

Reinventing Medical Teaching and Learning for the 21st Century: Blended and Flipped Strategies

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Abstract

There has been a recent rapid increase in the integration of flipped and blended modes of learning into Australian university classrooms. In the move to realize the benefits of these modes of delivery, universities are spending a great deal of time focusing on course redesign and upskilling teachers to assist in the adoption of these new methods of instruction. Large-scale blended learning projects have been completed at The University of Newcastle, Australia. One such project has been the integration of flipped and blended learning strategies into the redesign of the 1st year medical science course as part of a total undergraduate medical curriculum redesign. This course involves a large number of lecturers from a wide variety of disciplines. This involved not only the redesign of this course but also the introduction of new teaching materials and learning objects. To ensure success, this work required input from three groups: the academics teaching the course, the students taking the course, and the instructional designers who create the learning objects. The University of Newcastle, Australia, was instrumental in introducing problem-based learning (PBL) to medical schools in Australian universities with its initial intake of medical students in 1978 and continues the use of this methodology as its primary teaching approach. As the current project develops, it has become apparent the pioneering work previously undertaken to implement PBL, in fact, had incorporated many of the pedagogical principles and strategies of what is now considered blended learning in the flipped classroom (albeit without the technology components). This paper argues that our teachers and students will more easily adapt to the requirements inherent in blended or flipped learning due to previous familiarity with PBL strategies.

Keywords: Blended learning, blended learning framework, flipped classroom, medical education, problem-based learning

FLIPPED AND BLENDED LEARNING: THE ROLE OF STUDENTS

The “Flipped classroom” is a term that has been commonly used to describe the learning of content outside of traditional lecture time and space, where students are provided the content information in any number of forms before attending class, often through the use of a variety of technologies.^[1-4] Students are then brought together in the classroom to engage in active learning activities that will consolidate their previous independent learning. The “flip” is reversing the mastery of content (traditionally accomplished in a lecture setting) and engagement in group or individual activities (traditionally completed outside of class time).^[5,6]

Flipped and blended learning incorporates both online and face-to-face interaction.^[7,8] In a flipped learning model, students typically engage with the content before attending a face-to-face class where student-centered, active learning

experiences are prioritized, moving direct instruction from the group learning space to the individual learning space.^[4,9]

The term “Blended” Learning has generally been used to describe the integration of technologies or forms of media into methods of instruction – a blend of pedagogy and technology in any variety of forms.^[10] Blended learning refers to a number of teaching approaches, but generally, it refers to teaching practices which require students to master some amount of course content before class through engagement with a number of rich online resources such as videos, simulations, and quizzes. This allows students to engage in activities during class that solidify and enhance this knowledge. This form of university teaching is becoming the global standard for many courses.

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Fully blended courses are often referred to as “Flipped” in the literature. Other references to blended learning may involve less dependency on student independent study and still incorporate some amount of lecture time. Recently, these terms have often been used in tandem (flipped and blended learning), as the use of technology has become a common medium for the delivery of most course content worldwide.

This change in the nature of delivery creates the need for students to adopt study patterns that facilitate their learning of content outside the classroom and without direct face-to-face input from a lecturer and is frequently viewed by students as having to “teach themselves” as they are not receiving the instruction they were expecting.^[6,11]

IMPACT OF CHANGING TEACHING STRATEGIES

There is a definitive shift from students as consumers of content to creators of their own knowledge through what are being described as “deeper learning approaches.”^[12,13] These developments, especially the reduction in face-to-face teaching hours, place a greater emphasis on students as curators of their own learning and assign them greater responsibility for maintaining sufficient and effective involvement in their courses. Students no longer have a timetable of contact hours that directs their mastery of core course content, and for the first time, they have the responsibility and the opportunity to determine their own approaches to learning and understanding content and concepts.

While this may appear to be a positive development, we must acknowledge that students are being required to do this with little consideration for the impact the changes will have on their workload and their approaches to learning.^[9] The previous expectation that it was the responsibility of the university to ensure that students were being provided learning opportunities has now, to a large extent, been transferred to the students themselves. The increasing use of learning technologies will also require students to radically change their methods of organizing their study and general life.

