Flipped or blended? What's the difference and does it make a difference to learning in HE?

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Abstract: This paper discusses a critical evaluation of recent literature on the development and application of the "flipped classroom", defined as offering pre-class materials online and using classroom time for interactive, constructivist learning, looking at distinctions between this and "blended learning", the definition of which is diverse but which here is taken to mean any combination of online and face to face learning. The main focus is not to explore blended learning in detail, but to consider flipped learning as a subset of blended learning. The context in which this is explored is undergraduate Higher Education. Questions this research explored included: What kind of evidence does the literature offer for the effectiveness of the flipped classroom model? What range of versions is currently found in flipped classroom case studies? What learning/educational theories underpin the flipped classroom approach? What does the flipped classroom model offer to university teachers and students which cannot be achieved in other blended formats?

1. Introduction

As universities and higher education institutions increasingly adopt blended approaches to the provision of educational material and the stimulation of student-centred learning, there is a tendency to adopt flipped classroom as a "best practice" model, but this needs further evaluation. Some evaluative studies have been undertaken (e.g. Bishop and Verleger 2013), particularly in engineering and medical education where this model has already become very popular. As wider take-up progresses, this review of the literature aims to set out the key benefits and disbenefits of our current understanding of the flipped classroom as evidenced in the literature, and reviews the extent to which blended learning increasingly characterises Higher Education, distinguishing the impact of blended learning models and flipped classroom models. A further area investigated is the conceptual framework which predominates in case studies of flipped classroom and blended learning designs in an attempt to offer HE teachers a sound basis for discussion of blended and flipped practice in the classroom. In practice, many conference and journal papers discussing flipped classroom activities (online and face to face) are focussed more on the production of videos for online use than on the interactive activities which are meant to build extra value in the classroom (Zhao and Ho 2014). Studies show a clear need for further research in this area to help teachers design effective student-centred learning activities whether on or offline.

2. Background – the case for flipped learning

Flipped Learning has been defined as a "pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter" (FLN, 2014 cited in Yarbro et al, 2014). This approach to teaching in universities, and increasingly in secondary schools, has gained popularity, particularly since the work of Bergmann and Sams in 2007, which made full use of screen-capturing software to develop out of classroom learning materials. The reason they give for this move was in response to their question – What is the best use of face-to-face time with students? In other words, here is a good example of technology enhanced learning (TEL) which does not start with the technology, but starts with a teaching issue.

Since teachers at every level and stage of education are likely to come out of their classrooms from time to time feeling that they did not do justice to their subject for learners in that face-to-face time, the question posed by Bergmann and Sams is clearly helpful. In Higher Education, particularly at scaffolding levels such as Level 4 and 5 in the UK (first and second undergraduate years), it is often the case that teachers are faced with a considerable amount of material, often key definitions and

concepts, which must be discussed with students in order to facilitate learning. However, rather than being discussed, the sheer amount of material may drive teachers to resort to Microsoft PowerPoint ™ putting a wealth of material into slides which may or may not be understood, let alone learned, by students. In large lecture groups, it is especially difficult to check understanding, and too often, a few keen and eager faces giving good eye contact can persuade the teacher that all have understood, when in reality, few have done so.

We could argue that the technology, in particular the use of video, in flipped learning is simply a current twist on a well established approach to learning and teaching where students are required to prepare something for class, and demonstrate their knowledge and ability to use that knowledge in class. This has been happening for generations, without being called flipped anything. We could further argue that this method of learning has always been more effective than using class time to "lecture" or deliver information or direct instruction. The notion of the seminar or tutorial class in Higher Education has always focused on students being active in applying or discussing previously acquired knowledge. So why does flipped learning have an increasing following now?

The answer may lie in the expansion of Higher Education, as well as the increasing technological options now available. As institutions face higher tuition fees (external "price") yet lower funding per student (internal "cost") and increasing competition to recruit students, and as those students have Web access to a wealth of free, as well as paid for, learning materials from a range of institutions of learning across the globe, undergraduate class sizes have grown greatly in many disciplines. This poses challenges for staff who try to adapt lecture-style teaching and learning to a much more diverse student body (Cuseo 2007). Lectures can be excellent vehicles for stimulating curiosity, inspiring learners and sharing expertise, particularly where the staff concerned are researching in, and are passionate about, the field of study. But this makes several assumptions. First, that the teaching staff have the capabilities required for inspiring lecturing – many do, but not all. Second, that the students attending such lectures are in fact there to learn and are willing to do so – an assumption in mass Higher Education which no longer always holds. Third, that the students do actually attend the lectures and come prepared to listen and think!

