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Viewpoint

Flipped Classroom or an Active Lecture?

ABSTRACT

Recent changes in anatomy education have seen the introduction of flipped classrooms as a replacement to the traditional didactic lecture. This approach utilizes the increasing availability of digital technology to create learning resources that can be accessed prior to attending class, with face-to-face sessions then becoming more student-centered via discussion, collaborative learning and problem-solving activities. Although this approach may appear intuitive, this viewpoint commentary presents a counter opinion and highlights a simple alternative that utilizes evidence-based active learning approaches as part of the traditional lecture. The active lecture takes the traditional lecture, and (1) ensures the lecture content is relevant and has clear objectives, (2) contains lecture material that is designed according to the latest evidence-base, (3) complements it with additional supplementary material, (4) creates space to check prior understanding and knowledge levels, and (5) utilizes suitable technology to facilitate continual engagement and interaction.

Key words: Flipped classroom, lecture, anatomy education, active learning

INTRODUCTION

Recently, the traditional lecture has come under renewed criticism with the drive to introduce flipped classrooms (FCs) as an approach to teaching (Mehta et al., 2013; Pickles, 2016). FCs form part of a blended learning approach to curriculum delivery in which digital content is placed online for students to engage with prior to teaching sessions (Tucker, 2012; McLaughlin et al., 2014; Morton and Colbert-Getz, 2016; Boyle et al., 2016; Cheng et al., 2017; Koteeswaran et al., 2017). The face-to-face sessions then become student-centered with time devoted to discussion, group work and problem-solving. Although the idea of pre-class tasks and in-class interaction is not particularly new, the increased availability of digital resources means it is now much more straightforward to construct content that can be accessed before the class via a virtual learning environment or learning management system. This approach to higher education has gained widespread popular appeal beyond the traditional academic literature, with articles appearing as news items in the mainstream media. For example, a recent article on the BBC website – "Shouldn't lectures be obsolete by now?" – questioned the utility of lectures as an approach to teaching within higher education and asked why anyone would want to be forced to sit in a particular place at a particular time in order to receive the outpourings of a particular lecturer (Pickles, 2016).

The disadvantages of poor lecturing are well documented and include passive or rote learning, limited opportunities for discussion, and inadequate attention spans (Stuart and Rutherford, 1978; Wilson and Korn, 2007; Matheson, 2008). Moreover, despite their long history, many lectures delivered today still resemble those given decades ago, consisting largely of a one-way monologue, and can be perceived by some as being dull, boring and generally lacking in teacher-student interaction. However, although it must be acknowledged that some may follow this demoralizing approach, it is a simple mistruth to say that all

lectures have to adhere to this common stereotype. With an enthusiastic lecturer who engages the audience and embeds relevant examples to add context, lectures can provide an excellent opportunity to inform and enthuse students. Regardless of this, when curricula are reviewed, it is often the case that lectures are viewed as dull, boring and ineffective, and so alternatives, such as FCs, are sought.

IS THE FLIPPED CLASSROOM ALWAYS APPROPRIATE?

Embarking on a full curriculum review can be very time-consuming and, ideally, should be conducted with the support of hard evidence demonstrating the benefits of any alternative teaching modalities being considered. Although the literature is becoming increasingly populated with approaches to FCs, there currently remains a short-fall of convincing evidence that this approach promotes significant and long lasting benefits. For example, a recent scoping review of the literature across higher education noted that much of the emerging evidence of improved academic performance is indirectly related to the flipped classroom, with a paucity of conclusive evidence being put forward to support its utility (O'Flaherty and Phillips, 2015). Furthermore, and specifically in relation to medical education, a systematic review found that despite the positive perceptions of flipped classrooms, the effects on changes in knowledge and skills were less conclusive and suggested a lack of evidence on its effectiveness (Chen et al., 2017). However, two recent research articles have shown the potential of a flipped classroom in relation to histology and gross anatomy teaching. Morton and Colbert-Getz (2017) highlighted how their approach to a flipped classroom, which provided first year medical students with pre-class videos, supported higher attainment on questions that required analysis, but no difference on overall perfomance. Furthermore, Cheng et al. (2017) highighted how providing medicine students with histology video lectures and quizzes prior to in-class activities supported greater learning gains, compared to a traditional classroom arrangement.

