

# The reverse classroom: lectures on your own and homework with faculty

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## ABSTRACT

With the arrival of a technologically proficient generation of learners (often described with the moniker “digital natives”) into Canadian medical schools and residency programs, there is an increasing trend toward harnessing technology to enhance education and increase teaching efficiency. We present an instructional method that allows medical educators to “reverse” the traditional classroom paradigm. Imagine that prior to an academic half-day session, learners watch an e-lecture on their own time; then during class, they do “homework” with tailored consultations from a content expert. The reverse classroom uses simple, readily accessible technology to allow faculty members to engage learners in high-order learning such as information analysis and synthesis. With this instructional method, the inefficient, repetitious delivery of recurring core lectures is no longer required. The reverse classroom is an effective instructional method. Using this technique, learners engage in high-order learning and interaction with teachers, and teachers are able to optimally share their expertise.

## RÉSUMÉ

Avec l'arrivée de la nouvelle génération d'apprenants habiles en technologie (on dit souvent d'eux qu'ils sont «nés avec l'informatique») dans les écoles de médecine et les programmes de résidence au Canada, les professeurs ont de plus en plus tendance à recourir à la technologie pour améliorer la qualité de l'apprentissage et l'efficacité de l'enseignement. Nous faisons état, dans le présent article, d'une nouvelle méthode d'enseignement qui permet aux professeurs en médecine d'«inverser» le paradigme classique d'enseignement magistral. Imaginez la situation suivante: les étudiants assistent à un cours à distance, à leur propre rythme, avant une séance d'enseignement d'une demi-journée; puis font leurs «travaux» en classe, en la présence d'experts en contenu, qui leur prodiguent des conseils personnalisés. L'enseignement «inverse» en classe repose sur des techniques simples, facilement accessibles pour permettre aux membres du corps enseignant d'intéresser les étudiants à un processus d'apprentissage subtil, tel que l'analyse et la

synthèse d'information. Avec cette méthode d'enseignement, finie la répétition fastidieuse de cours de base, qui reviennent année après année. La méthode «inverse» de travail en classe est une méthode efficace d'enseignement. Grâce à cette nouvelle façon de faire, les apprenants s'investissent dans un processus d'apprentissage approfondi et d'interaction avec les enseignants, et ces derniers peuvent transmettre efficacement leurs connaissances spécialisées.

**Keywords:** instructional method, medical education, teaching, technology

Three emerging trends in medical education have the potential to significantly alter traditional instructional methods. First, the growing clinical, administrative, and research demands placed on faculty limit contact time with learners. Second, the seemingly endless expansion of core content within curricula necessitates improving learning efficiency. Third, the rise of a technologically proficient generation of learners (often described with the moniker “digital natives”) provides the opportunity for demands on faculty contact time and curriculum content to be partially addressed through instructional methods that leverage new technologies.<sup>1</sup>

## RATIONALE

The lecture format is often viewed as inextricably linked to medical education, having served people from Hippocrates, to Galen, to Osler. Although lectures are often viewed as “traditional,” the use of this term should not be seen as an indictment. In fact, lectures are efficient ways to connect complex ideas and evoke passion for a content area. They are also an efficient use of faculty time provided that the teacher-learner ratio is

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appropriate and the educational material is not suitable for an alternative instructional method such as directed readings.<sup>2</sup> However, lectures typically evoke passive learning, where learners are neither challenged to effectively construct knowledge nor code information using multiple retrieval cues. Passive learning in a lecture may result from both limited opportunities for reflection and an inability to tailor content to the varied ability levels of an audience.<sup>3</sup> Perhaps the greatest limitation is that lectures cannot promote learning at the higher levels described in Bloom's taxonomy of learning: analysis, synthesis, and evaluation.<sup>4</sup> Rather, the emphasis is typically on the transfer of knowledge and the initiation of comprehension by the learner.