These points may seem unnecessarily cynical but universities cannot continue to offer the learning and teaching methods which suited earlier generations while our current and future students may have patently different needs and wants. Tapscott and Williams in their article in Educause Review in 2010 suggested:

"Video lectures enhance education by allowing students to absorb course content online—whenever is convenient for them—and then get together to tinker, invent new things, or discuss the material. The OCW experience has shown MIT that the real value of what it offers is not the lecture per se but rather the whole package—the content tied to the human learning experience on campus, plus the certification. Colleges and universities cannot survive on lectures alone".

Today's students have choice, perhaps too much choice, of what and where and how to learn. But as Senior, Reddy and Senior discuss (2014), the student focus is likely to be broadly on capabilities which will help them into and in employment. These authors cite Barnett (2009) on students' "being and becoming", a focus on resilience, openness and a will to learn which, they suggest is fostered by peer engagement in learning. Willingness and ability to learn are touchstones of the "New Vocationalism" discussed by Bourner et al (2011) where they are considered the main ingredients of the graduate recipe offered to prospective employers. Yet passive receipt of delivered information is unlikely to foster either willingness or ability to learn; it is interactive opportunities for peer engagement, and for direct engagement with teachers where concepts prove problematic, that can support enthusiasm for learning; and this couldn't be further from the average HE lecture experience.

3. Diversity in flipped learning
This is where the idea of flipping the learning offers a possible solution: by offering explanatory materials prior to class, testing understanding early in class time or also before class (polling for example or simple testing), teachers can spend time in class developing learners' understanding of

applications or more thoroughly explaining concepts which are shown in the tests to be less well understood. A final end of class poll or test can help determine whether immediate understanding has improved, offering further opportunities for reviewing key concepts in advance of summative assessment. This is broadly the approach promoted by Eric Mazur of Harvard, who termed it Peer Instruction (PI) (1997). In a review ten years on from his first uses of PI (2001), Mazur and Crouch discuss improvements to the PI method in which pre-class reading is maximized and incentivized with conceptual questions for students including a note of what they find most challenging or interesting; this is followed by minimized lecture content interspersed with "ConcepTests", short focused questions asked after brief presentation of content which students work on individually and offer polled answers in class, then discuss with another student, trying to convince them of the correctness of their answer. This peer instruction is followed by a second poll and a discussion of their responses. Peer Instruction has since been increasingly adopted in the US, for examples see Smith et al 2011, Knight and Wood 2005.

Case studies demonstrate varying versions of flipped learning (also called inverted or reverse learning) beyond PI. Starting from the basic idea that classtime experience of listening and taking notes would be swapped with homework time of applying learning to problems has meant that the drive for flipped learning tends to centre on the teacher being present at the time the learner most needs help – when they are puzzling through how to apply and develop ideas presented to them. In Bloom taxonomy terms, the higher order learning (analyzing, evaluating, creating) traditionally seems to take place outside the formal class time, when the resources of the institution are not available. It could be argued that virtual learning environments mediate this issue, being available 24/7 with web access, however widespread usage of such learning environments as repositories and management systems rather than interactive environments means that help is still not necessarily at hand.

4. The ubiquity of video
There is a preponderance of case studies which discuss flipped learning as based around video materials (Zhao and Ho 2014). Usually in the studies, such as Lage and Platt (2000), Kaner & Fiedler (2005), Talbert (2012), Gannod (2007), Toto and Nguyen (2009), these are videos pre-recorded by teaching staff, or curated by teaching staff with direct relevance to the curriculum. The growth of video use in recent years has been stimulated by increasing software packages with user-friendly options. While the fully edited and creatively produced video still required studio equipment and specialized skills, this remained a limited opportunity, but the increased capabilities of mobile phones and tablets to produce effective video material, and increasing use of packages such as Jing and Camtasia Relay (both produced by Techsmith) which allow simplified video production and rendering involving no specific technical skillset from the producer, these changes have opened up the world of video recording to mainstream HE teaching staff. Coupled with the huge and still growing popularity of YouTube.com among learners of every age and ability, the place of the teaching video has become secure, particularly as studies such as that by Zhang et al (2006) find that video lectures are at least as good as face-to-face lectures at delivering information. However Freeman-Herreid and Schiller (2013) point out that good quality video lectures are rated higher by students than home-grown videos created by teaching staff: this is a potential area for investment and more effective tagging and sharing of Open Educational Resources.

It is a feature of this literature that relatively few studies discuss the "flipping" of complete courses or even complete modules. This is often done for individual sessions, particularly where content has been found to be problematic for students. This is also a reflection of the amount of preparatory work which is needed to design a flipped learning experience. This does not only involve preparation of video lectures in advance, but, almost more importantly, the re-design of classroom activities. The example given above of Mazur's Peer Instruction demonstrates the detailed preparation of questions to be completed prior to class and in class, and how these are designed to produce in class peer discussion for short periods interspersed with possible lecture, or sometimes problem-solving activities. Some studies advocate appropriating the pedagogic benefits of Problem Based Learning (PBL) in class activities, finding this to provide two potential beneficial outcomes: first to offer interactive, group-based activity in class which can be meaningful involvement in learning for students fitting with the notion of flipped learning and second to offer a way to operationalize and potentially scale up PBL, with all its attendant benefits of research-based enquiry, authenticity and

problem-solving skill development, having offered the scaffolding learning required via the pre-classroom video lectures.