Students with different backgrounds, experiences, year of study, discipline, circumstances, and learning styles will necessarily require different support mechanisms to take advantage of new approaches. Considerable research is required to determine the optimal institutional and course-based supports needed for these students. Universities are informing students that the blended mode is the best delivery method for their learning, when in truth, we are all in our infancy in this new paradigm.^[14]

Universities have also made the assumption that students possess sufficient organizational and study skills to easily cope with these changes.^[15] Students enrolling in what they assume are “traditional” university programs will not have an expectation of multiple uses of educational technologies or of self-directed learning.^[16] The increasing use of purposeful video or other activities designed to engage the student in the independent mastery of content is an essential part of the “flip.”

Most students are not aware that they will need to develop a whole new skill set that allows them to be effective learners when exposed to these changes in pedagogy. The major change they will need to adopt is an imperative to independently manage their own learning processes and constructs their own knowledge.^[15] This may also be said for students enrolling in courses taught through problem-based learning (PBL), a typical teaching strategy in many medical institutions.^[3]

Further, this new learning model has not been experienced by their parents or older siblings, teachers, or other role models, and this renders most students of blended learning as a new breed of “first-in-family,” without traditional mentors – a cohort that has been previously acknowledged by all universities as requiring special support.^[17]

As these blended delivery models become increasingly popular, universities are providing a plethora of programs to support academics in teaching and course design. A broad variety of incentives and programming is provided to assure that teaching academics are redesigning their courses, as well as their teaching methods. Despite these efforts, the skill deficit of many university teachers is a major challenge. Many of the teachers are learners themselves, with a compulsion to change their teaching methods through university policy and strategy, and not necessarily through their own choice.^[11,18]

A MODEL FOR THE SUCCESSFUL DESIGN AND DELIVERY OF BLENDED COURSES

The design and delivery of these blended courses involve three essential partners: the academics teaching the course (and their teaching teams including tutors and lecturers), the students taking the course, and the instructional designers creating the learning objects for the course and often assisting with course assessment, structure, and design. Any model targeted at designing and delivering a successful blended course must include all three groups.

The blended learning model [Figure 1] included here was developed as the result of the examination of student feedback, our professional experience, and an extensive review of the literature. The significance of this model is in the identification of three distinctive stakeholders involved in the blended course design and delivery cycle. The model suggests that three essential inputs are required before and during the design, delivery, and evaluation of a blended course: from the academics teaching the course, from the students taking the course, and from the instructional designers enabling the course.

Achieving success in blended learning courses also requires intensive support for the three stakeholder groups [Figure 1]. Academics need continuing and comprehensive support and guidance in the development of courses in the blended learning mode as well as in the associated pedagogical theory. Instructional designers require constant upskilling relating to the rapidly evolving suite of tools at their disposal as well as

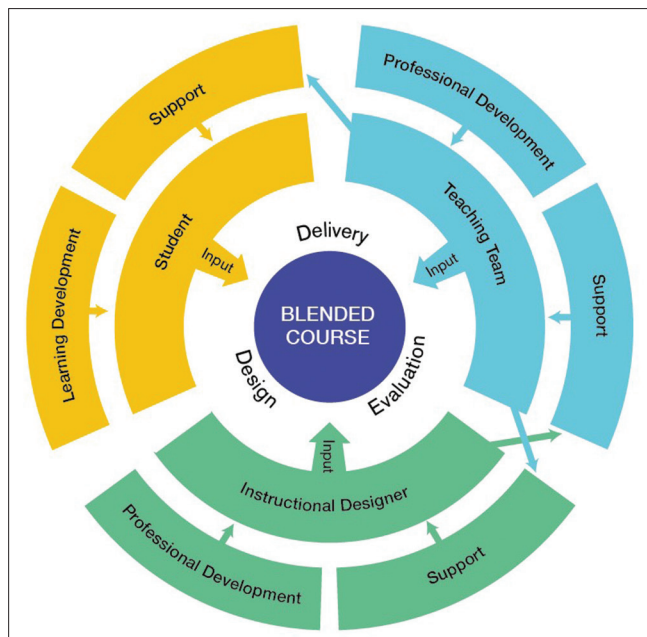


Figure 1: Model for inclusive blended course design, delivery, and evaluation

sound pedagogical knowledge. Students need substantial and formal training relating to how their behaviors will help them succeed (or not) as well as specific professional development in the use of technologies and other study skills.