Electronic lectures, also known as e-lectures, partially address the shortcomings of the traditional lecture. An e-lecture is a traditional lecture delivered via a digital platform (e.g., web-based streaming, video, screen cast, etc.) and can incorporate and link ideas not found in other resources. It can be paused while additional resources are searched, replayed to review a complex idea, or advanced to allow individuals to move ahead at their own pace. An e-lecture is always accessible, regardless of the competing demands of teachers and students in a crowded curriculum and clinical environment. The Khan Academy is a powerful example of e-lectures networked together to provide a digital curriculum for primary and secondary school students (<<http://www.khanacademy.org>>).<sup>5</sup>

### **DESCRIPTION OF THE INNOVATION**

The reverse classroom requires students to learn basic and foundational concepts outside of class time using e-lectures. Class time is then focused on individual or group "homework" using an assigned problem. This focuses learning toward Bloom's higher levels of analysis, synthesis, and evaluation. With this approach, the teacher functions as a consultant, assisting with complex questions that arise from the homework and tailoring responses to the specific learning needs of an individual or small group. Faculty members no longer inefficiently and repeatedly deliver core content lectures. Rather, their content expertise and teaching skills are leveraged for maximal gain by addressing high-order and specific questions. Individualized learning consultations are the end result.

We applied the reverse classroom technique in the McMaster emergency medicine residency program

during academic half-days in 2011. Through this, three faculty members (the authors) were involved in this method of delivery with 38 junior and senior emergency medicine residents. This educational approach was also used with the chairs of 15 different Canadian specialty committees during a national half-day workshop in 2011. The topics covered included approaches to undifferentiated abdominal pain, gastrointestinal emergencies, tick-borne illness, and teaching CanMEDS in the clinical environment.

In our reverse classroom, we created 1-hour (or multiple 15 minute) e-lectures using free, simple-to-use software (<<http://www.screencast-o-matic.com>>). Opting for expediency over production quality, e-lectures were recorded on the first take. These were hosted via free Internet services (youtube.com and docs.google.com), ensuring easy access. Each classroom session began with a pretest to ensure student preparation and to facilitate new learning. The pretest not only provided a marker of compliance with viewing the e-lecture but also both a stimulus for learning (education effect) and formative feedback to learners about their own needs (catalytic effect).<sup>6</sup> The classroom session included a general question-and-answer period on issues that arose from the e-lectures; a large group discussion of the answers and issues that emerged from the pretest; and a series of cases relating to the clinical topic that were worked on in small groups.

### **DISCUSSION**

From informal inquiry, participants appeared satisfied with this instructional method. Self-reported compliance with watching the e-lecture in advance of the homework session was unanimous. Nearly all respondents indicated that they had rewatched a portion of the e-lecture to emphasize an area with which they were unfamiliar. All respondents felt that the interactive classroom sessions allowed them to maximize their use of an expert and focus on specific and high-order learning needs.

E-lectures are no different in structural design from traditional lectures, and guidelines for effective communication must still be observed.<sup>7</sup> The technical sophistication of e-lectures depends on the facility of the developer. Simple screen casts (recorded audio voice-over paired with digital slides) can be enhanced using embedded video and digital illustration software. Creative Commons illustrations (<<http://creativecommons.org>>) and public

domain photos (e.g., Flickr) can be used to ensure ethical and legal distribution of an e-lecture.

To realize the maximum potential of the reverse classroom, learners must be given time to process the material covered in the e-lecture. Providing the questions and problems to be covered in advance of the class homework session is a function of the type of clinical case and the flexibility of the curriculum.

Finally, when mapped to a curriculum blueprint, the reverse classroom appears to increase the educational activities of learners. However, we believe it simply captures (and increases the efficiency of) hidden, unaccounted learning tasks that have always existed, such as prereading for a lecture. Reverse classrooms may even enhance buy-in for unscheduled study because they increase the amount of interaction and meaningfulness of the classroom interaction. The first iteration of a reverse classroom increases the work required of faculty because they must record an e-lecture in addition to providing consultative advice during the class homework session. However, the education benefits discussed above warrant this one-time increase in faculty workload.

### **SUMMARY**

The reverse classroom is an effective instructional method. Using this technique, learners engage in

high-order learning and interaction with teachers, and teachers are able to optimally share their expertise.

**Competing interests:** None declared.

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