Alongside this debate on the efficiency of flipped classrooms, numerous studies have highlighted the positive impact active learning alone can have on student learning, with these forming part of a large meta-analysis across science, technology, engineering and mathematics (STEM) disciplines (Freeman et al., 2014). This in-depth comprehensive review found classroom sessions that integrated some degree of active learning (e.g., group work,

problem-solving, worksheet completion, audience response systems) resulted in enhanced student examination performance. More recently, Jensen (2015) used a quasi-experimental design to compare a flipped and non-flipped approach finding no significant difference between either approach, and accounted the enhanced learning for both groups to in-class active learning techniques.

Although the principle of FCs may be intuitively attractive, for this approach to work effectively and efficiently, students need to exhibit a particular set of competencies and behaviors. Firstly, each student needs to be sufficiently motivated and engaged cognitively with the pre-class material to enter the discussion or group work with adequate knowledge (Pickering, 2017). However, the literature once again fails to provide a consistent picture regarding how students access pre-class material. Bouwmeester et al., (2015) noted that medical students generally engaged in the viewing of web lectures and recommended readings, with this access relating to their own learning strategies. This finding contrasts with Gilliland (2017) who reports that only a minority of students engaged with pre-class histology material. These two contrasting findings are of additional interest when viewed alongside the work of Jensen (2015), mentioned previously, who concluded that engagement with content prior to in-class active learning does not appear to impact on learning gains.

Secondly, while some students will enjoy engaging during in-class discussions, others may shy away, even if they have prepared properly; for them, the environment can become socially inhibiting, with potentially detrimental effects on their learning. White et al., (2014) found that students were ‘checking out’ of the active learning activities during class. The overall numbers attending active learning teaching sessions dropped, with students preferring to work in isolation as a more efficient learning experience, and those in attendance often losing focus due to the ease of social interaction with their peers and accessing the internet.

These findings were confirmed by both faculty and students, with Marzuk (2013) commenting previously that these students are present 'in body' only.

Thirdly, although many students will have the skills needed to access digital pre-class materials, others without this level of competency may find accessing and effectively engaging with the materials difficult (Margaryan et al., 2011; Kirschner and van Merriënboer, 2013; Kirschner and De Bruyckere, 2017; Frawley, 2017). Thus, while in an ideal world every student would come to class well-prepared to share and discuss the topic in hand, it is very unlikely this will always be the case. The pragmatist needs to be aware that not all students will benefit from a constructivist approach to learning (Kirschner et al., 2006).

From the faculty perspective, the creation of a FC will inherently require significant resource and curriculum development, increased workloads, and the recruitment of additional facilitators to support delivery. Furthermore, existing teaching spaces are often characterized by fixed, forward-facing rows of seats, rather than the more open and flexible configurations that are conducive of discussion and interaction. Although these problems are not insurmountable, solving them can be beyond the means of an individual course leader; staff recruitment and costly infrastructural changes require commitment at an institutional, rather than individual, level. Moreover, large class sizes, such as those often encountered in anatomy programs, may represent a rather more intractable problem. Whereas a FC approach for a class of 30-50 students may be run by one or two faculty members in an appropriate small group teaching space, using this approach with 200-300 students in a large lecture theatre designed for didactic teaching presents some real challenges. For instance, how do you promote in-class discussion? How do you manage a class of this size with only one facilitator? How can you ensure that meaningful student-teacher contact is still possible?

In summary, it is possible that lectures become discounted as they can, when poorly executed, exhibit properties that are not conducive to learning. In contrast, FCs are often promoted despite requiring learner characteristics, teaching space configurations and class sizes that are anything but universal. Hence we run the risk of spending a great deal of time and effort replacing one type of teaching that can be less than ideal, with another that can also be less than ideal, just in different ways. So, what should we be doing?

SOLUTION: THE ACTIVE LECTURE

One obvious answer is to try and blend the best elements of each approach: instead of the FC, the active lecture. In an attempt to increase cognitive engagement with the lecture content, we have recently adopted a five-step approach to 'activating' our lectures. This includes:

(1) editing the current lecture slides to ensure they are all relevant to the matter in hand and that the context of the session is clear and explicit (being careful to try and adopt the point of view of the learner);
(2) where necessary, re-designing slides to cognitively support the learner, using current, evidence-based approaches (Mayer and Moreno, 2003; Issa et al., 2011);
(3) developing support materials for students to use either before or after the face-to-face session to complement their own learning strategy;
(4) embedding a catch-up segment at the beginning of each lecture to ensure everyone in the class has the background knowledge needed to engage meaningfully;
(5) utilizing suitable technology to continually facilitate engagement, interaction and questioning during the session.

