TWELVE TIPS

Twelve tips for "flipping" the classroom

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Abstract

The flipped classroom is a pedagogical model in which the typical lecture and homework elements of a course are reversed. The following tips outline the steps involved in making a successful transition to a flipped classroom approach. The tips are based on the available literature alongside the author's experience of using the approach in a medical education setting. Flipping a classroom has a number of potential benefits, for example increased educator–student interaction, but must be planned and implemented carefully to support effective learning.

Introduction

The flipped classroom describes an educational approach that reverses the traditional lecture and homework elements of a course. Students are first presented with course material in advance of class: they read a book chapter, watch a video or listen to a podcast. Class time is then freed from simple delivery of information and used for other purposes, notably small group, active learning exercises (Bishop & Verleger 2013). This approach has received a large amount of recent attention in the media and educational research literature.

If you accept the loosest definition of the term "flipped classroom", the idea is neither new nor novel. One of the first recorded examples comes from the early 1800s, when General Sylvanus Thayer instructed engineering students at the US military academy at West Point, New York, NY, USA to self-source content prior to class (Musallam 2011). This allowed Thayer to use class time for exercises in critical thinking and group problem solving. Many credit the rejuvenation of this idea with the development of, and increased access to, educational technologies. Bishop and Verleger (2013), authors of a comprehensive survey of flipped classroom research, use a description that highlights the role of technology, calling it "an educational technique that consists of two parts: interactive group learning activities inside the classroom and direct computer-based individual instruction outside the classroom".

Current research evidence shows that the flipped classroom has a number of potential advantages. These include increased opportunities to provide individualized education to learners and to incorporate evidence-based teaching techniques into existing courses (Kachka 2012a; Johnson 2013). In addition, the approach allows educators to optimize their time; flipped classrooms increase educator–student interaction time as the educator is present when students attempt to analyse and apply new knowledge (Bergmann et al. 2012; Johnson 2013). Educators who have used the approach say that the flipped classroom improves student self-direction and encourages students to take responsibility for their own education (Bergmann et al. 2012). Students also report enjoying the flipped classroom, particularly the flexibility associated with being allowed to move through material at their own pace (Johnson 2013; Butt 2014).

There are, however, challenges associated with "flipping" a classroom. One of the main pitfalls discussed in the literature is the increased time and work involved in remodelling course material (Wagner et al. 2013). In addition, the approach requires that students are self-motivated and take responsibility for their education. It is a valid concern that the flipped classroom will not support effective learning if students fail to engage with the assigned pre-class or in-class activities (Kachka 2012b).

For those considering whether or not to flip their own classroom, a valuable question to ask is: "Do I use the time I spend in front of my students to best effect?" If the answer is "no", then a transition to the flipped classroom, or adoption of at least some of its features, could represent a simple and practical way of reinvigorating teaching and learning. In this article, we look at twelve tips for medical educators who are considering a transition to a flipped classroom approach.

Tip 1

Use recognized educational theory and evidence-based techniques to drive your flipped classroom

There's a common misconception that the strength of the flipped classroom centres on the use of technology, for example moving lecture material into online, video-recorded presentations (Bergmann et al. 2012). Although educational technology has revolutionized the flipped classroom concept, this resource should support, rather than drive, decision making with regards to creating a model for effective learning.

In a study exploring the use of technology in the medical education classroom, Rowe et al. (2013) discuss its benefits

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and limitations: "information and communication technologies (ICTs) allow for the displacement of content away from the classroom, freeing-up time for interactive engagement with other students and the educator. When combined with the possibility for enhancing content with rich media, ICTs were acknowledged to have a potentially powerful role to play in the development of attributes relevant for clinical practice. However, (study participants) also discouraged the use of ICT for its own sake, suggesting that a sound pedagogical teaching strategy must drive and support the implementation of technology in teaching practice".

The technology that we decide to use, or not, is only part of the equation. When a decision to flip is made, educators should first consider the recognized essential elements of course design. These include conducting needs assessments, determining content and learning outcomes, and selecting appropriate educational and assessment methods (Lockyer et al. 2005).

Tip 2

Capitalize on the positive features of the flipped classroom

Considering the significant time and effort involved in course redesign, it is important that any investment into a flipped classroom approach capitalizes on its positive features. Medical educators are advised to reflect on how the approach may be used to integrate new topics, methods, and people onto a course, or solve other existing challenges. For example, flipped classroom models have been used successfully to involve external subject experts, who would otherwise have been excluded from being educators, due to limitations of time or geographical location (Wagner et al. 2013). Another recognized advantage of the flipped classroom is its ability to create time and space in an existing curriculum for educational innovations (Kachka 2012a). Once the delivery of content (either whole or partial) has been removed to an online environment, class time now becomes a space to introduce a wide variety of evidence-based educational models, for example experiential learning, team-based learning, and problem-based learning (Kolb & Kolb 2005; Klegeris et al. 2013; Ofstad & Brunner 2013).