This model [Figure 1] does not propose new or radical concepts in the field of blended design, delivery, and support. Rather, it aggregates what has been acknowledged as the challenges to course development and delivery and suggests a way forward that may assure academic success. The model suggests that academics, students, and instructional designers should all have active input into blended course design.

This is consistent with the findings of Deane and Stanley,^[19] who recommended that students and staff must work together as partners to create more effective curricula and a better general learning environment. They recommend that students and student leaders are given training so that their contributions go beyond that of an often uninformed token student representative and passive consumer of knowledge, and that students are “co-producers and partners in knowledge generation and acquisition.” This philosophy of engaging students in the actual development of curriculum is described as well by Bovill *et al.*^[20] and Bovill,^[21] who report that globally, academics are increasingly involving students in the development of their curriculum, course activities, and engagement. This involves the practice of co-created curricula, where students are actively involved in the curriculum development at the outset and engaged along the way as the course is delivered.

Including students in the provision of input to curriculum design can take a number of forms such as welcoming senior students on curriculum development committees, asking for their direct input during the curriculum design

and development process, requesting frequent and broad feedback from students engaged in a newly designed course while the course is underway, gathering traditional student feedback on teaching after the course has been delivered, and surveying students both within programs and more generally, regarding their learning requirements and resource and activity preferences.^[20] Bovill describes these methods as engaging in true collaboration with students on general curriculum design, and it is argued that this partnership is even more critical for offering blended courses.^[21] A unique opportunity exists that will allow academics, instructional designers, and students to learn together as they move forward in this fundamentally different form of university study.

INTEGRATING BLENDED LEARNING AT THE UNIVERSITY OF NEWCASTLE, AUSTRALIA

In 2014, the Business Faculty at the University of Newcastle began a concentrated initiative to convert all 1st-year courses for delivery in a blended mode. Four of these newly designed courses were offered in the first semester in 2015.

Feedback from students was mixed, with many saying that they would prefer the traditional lecture mode, while others indicated that they enjoyed the added engagement in the classroom. Other opinions fell within these two extremes, but the general feedback was that students had not expected to “learn the material themselves” when they enrolled. The courses in this case were new and developed by academics who were inexperienced with teaching in these modes, which may well have had an impact on student perception. No targeted student support was directed specifically toward these courses, but academics were provided with course design and development assistance. Initial anecdotal information suggested that 3rd-year students were more comfortable with engaging in activities that allowed them to construct their own learning than were 1st-year students. This was concluded to be primarily due to 3rd-year students’ acquired abilities to independently engage with learning materials and construct learning through their previous experience of university study. It should also be noted that the 3rd-year blended course was flipped voluntarily by the course coordinator as compared to those compelled to flip their courses under policy.

INTRODUCING BLENDED LEARNING IN MEDICAL EDUCATION

When considering the above, those engaged in the field of medical education may successfully argue that flipped learning methodologies are not dissimilar to PBL strategies that have been employed in medical education for over 30 years.^[2]

PBL originated in the medical school at McMaster University in Hamilton, Canada in 1968^[22] and evolved into an overall learning approach in the 1980s. Subsequently, the PBL approach was initially adopted as the central teaching method at the University of Newcastle (Australia), New Mexico (US),

and Maastricht (the Netherlands). Currently, PBL has been successfully implemented in a wide range of educational settings and has grown in popularity, becoming the standard mode of teaching in a number of disciplines, including medicine.