This pragmatic approach allows us to merge the positive elements of a traditional lecture, including explicit instruction and suitability for large class sizes (Rosenshine, 2012), with the active learning techniques that characterize the face-to-face phase of a FC (Freeman et al., 2014; Jensen et al., 2015). At the same time, the catch-up segment mitigates for the reality that some students will come to the session without adequate preparation, and aims to ensure every student is sufficiently prepared for the upcoming teaching session.

Of course, simply changing the lecture slides and providing supplementary materials does not necessarily lead to a more discursive environment where students can interject with their opinions and ask questions of the lecturer and of each other. In order to promote the more active involvement of the class, we have been using tablet devices running screen-mirroring software that allows the pen-enabled screen of the device to be projected onto the lecture theatre big screen via WiFi. The lecturer is now free to roam around the audience, interacting with individuals and groups, allowing them to annotate the slides being projected, or to share their written or drawn material with the rest of the class via the tablet's built-in camera. The now-ubiquitous radio microphone ensures that the entire audience can hear, and respond to, all the conversations that the lecturer has with the class. This means the common, and not so common, questions asked by individual students can now be clearly heard by all, as can the answers to them. By continually prompting with questions and sharing the answers with the entire class, it is possible to avoid the cognitive biases known as the curse of knowledge (Fischhoff, 1975), where the lecturer finds it difficult to appreciate not knowing the topic being taught, and the Dunning-Kruger effect (Kruger and Dunning, 1999), where the student overestimates their level of understanding. This real-time feedback means that the lecturer can constantly adjust what they teach dependent on the current level of knowledge exhibited by the cohort of students. This ability to make individual exchanges between teacher and students accessible to all solves one of the inefficiencies inherent in the FC approach, where a process of social negotiation is required during group or collaborative learning to reach a consensus understanding based on the students' existing knowledge base (Mayer, 2004; Krahenbuhl, 2016). Although any incorrect knowledge acquired during discussion is corrigible, exposing novice learners to prolonged periods of un-guided learning can be counter-productive and inefficient (Kirschner et al., 2006). While it is likely that FCs with small student-teacher ratios can provide sufficient support, for larger class sizes with

only one or two facilitators, it is essential to expose the entire class to all aspects of the discussion in order to stand the best chance of avoiding incorrect understanding. This is especially relevant when there is an imperative need, which is common in anatomy education settings, for students to correctly understand certain facts and concepts.

Although developing this approach requires an investment of both time and money, the increased availability of internet-enabled tablet devices able to display documents, slides, browsers, 3D anatomy apps, and both live and pre-recorded video streams, alongside high quality in-theatre audio and audience response systems, provides a rich alternative view of lecturing that is interactive, engaging and achievable, even when dealing with the ever-increasing class sizes that challenge us today.

CONCLUSION

Blended learning is now ubiquitous across anatomy education, with FCs forming an increasingly large part of this approach. This change in delivery has often been at the expense of the traditional didactic lecture that often appears to be the target for criticism and, potentially, removal. However, although lectures can be a poor method of teaching, some simple and effective strategies can be employed to promote active participation by the students. With the literature unable to provide evidence of clear benefits for the widespread introduction of FCs, surely it is time to consider alternatives that don't require a wholesale redrawing of curricula and expensive re-development of large teaching spaces.

REFERENCES

Bouwmeester RAM, de Kleijn, RAM, ten Cate OTJ, van Rijen HVM, Westerveld HE. 2015. How Do Medical Students Prepare for Flipped Classrooms? Med Sci Educ 26:53-60

Boyle J, Quail N, Loo XY, Linn A. 2017. Flipping the classroom: Is it worth the bother? Clin Teach 14:137–138.

Chen F, Lui MA, Martinelli SM. 2017. A systematic review of the effectiveness of flipped classrooms in medical education. Med Educ 51:585-597

Cheng X, Ka Ho Lee K, Chang EY, Yang X. 2017. The 'flipped classroom' approach: Stimulating positive learning attitudes and improving mastery of histology among medical students. Anat Sci Educ 10:317-327.

Fischhoff B. 1975. Hindsight ≠ Foresight: The Effect of Outcome Knowledge on Judgment Under Uncertainty. J Exp Psychol 1:288–299.