Tip 3

Decide how you want to organize your course material

One of the first decisions that the flipped classroom educator faces is how to divide the course material into two elements: what will be addressed prior to class and what will be addressed during class. We can use educational models such as Bloom's taxonomy (revised) (Anderson & Krathwohl 2001) to help organize the approach. For example, pre-class activities are used to support lower levels of learner cognitive work (e.g. knowledge and comprehension) and in-class activities are used to facilitate higher levels (e.g. application and analysis).

This stage of planning is also an appropriate place to consider what course material needs prioritizing. Medical educators often face the challenge of covering expanding scientific knowledge to a backdrop of increased competition for students' time (Densen 2011). With a flipped classroom approach, educators can encounter the risk of "dumping" content into an online learning environment, resulting in information overload for students. Excessive content has been highlighted as a concern for students in several flipped classroom studies (Johnson 2013; Wagner et al. 2013).

A well-designed classroom flip should facilitate efficiencies in teaching and learning. Ideally, the time allowed for pre-class and in-class activities in the flipped classroom should mirror, or be less than, the time used for lectures and post-lecture homework in the traditional classroom.

Tip 4

Invest in your choice of pre-class activities

An important component of the flipped classroom formula is the pre-class activities, which (as highlighted above) should be informed by evidence-based teaching methods (Wagner et al. 2013). Educators should consider how course material will be delivered prior to class, in what format, and how to assess effective student learning. It is necessary to design online pre-class activities with students can, and are willing to, engage (Ellaway & Masters 2008). For example, consideration needs to be made to accessibility; if course material is delivered online, do all students have access to appropriate technology and reliable internet?

Much of what is written on the flipped classroom centres on the use of video-based instruction. The literature highlights many advantages of the medium, for example learners come to class better prepared when they are provided with videos rather than textbook readings (Bishop & Verleger 2013). It is, however, also recognized that educators, particularly those with time constraints or low confidence in using technology, may find the idea of creating video-based course material unappealing (Shimamoto 2012; Snowden 2012; Johnson 2013). Fortunately, there are many ways in which course content can be delivered through video, some of which require little technological expertise. Educators can choose between using content from external sources such as Vimeo and iTunes University, or producing their own. This latter option can be as simple as synchronizing an audio narration to a series of PowerPoint slides. Other solutions include screencasting applications, for example Camtasia, ShowMe. As with many other facets of the flipped classroom, there is no "one-size-fits-all" solution.

Video-based instruction is not the only, or necessarily "best", way of delivering content (Figure 1), and an online virtual learning environment (VLE) presents an opportunity to support flexible, learner-centred material (Ellaway & Masters 2008). For example, students are given the choice of learning about a topic through viewing a video, reading a paper, or completing a computer-assisted learning module; the formats are different but the course material and learning outcomes remain the same. There is extra effort involved in producing

Externally produced video content	iTunesU: Large online catalogue of free educational content TED-Ed: Free videos available which can be customised by educators for use with own students Vimeo: Video-sharing website, not restricted to educational content
Presentation software	Microsoft PowerPoint: Most well-known presentation software, slides can be narrated to produce short videos Powtoon: Software which allows users to develop colourful animated presentations
Screencasting software	Camtasia: Allows capture and personalisation of videos, can be viewed from mobile devices ShowMe: Free iPad app that allows educators to create and share whiteboard-style lessons with students
Learning management systems	Moodle: Open source web platform for online learning activities Blackboard: Commercially available platform for online learning activities
Other content delivery applications	Edmodo: Virtual learning environment with online discussion and poll facilities DropBox: Web-based repository, allows educators and students to share documents and large attachments Educlipper: Online social platform, allows educators to collect, store and share web resources with students
Social networking applications	Twitter: Online social networking platform where 'hashtag' categories allow students to hold online, interactive discussions during class Wikispaces Classroom: Wiki application which allows students working in small groups to record and playback discussions, either to group or during plenary session
Video-calling and webcast software	Skype: Video-conferencing tool, allows outside speakers to be involved in classroom discussions from a different location GoToMeeting: Webcasting tool that allows educators to share screens and interact with an outside speaker
Audience response systems	TurningPoint: Commercially available 'clicker'-operated system, allows real-time feedback and polling
Other polling applications	Poll Everywhere: Web-based alternative to clickers. Free for audience size up to 40 people

Figure 1. Technology available to support the flipped classroom.

diverse versions of instructional material, but this approach is thought to better address students' different learning styles and preferences (Cooper 2000). For further information on technology available to support a flipped classroom, see Figure 1.