Using the structured PBL approach,^[3] students learn the content of a subject by developing a solution for an open-ended problem they receive before a tutorial session. The PBL process does not focus on solving the problem posed (although this is a desired outcome) but supports the development of knowledge and skills that are necessary for successfully completing the given task. Using PBL and similar to flipped classes, students engage with course material as they develop their solution to a problem before to a group tutorial. The main structure for the tasks relies on group activity to reach consensus in structured tutorials that are closely monitored and supervised.

For example, medical students may be presented with an ill patient and their task would be to research possible diagnoses and treatment options. The students may research using any resources available including the internet. Following this research, the structured tutorial could consist of a presentation with a synopsis of the findings and discussions about possible diagnoses followed by possible treatments appropriate for the case. In the group review of the cases, the tutorial leader will ensure all possible diagnosis options are considered, verifies all material presented is accurate and appropriate and ensures treatment options are covered through active discussion.

PBL tutorials involve working in small groups to complete the set task. As in the example above, these group tasks focus on the student's ability to reflect and on their reasoning skills to construct the solutions to the problems posed. There is consideration given to the Maastricht seven-jump process (clarifying terms, defining problem(s), brainstorming, structuring and hypothesis, learning objectives, independent study, and synthesis).^[23] In this way, students identify what they already know, what they need to know, and how and where to access other information that can help solve the problem.^[24]

PBL was developed based on the concept of student-centered self-directed learning,^[2] building on previous concepts of constructivist learning already well documented in the field of education.^[25-28] The process of solving the problem promotes deep learning. PBL was designed to build clinical reasoning skills, build on knowledge deficits, and promote continuous learning through the development of skills used to address the problem.

Just as PBL represented a fundamental shift in teaching and learning methods for medical students in the 1980s, blended learning fundamentally changes the ways that we expect students in all disciplines to learn. One possibility that arises concerns medical teachers and students more easily adapting to the requirements inherent in blended learning, relating both to course design and self-directed study strategies, based on previous experience with and the expectation of PBL.

When considering blended learning and the impact on student success and student study habits, many teaching practitioners tend to focus on the technology component of blended strategies.^[6] While it is undeniable that the rapid development of educational technologies over the past decade has introduced a myriad of tools to engage students that were previously unavailable, the essence of blended learning is in the pedagogy and the student support aspects, as is also the case with PBL. A number of authors have suggested that there should be a new model of learning identified when integrating technological tools into PBL classes, for example, web-based learning^[29] and blended PBL.^[30]

It should be emphasized that blended learning, while generally including some components involving technology and online activities, is not about the technology *per se*, but more specifically about the strategy of having students master content before coming to class so that they can engage in activities that will help to solidify and deepen this learning.^[6] When considering concern for student success and achievement in a fundamentally unfamiliar environment such as PBL or blended learning, it should be acknowledged that the use of technology is not the focus. Online tools merely enable students to achieve learning outcomes independently before the intervention of university teachers who direct student activities when face-to-face classes occur. Therefore, the model described [Figure 1] would be effective in designing courses that are to be delivered in either PBL or blended modes, and for those taking advantage of both strategies because PBL and blended courses involve very similar design approaches and require similar student strategies to achieve success, the model would be applicable.

APPLICATION OF THE MODEL TO THE DESIGN OF A 1ST-YEAR MEDICAL EDUCATION COURSE

Recently, the University of Newcastle, Australia's School of Medicine, has been accredited for a completely redesigned undergraduate medical curriculum which assures the integration of both PBL and blended approaches. This innovative curriculum continues the program's internationally acknowledged success in PBL, integrating high-fidelity clinical and virtual experiences and activities for students in each year of study by introducing current practices of blended learning course design strategies.

The 1st-year medical science course in the new curriculum includes the following subjects: anatomy, histology, human physiology, medical biochemistry, immunology and microbiology, medical genetics, biomedical pharmacology, and pathology. This is a complex course with different lecturers from each discipline on each partner campus involved in course design and delivery. The course is currently scheduled for 4 h of lecture per week through both academic semesters of students' 1st year of study. Previous PBL strategies have been maintained within the curriculum and are being enhanced with video-based content.