Frawley J. 2017. The Myth of the 'Digital Native'. Teaching Tips. 27 February 2017. The University of Sydney. URL: http://sydney.edu.au/education-portfolio/ei/teaching@sydney/digital-native-myth/ [accessed 14 May 2017].

Freeman S, Eddy SL, McDonough M, Smith MK, Okoroafor N, Jordt H, Wenderoth MP. 2014. Active learning increases student performance in science, engineering, and mathematics. PNAS 111:8410–8415.

Gilliland KO. 2017. The Flipped Classroom and Learning Analytics in Histology. Med Sci Educ 27: 9-13

Issa N, Schuller M, Santacaterina S, Shapiro M, Wang E, Mayer RE, DaRosa D. 2011. Applying multimedia design principles enhances learning in medical education. Med Educ 45:818–826.

Jensen JL, Kummer TA, Godoy PDDM. 2015. Improvements from a Flipped Classroom May Simply Be the Fruits of Active Learning. CBE-Life Sciences Education 14:1–12.

Kirschner PA, Sweller J, Clark RE. 2006. Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based Teaching. Educ Psychol 41:75–86.

Kirschner PA, van Merriënboer JJG. 2013. Do learners really know best? Urban legends in education. Educ Psychol 48:169–183.

Kirschner PA, De Bruyckere P. 2017. The myths of the digital native and the multitasker. Teach Teach Educ 67:135-142

Koteeswaran R, Simpson P, Bartle E, Smith D, Bhutada E, Ayre J, Lakhani SR. 2017. Flipping Pathology: Our Experience at an Australian Medical School. Med Sci Educ (in press; doi: 10.1007/s40670-017-0406-4).

Krahenbuhl KS. 2016. Student-centred Education and Constructivism: Challenges, Concerns,

and Clarity for Teachers. The Clearing House 89:97–105.

Kruger J, Dunning D. 1999. Unskilled and unaware of it: how difficulties in recognizing one's own incompetence lead to inflated self-assessments. J Pers Soc Psychol 77:1121–1134.

Margaryan A, Littlejohn A. Vojt G. 2011. Are digital natives a myth or reality? University students' use of digital technologies. Comp Educ 56:429–440.

Marzuk PM. 2013. More about medical students' attendance at lectures. Acad Med 88:149.

Matheson C. 2008. The educational value and effectiveness of lectures. Clin Teach 5:218–221.

Mayer RE. 2004. Should There Be a Three-Strikes Rule Against Pure Discovery Learning? The case for guided methods of instruction. Am Psychol 59:14–19.

Mayer RE, Moreno R. 2003. Nine Ways to Reduce Cognitive Load in Multimedia Learning. Educ Psychol 38:43–52.

McLaughlin JE, Roth MT, Glatt DM, Gharkholonarehe N, Davidson CA, Griffin LM, Esserman DA, Mumper RJ. 2014. The Flipped Classroom. Acad Med 89:236–243.

Mehta NB, Hull AL, Young JB, Stoller JK. 2013. Just Imagine: New Paradigms for Medical Education. Acad Med 88:1418–1423.

Morton DA, Colbert-Getz JM. 2017. Measuring the impact of the flipped anatomy classroom: The importance of categorizing an assessment by Bloom's taxonomy. Anat Sci Educ 10:170-175.

O'Flaherty J, Phillips C. 2015. The use of flipped classrooms in higher education: A scoping review. Internet High Educ 25:85–95.

Pickering JD. 2017. Cognitive Engagement: a More Reliable Proxy for Learning? Med Sci Educ (in press; doi:10.1007/s40670-017-0447-8).

Pickles M. 2016. Shouldn't lectures be obsolete by now? BBC News Business. 23 November 2016. The British Broadcasting Corporation. URL: http://www.bbc.co.uk/news/business-38058477 [accessed 7 December 2016].

Rosenshine B. 2012. Principles of Instruction: Research-Based Strategies That All Teachers Should Know. American Educator (Spring) 36:12-19.

Stuart J, Rutherford RJ. 1978. Medical student concentration during lectures. Lancet 2:514–516.

Tucker B. 2012. The flipped classroom: Online instruction at home frees class time for learning. Education Next 12:82–83.

White C, Bradley E, Martindale J, Roy P, Patel K, Yoon M, Worden MK. 2014. Why are

medical students ‘checking out’ of active learning in a new curriculum? Med Educ 48:315–324.

Wilson K, Korn JH. 2007. Attention During Lectures: Beyond Ten Minutes. Teach Psych 34:85–89.