kimonen & Nevalainen 2005). For ease of understanding, we will discuss it as made up of three interrelated components: *intentional engagement*, *purposeful observation* and *critical reflection*.

*Intentional engagements* are experiences where learners perform what we want them to learn. These performances may be set in real or simulated contexts: learners take a medical history; they perform a physical exam; they communicate the bad news of a particular condition to a patient.

*Purposeful observations* are experiences where learners watch or listen to someone doing what we want them to learn. These observations can be real or simulated. Students observe a cardiology procedure; they observe instructors modeling the thought processes applied to understanding symptoms; they observe interactions between a physician and a patient where the patient speaks a different language from the physician.

*Critical reflection* experiences round out the triad of active learning components. Reflection is defined as thinking about how meaning is made. People make meaning based on their experiences and on the information and ideas they encounter (Fink 2003). Much of meaning-making remains unconscious if it is not reflected on.

Active learning combines engagement and observing with reflective experiences. Students perform or observe a certain activity, and then they reflect on the way that experience has activated specific learning patterns. Intentional engagement or purposeful observation, done without the reflective

component, is just experience, and it is not clear that experience by itself does little more than confirm previously held prejudices (MacLellan 2005).

In these ways, active learning is different from passive learning, though passive learning is important to the learning process, and its role should not be downplayed (Fink 2003). However, as a method it fails to connect students directly with the knowledge and skills they need to learn. Passive learning occurs when students read an assigned article, chapter or book; when they attend a lecture; when they watch a film. Active learning occurs when each of those activities is combined with engagement, observation and reflection.

The difference is not just observable, it is ideological. Whereas passive learning presupposes that knowledge can be transferred from one person to another, active learning presupposes that all knowledge is constructed by the learner. Each offers a very different kind of epistemological underpinning. Passive learning perceives knowledge as a commodity, whereas active learning perceives knowledge as experience created by the individual’s meaning-making processes (MacLellan 2005). Contemporary learning theory extols active learning as the significant process of human understanding (Bransford et al. 2000).

Designing active learning engagements means discerning ways to activate the learners’ experiences so their previous world comes into direct contact with the new world being explored. This juxtaposition, when followed by significant reflection, builds frameworks upon which new learning functions.

In active learning environments, teachers are less concerned with content, and more concerned with stimulating reflective critiques of the nature of knowledge. Learning situations are designed so students grapple with ill-structured problems or evaluate a discipline’s inquiry patterns. Active learning pedagogies develop, evaluate, and revise mental models and schema used to understand the world.

## Strategies for moving from passive to active learning in lectures

Transforming teaching methods is a difficult process. According to Hativa (2000), it involves not only a modification of classroom practice but also an exploration of beliefs, especially those about learning. Concerning beliefs that deter teaching modification, many faculty:

- regard the adaptation of instructional practices as equivalent to lessening academic quality (Hativa 1998);
- believe that teaching is transferring knowledge from one person to another (Fang 1996);
- believe their job mandates covering all pertinent and available material (Smith 1995).

However, significant research (Minstrell 1989; Bonwell & Elison 1991; Cashin & Downey 1995; Barron et al. 1998; Bransford et al. 2000) demonstrates these beliefs to be detrimental to good learning. Suffice it to say that one major obstacle to developing active learning pedagogies is teacher belief.

Much has been written on teacher beliefs, so this paper will not delve there. Rather it will present ways for medical faculty to begin transforming pedagogical style. This section will describe simple strategies for medical faculty who are willing to take on pedagogical change but, for some reason, lack the background knowledge to begin the process.

### Breaks as action moments

As the predominant teaching method in higher education is the lecture (Fink 2003), it is safe to assume that most medical faculty probably use this method to a great extent. Accepting that faculty are comfortable in that stance, and that it will maintain its role of prominence, these first two adaptations only barely change the nature of the lecture model. However, both effectively create moments where students are differently engaged with the material, thereby offering opportunities for critical reflection and interaction.

- *Pause Procedures*: During the course of the lecture, the instructor makes regular pauses of three to four minutes during which the students work in pairs to make collaborative notes on the major issues of the lecture up to that point or since the last pause. These pauses need to occur regularly, with lecture intervals not exceeding 18 minutes (Ruhl et al. 1987). Essentially, this simple adaptation involves a low level of doing and reflecting into the process of listening to a lecture.
- *Bullethead Breaks*: Considering that most lectures are organized around some kind of outline, the instructor can take parts of the lecture and move them from oral delivery to print format. At some point in the lecture, the instructor distributes a set of unordered bullet points. These points make up what would be five or six important issues in the lecture. Students work in groups of three or four to categorize and order the points, as well as to generate one or two questions to be asked of the instructor. This work takes approximately 25 minutes, including the asking of questions to the instructor. Essentially, this adaptation involves a higher level of doing and reflecting, though it maintains the basic status of the lecture.

### Questioning techniques

Many lecturers pepper their presentations with an assortment of questions to their students. Questions change the tone of the presentation, for more than just the time that the question is 'out there' looking for a responder. When members of an audience know that questions may be asked of them, they listen differently.

Questions allow instructors to diagnose the level of student understanding, while simultaneously involving the students in the construction of knowledge. There are several ways to consider the use of questioning in teaching, and each of these would do a good deal to change the nature of lectures.