5. Learning and educational theories in flipped learning
We do not have to look too hard to find evidence of constructivist learning theory in flipped learning models. Constructivist and co-operative learning stem from the well accepted ideas of Piaget and Vygotsky, leading to the notion that the involvement of others can become both catalyst and catharsis in social learning contexts. Kolb's development of experiential learning and Bandura's Social Cognitive Theory, particularly the role-modelling dimension, can both be seen in the face-to-face activities fostered by flipped classrooms. Bishop and Verleger (2013 p8) cite Johnson and Johnson's notion of co-operative learning with particular relevance to flipped learning patterns: "the integrated use of cooperative, competitive and individualistic learning" which they call "Learning together and alone". Then there is Problem Based Learning (PBL) which is generally attributed as a theory to Barrows and Hmelo-Silver (Savery 2006) and brings together collaborative learning in groups with a focus on ill-structured or messy problems with a feeling of authenticity. Where PBL can be adopted into face-to-face time, learning is driven largely by the learner, rather than the teacher, who facilitates rather than directs. PBL in Higher Education can lead to issues of scaffolding, which in a flipped model would be provided by pre-class video lectures or reading assignments, tested at an early stage to ensure basic underpinning concepts are understood in order to give more autonomy to students in the application of research and group problem-solving skills to the task in hand. The pedagogic framework then for flipped learning has students at the centre of the learning process, constructing their beliefs and meanings of the materials presented, with checking, facilitation and guidance as needed by the teacher.

6. Challenges of flipped learning
There is no doubt that the affordances of virtual learning environments offer the potential to provide interactive support for learning, and out of class opportunities to communicate and collaborate with peers and teachers. This can support blended learning in general and flipped learning in particular. There is also little doubt that interactive group-based activities in class go down well with most students. What then are the problems and challenges associated with flipped learning? There is evidence in the literature (for example, see Willey and Gardener 2013) of a continuing reluctance on the part of some students to accept reduced lecture time. These students have an expectation of what they are consuming as HE customers, and their comments relayed in some papers suggest a common complaint in the form "I am paying for a campus-based university experience and that does not mean online materials, that means lectures with academic staff." This could be a transitional phase, where students increasingly become accustomed to blended learning and flipped learning modes at university and come to see them as a right rather than a variation from tradition. This resistance may also relate to levels of student motivation. Students who do not come to lectures prepared to learn but to be entertained and to take part in a ritualized form of educational development may well be less enamoured of a format which involves pre-reading or watching of videos and coming to sessions prepared to take an active role in learning.

This resistance cannot be lightly dismissed as a passing phase, however, since the repercussions for staff who try to implement flipped learning and find a body of students have not done the pre-class work will have practical difficulties to overcome; in particular dealing with two different groups of students, some of whom may be reluctant to take part in tests, polling and other interactive activities. While one of the potential advantages suggested by advocates of flipped learning is that it can advantage a range of learners with differing learning preferences and abilities, able to follow the video lectures, or indeed pre-reading assignments in their own time and at their own pace, there is, nonetheless, a learning contract here that requires tacit acceptance. The literature seems to show that persistence is required on the part of teaching staff who need to offer regular encouragement and explanation of the purpose of a flipped learning approach (Strayer, 2009, Davies et al 2013, Rowe et al 2013). Furthermore it does seem useful to include formative testing or quizzes to improve motivation to complete pre-class activities (McLaughlin et al 2013).

7. Student achievement

Discussions of student achievement with flipped learning models, for example there are a number of short case studies from US universities in Yarbro et al (2014), present outcomes which either improve or show no difference from traditional lecture-style teaching. Yarbro et al raise the question as to what particular contexts might suit flipped learning and show clear advantages. From the range of literature reviewed for this paper, suggestions would be contexts where there are difficult concepts to explain, or significant factual or background information is required to set the scene for problem solving or application and development of understanding, and where students of varying ability and learning preferences are involved to enable self-paced learning prior to class.

8. Discussion

This literature study has aimed to answer the following questions:

- What kind of evidence does the literature offer for the effectiveness of the flipped classroom model?
- What range of versions is currently found in flipped classroom case studies?
- What learning/educational theories underpin the flipped classroom approach?
- What does the flipped classroom model offer to university teachers and students which cannot be achieved in other blended formats?