Tip 5

Utilize VLEs to best effect

Modern VLEs, for example Moodle, Blackboard, can be used to support learning beyond simple presentation of didactic content. A specific feature is that learners can interact with core course material in a more active way, that is learners become involved in authentic projects and problem-solving situations, which hold the concept of enquiry-based learning at their centre (Berge 2002). Active learning techniques that work in the classroom can be adapted easily to the online environment. For example, an educator can ask students to discuss what they considered the most challenging concept they met in the content material (i.e. the "Muddiest point" exercise). The resulting conversation, through discussion boards or chat rooms, can encourage peer learning, and allow the educator to determine gaps in student comprehension (Faust & Paulson 1998).

Where a VLE supports learner–learner or educator–learner conversations, educators should consider the goals of such interaction; is individual reflection or evidence of group work a part of the learning outcomes for this flipped classroom?

(Berge 2002). In addition, educators should define what format online interaction will take. Useful questions include: should communication be synchronous or asynchronous? Do discussions require heavy, light or no moderation from educators? Are discussions saved and used in any way, for example learners given course credit for participation, and how is this communicated?

Tip 6

Use class time creatively and effectively

Another key advantage of the flipped classroom is that class time can be freed from delivery of material and used for more creative teaching and learning methods. Again, it is important to align in-class activities with evidence-based instruction. Rowe et al. (2013), on investigating the integration of technology in medical education, recommend that we use "teaching activities that are learner-centred, interactive, integrated, reflective and that promote engagement". This potential for innovation in the curriculum now asks the educator to consider: "How do I use the time I spend in front of my students to best effect?"

Most flipped classrooms use class time to facilitate active learning exercises, and a wide variety of methods, for example peer support groups, case-based learning, and experiential learning, has been described in the literature. This variety makes it difficult to draw any firm conclusions on what methods work best, and this has been highlighted as an area that needs further research (Bishop & Verleger 2013).

Whatever educational methods are adopted, the flipped classroom normally allows for increased educator–student interaction during lectures. On a practical level, this means that students can get support and clarification as they work through problems, whilst educators get real-time feedback on the in-class activities and what specific topics cause confusion for the students. Both students and educators report that this increased interaction is one of the most valuable features of the flipped classroom (Snowden 2012; Johnson 2013). For further information on technology that can be used during class time, see Figure 1.

Tip 7

Utilize the flipped classroom to tailor education to your learners' needs

Educational technology can be harnessed in flipped classrooms to tailor education to learners' needs. For example, educators can use online interactive exercises such as discussions, quizzes, and computer-assisted learning modules to gather rich information about student engagement and understanding (Cooper 2000).

Such activities can be used to increase the level of learner-centredness of a course. For example, a class of first year medical students view a video presentation on the gross anatomy of the brain. After the presentation, they are required to complete a short online quiz on the material covered in the presentation. A large proportion of the class performs well but has difficulty with a series of questions relating specifically to the cerebellum. This gives the educator important feedback, on the pre-class activity ("Do I need to change or provide more information about the cerebellum during the online part of the course?") and/or the students ("They need more clarity on the cerebellum. How will I address this in class?").

The flipped classroom also facilitates the identification of individual students that may need extra attention. For example, a student may display repeated difficulty with quizzes offered online or during class through an audience response system. In addition, educators can pose a Likert-type question at the end of each class session, for example: "How confident, on a scale of 1–4, do you feel about the material covered in this workshop? (1 = lowest, 4 = highest)". Those students that report low confidence can be identified (e.g. through an audience response system) and offered further educational support.

Tip 8

Be aware of the timelines involved with converting to a flipped classroom

One of the main concerns that educators have about converting to a flipped classroom is the amount of time and work involved (Snowden 2012). This is a legitimate concern; for the flipped classroom to succeed, educators require time to learn and incorporate new technologies, and devise effective ways to present course material (Shimamoto 2012; Snowden 2012). It should also be recognized, however, that most of the initial time outlay involved in flipping a classroom is once-off in nature. Once learning resources have been created, they can be used for successive classes of students. In addition, the flipped classroom, if functioning effectively, can result in reduced overall lecture time and office hours for educators (Wagner et al. 2013).