- *Targeted Questioning*: Many instructors ask open questions of their students: 'What is the condition pediatricians diagnose most often?' These questions often become rhetorical as soon as it is clear that no one is offering an

answer. A better method is to select a student and then ask the question. Selecting the student changes the nature of the question. Suddenly it is a question that needs to be answered. The conversation is transformed from the 'one-speaking-to-many' to a 'one-on-one' type immediately. An intimacy is created in what may have been a fairly informal place. Such a transformation engages the student quite differently, and the reflection possibilities are great. In medical education, this is important because students will be having very intimate conversations with their patients, conversations that transform themselves quite quickly depending on the knowledge being shared.

- *Follow-up Targets*: After some practice with targeted questioning, or concurrent with its beginning, a good addition involves asking a second student what she/he thinks of the first student's response. Again, the student is selected before the question is asked: 'Samantha, what did you think of John's idea that pink eye is the most diagnosed condition?' Samantha can now answer in several ways, all of which should inform the instructor of the nature of her knowledge. Follow-up targets can begin a conversation between students; they can begin larger discussions and/or debates. They can involve more students as it is even possible to follow up the first follow-up target, though diminishing returns come at about the third person in.
- *Connection Questions*: We want students to pay attention to our lectures. Questions help us get that attention. We also want them to be critically engaged. Connection questions can help to this end. In a nutshell, connection questions recognize knowledge systems. No knowledge is 'out there' on its own but rather is connected in myriad ways to other knowledge. This is no surprise to medical faculty. Students, though, often need reminding. Connection questions can be as simple as 'what are the similarities between tinea capitis and hand-foot and mouth disease?'. These are issues that are generally thought of as facts easily placed in a presentation. Treated as a question, though, the nature of learning that fact is changed. Connection questions can also be used as precursors to the next material to be covered in the lecture. 'Samantha, after dealing with this case of roseola, and considering I want us to stay in the same age group, is it possible we'll be dealing with hand-foot and mouth disease next?' Again, such questions can help instructors diagnose their students' strengths and weaknesses as well as create an atmosphere of full group involvement.

### Case scenarios

Medical education is not unfamiliar with case-based learning. PBL has made its name through this method, and TBL is doing the same. Yet case-based decision-making is often overlooked when instructors organize their lecture material. This is too bad, because material not processed through the decision-making functions of the mind is less likely to be recalled after an extended period of time (Fink 2003). Reworking minor and major points of the lecture into cases that engender instructor/student interactions can be a powerful transformation to the learning environment.

- *Cases for student decision-making:* Turning lecture material into cases is generally an easy process. Rather than presenting the data on the clinical manifestations, treatment and control measures of a childhood rash, the instructor could describe a hypothetical case and then engage the students by getting them to establish (or raise questions about) the pertinent characteristics of each area. This simple alteration intentionally engages the students in a topic on which they can critically reflect, conjoining two aspects of active learning. Plus, it gets them using the kind of thoughtful analysis they will need as physicians.
- *Cases for modeling:* Cases can also be used to model the thinking and analysis medical professionals actually use. After presenting the hypothetical case to the students, the instructor can then take some time and think aloud about the aspects that will reveal the case's significance. By speaking aloud the cognitive process used to identify the clinical manifestations, symptomatic characteristics, potential treatment plans and long-term control measures, the instructor serves as a model students can observe. Thus, as with the student decision-making cases, this activity combines two components of active learning. Cognitive modeling is a far too little used strategy, and one that is within the grasp of nearly all medical faculty based on their content area expertise. Students rarely get an opportunity to observe the cognitive processes of decision-making, especially in classes that merely deliver the 'facts' of a condition/case to them in lecture.

All of the activities/methods shown here are easily placed within the context of an already designed lecture. In many ways, the format could still be called a lecture, though certain elements within allow for a changed engagement. Active pedagogies change the nature of the learning experience, but they do not always require wholesale changes of the material to be delivered. Simple changes in the presentation can begin the process of developing a more active learning pedagogy.

## Discussion

Most instructors in higher education believe they promote critical thinking and active learning but, in fact, only 9% engage in these activities regularly. Only 8% can identify active learning in practice (Paul et al. 1997). These same instructors report on the positive nature of their lectures when, in fact, lectures consume an inordinate amount of class time (Fink 2003), do little to assure that content material is well learned (Meister 1998), and offer information in a singular style when evidence points to a broad range of learning styles among students in higher education, including medical schools (Curry 1999). All of this emphasizes Cohen's comment that:

[a] majority of educators within medical education employ teaching methods that knowingly fail to change physician behavior and thus cannot be expected to improve the quality of care physicians provide to their patients. (2004, p. 2)

To address this situation, pedagogical transformations are needed. However, with little pedagogical training, many

medical faculty will be unable to enact such change. Primers like the examples offered here do not create immediate active and significant learning experiences, but they do acknowledge the need for more interactive approaches to learning in medical education.

Once such an acknowledgement occurs, once medical faculty begin the work of transforming passive into active learning experiences, the epistemological concerns of medical pedagogy can be explored. Faculty who move away from the simplistic view that teaching is merely transferring knowledge begin to rethink knowledge itself. Future pedagogical work will include helping medical faculty explore the different kind of knowledge demands that are put upon medical students. These differences require different styles of active learning, as well as different frameworks for how medical knowledge is constructed by the individual learner.

At that time, learning frames can be completely redesigned, as instructors will have transformed their understanding of learning writ large. Knowing that students need to engage, observe and reflect in order to be actively involved in the learning informs instructors how better learning engagements might be constructed.

Ideally, the primer offered here will begin the process of exploring those epistemological concerns. Each activity engenders interactions between instructor and student, manifesting behaviors befitting the active learning components of intentional engagement, purposeful observation and critical reflection. While not a panacea, these steps may be a beginning for faculty to explore the idea of active learning in their classrooms. If so, they are worth the experiment.

## Notes on contributor

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