To increase student engagement and assure the benefit to our students of current practices of active and blended learning, it was decided that this intense 1st-year medical science course would be developed and offered in a blended mode.

Utilizing the model [Figure 1], all lecturers involved in the course were brought together with learning designers and media production staff, in a series of workshops to determine which components of the basic medical science curriculum could be offered in a high fidelity “blended” mode. The expectation was that students would master a certain portion of the content before attending lectures. This was intended to allow lectures to address only those aspects of this very complex curriculum that are difficult for students to master and devote more time to these. PBL activities are also included in the 4 h per week lecture time.

Preliminary plans to integrate blended learning into the medical science course are more conservative than some blended initiatives, initially maintaining the 4 h per week of lectures, while asking students to master some rudimentary aspects of this content independently through online resources. This will allow more time for lecturers to explain complex and difficult content, as well as to begin the introduction of engaged activities in a systematic fashion. In subsequent years, over a 3-year period, the intention is to reduce the lecture time and add more online self-directed learning for the students, eventually resulting in 2-h workshop style classes per week with minimal lectures, accomplishing the “flip.” As more is learned about medical students’ capacity to master course content independently, this will progress with a goal to solidify this knowledge with face-to-face group encounters focused on PBL cases.

PBL cases will be offered through high fidelity video and presented to students in segments, to facilitate student independent inquiry. Caution must be exercised with this inclusion; however, because it may not always be accurate to assume that students, as digital natives, will naturally appreciate technological tools for learning. Ghanchi *et al.*^[31] reported that when presented with video-based PBL cases, students preferred the paper-based cases as more engaging and more effective to facilitate group discussion - more helpful in determining the detailed learning required by the cases. In this study, medical teachers reported that they found the video cases engaging but found no difference between the effectiveness of the two methods. This would suggest that while video may enhance the effectiveness of paper-based cases, students should be offered the content in both modalities.

As the initial offering of this course is presented to students, it will be critical that student feedback is sought at several points along the way. As presented in the above model, as the course is further redesigned with additional blended content, it will be essential to include the voices of students to ensure a student-focused delivery and adequate student support mechanisms in the future.

CONCLUSION

Given the above case example, it is suggested that the model presented here could be universally applied to any course design activities that involve the three partners – teaching faculty members, students, and instructional designers. With PBL as an expected standard now in medical education, it should come as little surprise to entering medical students that they will be required to construct much of their own learning, as the philosophies behind PBL and flipped learning are very similar.^[32]

An advantage for the medical discipline may be the previous experience that medical teachers have had with passing some control of primary learning to their students. Concerns outlined in this paper relating to the necessity for active student support and engagement would also apply to PBL courses, and the voice of students must be integrated into the design and redesign of these courses. This has proven more difficult in disciplines with a traditional didactic approach to teaching where instructors are reluctant to “let go” of the lecture, and where students have an expectation that they will receive traditional teaching at university.^[21] It will be interesting to determine whether these circumstances are less problematic for medical teachers and students due to the history of PBL in the discipline, and its acceptance as an expected method of instruction.

An interesting area of inquiry would involve the capacity of medical students to initially embrace the opportunity to take control of their own learning through flipped and blended strategies due to a number of general cohort characteristics such as academic aptitude, motivation, and availability of resources.

This paper has outlined a number of opportunities and concerns relating to university teachers’ and students’ ability to adapt to new pedagogical approaches currently gaining popularity in universities across the globe. Specific focus has been placed on consideration of the substantial change to learning and study activities, and the support mechanisms that would be required to assure their success in this new and often unexpected mode of learning. This necessitates the careful inclusion of the student’s voice in course design and redesign activities as the presented model illustrates. The design of blended courses must include all three essential partners – students, teachers, and learning designers.

Consideration for the interplay between PBL and blended approaches might suggest that medical teachers and their students may be somewhat ahead of the game relating to acceptance of and achieving the benefits of these evolving teaching strategies.

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