Tip 9

Offer training to those involved in delivering a flipped classroom course

Educator "readiness" is an important factor in the success of a flipped classroom course; if educators do not feel capable, or enthusiastic, to flip then it is unlikely to work (Shimamoto 2012; Snowden 2012). According to Shimamoto: "In order to effectively implement a flipped classroom, (educators) need to possess a set of requisite technical skills, conceptual knowledge, and pedagogical experience". Provision of training or faculty development is a valuable first step. Educational researchers advise that instructors are shown how to use new technologies and incorporate evidence-based teaching into their courses (Shimamoto 2012). Training should also provide educators with worked examples of how the flipped classroom can be applied within their own area of expertise, as this has been recognized as a confidence-building step (Shimamoto 2012).

Training sessions can also be used to inform educators about the key features of the flipped classroom so that they

can see value in making the change. Research suggests that if educators already use a significant amount of active learning in their classroom, they can see less benefit in making the switch to a flipped classroom approach (Shimamoto 2012; Snowden 2012). In such cases, adoption of a flipped classroom may become a "harder sell" for some.

Studies of educators' attitudes to the flipped classroom report that where training is offered and other necessary pre-requisites are in place, for example appropriate technical support and the time and resources to flip, teaching faculty are normally motivated to use the approach (Shimamoto 2012; Snowden 2012).

Tip 10

Prepare your students

It is also likely that learners need support in transitioning to a flipped classroom. For example, students who are moving from a traditional, passive lecture environment towards one that uses more active learning activities may need help to "buy in" to the approach. In a study of US college-level students, Strayer (2007) found that: "students in the flip(ped) classroom were less satisfied with how the structure of the class oriented them to the learning tasks in the course. The analysis showed that the variety of learning activities in the flip(ped) classroom contributed to an unsettledness amongst students (a feeling of being "lost") that students in the traditional classroom did not experience".

It is important that educators, once again, adhere to the recommended concepts of evidence-based teaching and learning. For example, adult learners are motivated to develop their knowledge and skills when they are presented with an idea or task that is relevant to them in their current context (Swanwick 2010). It may be useful to provide learners with the rationale for using the flipped classroom in a medical education setting, for example communicating to students that a short flipped classroom course has been specifically designed to develop critical thinking skills in an emergency room setting.

Tip 11

Decide on how you will evaluate your flipped classroom approach

Educators who decide to adopt a flipped classroom should consider how they will measure its effectiveness. They may, for example, want to examine how their specific approach functions according to Kirkpatrick's four levels of evaluation (Kirkpatrick & Kirkpatrick 2006): opinions/reactions, competence/learning, performance/behaviour, and outcomes/results. Qualitative research approaches, for example using such data collection methods as questionnaires and focus groups, can give information about the lower levels, whilst examination performance and student grades can be used to investigate the upper levels.

Much of what appears in the literature about the flipped classroom reports on student perceptions of the approach, rather than objective assessment of student performance (Bishop & Verleger 2013). There have been a limited number of promising studies; for example, improved student performance has been documented in biology and computer courses which have adopted a flipped classroom approach (Bishop & Verleger 2013). Within medical education, Pierce and Fox (2012) observed improved examination performance when a module on renal pharmacotherapy was flipped for pharmacy students.

Should an educator use academic performance to track the effectiveness of a flipped classroom, it is important that the assessment method chosen is appropriate (Norcini et al. 2011). If the goal of flipping the classroom is to improve skills (e.g. communication) or promote a higher level of understanding, the final examination should be adjusted accordingly.

Tip 12

Remember that a flip does not have to be "all-or-nothing"

Having heard the arguments for and against the flipped classroom, and the steps involved in adopting this approach, medical educators may remain undecided. Fortunately, a decision to flip need not be an "all-or-nothing" commitment. Flipped classroom techniques can be incorporated around single topics or modules; indeed there is evidence to suggest that students prefer courses that are divided into both traditional and flipped classroom portions. In one study (Wagner et al. 2013), engineering students indicated that a balance of 30% flipped classroom and 70% traditional classroom represented the optimum balance.

If we return to the idea of capitalizing on the positive features of the flipped classroom, educators can choose to pilot the approach where challenges exist within a curriculum, for example a topic that experiences poor student engagement, or a module that needs to facilitate increased learner critical thinking.

Conclusion

The flipped classroom is an educational innovation that shows promise for use in medical education. The approach has a number of potential advantages, including facilitation of learner-centred education, increased educator–student interaction, and optimization of educator time, but undertaking a classroom flip involves time and effort. It is important that any large-scale course remodel is planned and implemented carefully; amongst other considerations, it is likely that educators will need time and technical support to adopt the approach. Finally, whilst educational technology is credited with jump-starting the flipped classroom's recent attention in the literature, it's important that educators aren't dazzled by this. Course design decisions should, as ever, be based on sound educational theory and evidence-based practice.

Notes on contributor

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