8.1 The evidence for effectiveness is varied, as might be expected. It is still unusual to find whole modules or courses run on a flipped model, for the very good reason that this requires extensive preparation to work well and appears to be best suited to specific classes where content is experienced by students as particularly difficult conceptually, or where there is much factual information to share which must precede application and discussion in interactive mode.

8.2 The range of versions is fairly wide but the most popular option is recorded video up front followed by groupwork, concept explanation and other forms of interaction including polling and testing during class.

8.3 Learning and educational theories are constructivist, co-operative and problem-based learning, with a focus on formative testing and polling giving helpful feedback as learners construct their understanding of difficult concepts and supporting them in applying ideas to messy problems.

8.4 This is a much wider question which is at the heart of this paper. Blended learning is so broad a concept as to be difficult to pin down, offering potential technology enhancements to classroom face-to-face learning. We could suggest that a broad blend is always there when a VLE is available for learners, but this, of course, is a passive response, offering at least a safety net for content but not necessarily involving interaction in both classroom and online modes. There is the further dimension of increasing synchronous online options, such as webinars, using a variety of software to offer interaction between teacher and learner but not requiring the same venue. The focus of blending is to redesign learning experiences, using technology when it is contributing value, and this continues to enable a shift in HE towards the needs of the learner.

Blended learning developments have allowed the questioning of the dominance of lectures and information-giving formats in Higher Education (Garrison and Kanuka 2004). While there are many issues still to be tackled, blended learning covers a wide range of ways to develop interaction in learning, to develop what these authors refer to (p98) as teaching, social and cognitive presence in a genuine community of inquiry, privileging learner engagement, rather than a focus on content delivery. There is no question that many university teachers deliver lectures which help people learn and which inspire to further effort, questioning and enquiry. These teachers already focus on learners, unlike perhaps the silent majority. Blended learning has given us a chance to debate such issues. However blended learning design takes time, scholarship, team and institutional support and, often, courage to step out from well-tried teaching practices. So, of course, does the design of flipped learning. Is the latter then simply an example of blended learning? There are other blended designs which do not necessarily require scheduled preparation of material in advance of face-to-face classes.

The fundamental argument must surely be that Higher Education is not primarily about content. Information and communication technologies have offered a lens to focus attention on the quality and comparability as well as the currency of that content offered in universities and other HE institutions. Lower order learning activities which include exposure to information, remembering and seeking understanding are able to transfer beyond the face-to-face time of students and teachers partly because this information is no longer limited to physical books and papers but can be found in easily accessible and always available online formats. With increasing numbers of personal devices to access this information (university students are much more likely to own high proportions of mobile devices from laptops and tablets to smartphones (Davies 2014) and mobile use which grew 115% in 2013 (flurry.com 2014)) access to content is not the issue for HE. It is evaluation and application of content in order to make it meaningful which is the central task.

So there is a strong argument for offering content online, possibly curated by rather than produced by the teacher, and using face-to-face time in the classroom in a more interactive way. However this is not necessarily flipped learning. Blended learning is a much wider category for a range of varied ways of combining online and face-to-face activities for learning. Blended approaches are less rigid in a requirement for pre-class activity, which may suit some topics better, and a wider range of online tools may be useful both in and out of class, for example wikis and blogs, e-portfolios, and opportunities for wider literature search. Opportunities for webinars to replace face-to-face physical classes can sometimes solve resource or logistical problems, and these can be adapted to bother blended and flipped models. Technology enhanced learning comes in many forms and can be effectively used "on the fly" in class rather than pre-prepared (for example, developing Prezis from student feedback, polling as gaps appear in student understanding).

The argument about content becoming less important in the university offer should receive rather more attention in discussions of flipped learning. University teachers are well aware of the explosion of resource materials and media relating to their subject discipline, most of which can be accessed online. A flipped approach would seem, in its present forms, to be a return to a more directed confined presentation to the student of what the teacher believes to be most important. Yet the trend supported by Web technology, and constructivist thinking, places teachers in a collaborative learning role alongside students, as all can bring useful and up to date resources into play in an open learning design. If teachers are to spend considerable time setting up front reading assignments or video lectures, we could be back to "teacher knows best" rather than encouraging students to roam and surf to find possibly useful information which can be debated and evaluated in class or online through synchronous or asynchronous discussion and case application or problem-solving. Not every subject discipline, and certainly not every level of university education is perhaps suited to wide-ranging student-led foraging for relevant information (as, for example in Problem Based Learning which is not pre-designed beyond an initial trigger). However, if flipped learning continues to gather momentum, this will be an issue to address. For employability at the very least, Higher Education institutions are charged with developing students' capabilities to test and evaluate information and to be prepared to "unlearn"or be open to new perspectives. A fully flipped curriculum would seem to close down these opportunities rather than develop them, leading to reservations in answering the question – What is the best use of face-to-face time with students? - with the term "flipped learning".

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