

Hybrid Course Delivery: Impact on Learning and Assessment

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Abstract—Technology is influencing education, blurring the boundaries of delivery modes. A combination between online and traditional teaching style, the hybrid/blended course, may present a solution with many benefits. This paper provides definitions of the different delivery approaches, and then evaluates four years of data from a course that has been converted from traditional face-to-face delivery, to a hybrid system. It is determined that the revised course, in hybrid delivery mode, is at least as good, if not better, than it previously was.

Keywords – Hybrid, e-Learning, Higher Education, Evaluation, Assessment

I. BACKGROUND

The Gartner Group Research Institute in the United States anticipated that the world's e-Learning sales would grow 14.5% annually from 2006 to 2011 [1]. Over a similar timescale, government policies in the UK also indicated that the effective use of technology-assisted student-focused learning is essential for the future of higher education [2]-[5]. In a review of higher education and the future role of the university, Ernst & Young [6] have suggested that "... campuses will remain, but digital technologies will transform the way education is delivered and accessed, and the way 'value' is created by higher education providers, public and private alike." (p. 4).

Greater, and smarter, use of technology in teaching is also widely seen as a promising way of controlling costs [7]. When compared to other service industries, higher education stands out as being particularly affected by what has been described as the "cost disease"[8]. Universities have large costs for infrastructure and labour, with reliance on expensive face-to-face provision. The urgent need to boost university productivity has been noted by many [9]-[11].

Lectures are accepted as being a very inexpensive way of presenting new ideas and concepts to students. Additionally, lecturing has been described as an ineffective tool for promoting theoretical understanding [12], as it rarely stimulates student thinking beyond the short-term memory [13][14]. The passive role assumed by students in lectures is too focused on the subject being delivered, rather than the learners and their individual needs [15]. But, teaching the same content can be made more interesting, and students can become active, independent learners, if different delivery methods are used [16].

Implemented proficiently, online or hybrid/blended

provision has the capacity to lower costs and at least sustain, if not boost student outcomes [17]-[19]. Hybrid/Blended learning can ease some of the economic strain on students, as it reduces commuting expenses and allows for a flexible timetable that may better accommodate the students' personal circumstances [20]. Cost simulations, although speculative, have indicated that adopting hybrid models of instruction in large introductory courses has the potential to reduce costs quite substantially [7].

This paper begins in Section 2 by introducing definitions of the terms in use for educational delivery. The "*Fundamentals of the Internet and the World Wide Web*" (CSCI 1150) course is then described in Section 3. The methodology for data collection is outlined in Section 4, with Section 5 exploring the evaluation of said data in terms of student outcomes and attrition rates. The relationship between assessment weighting and online student interactions in discussion forums is also measured. Section 6 identifies the limitations of this study, with Section 7 concluding that CSCI 1150, in hybrid delivery mode, continues to provide as good, if not better provision, than the previous traditional face-to-face delivery method.

II. DEFINING HYBRID/BLENDED LEARNING

The boundaries of educational modes are blurring due to the introduction of technology [21]. A wide range of terms are in use to describe ways in which students may engage with their studies, including on-campus, face-to-face, off-campus, open education, distance education, external study, online education, e-Learning, flexible learning, blended learning and hybrid. There is limited consensus on the meanings of these terms [22][23] resulting in confusion for academics, administrators and students.

For each method of engagement, there are distinct attributes that help define them, for example, it is suggested that an on-campus mode relates to "courses that deliver material face-to-face and students interact with instructors face-to-face" [24], whilst distance learning can be described as "the various forms of study at all levels which are not under the continuous, immediate supervision of instructors collocated with their students in the same physical location but which, nevertheless, benefit from the planning and guidance of a supporting organization" (p.4) [23].

The terms Blended learning and Hybrid learning are being used interchangeably with increasing frequency in academic writing, but again, there is no consensus on their

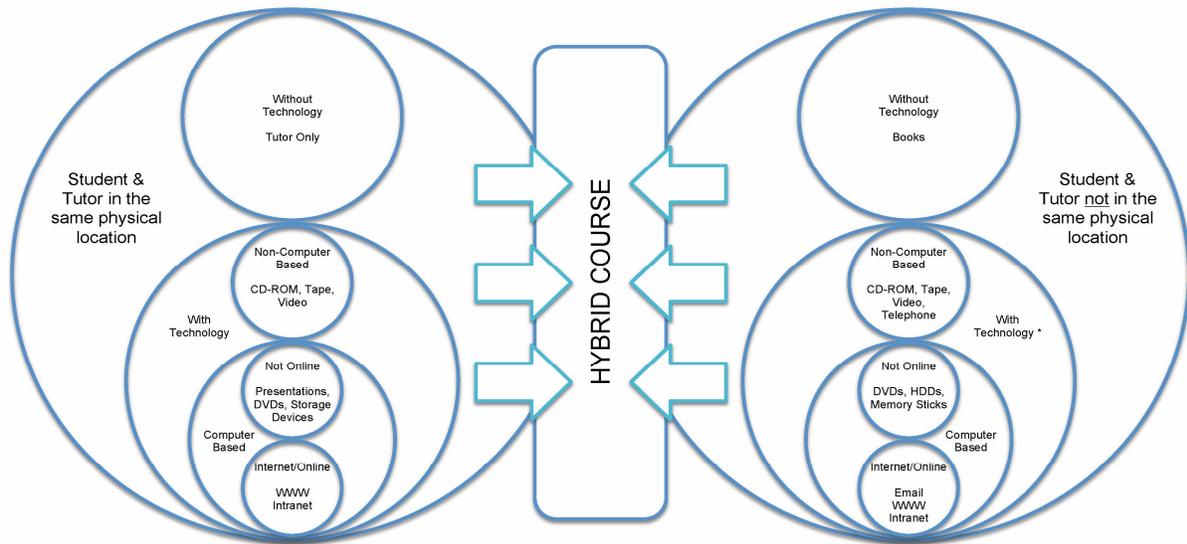


Figure 1. Hybrid courses in relation to traditional and online delivery

meaning [25]. In their most basic form, *Hybrid* is defined as being of “mixed character; composed of different elements” [26], whilst *Blended* is “an unobtrusive or harmonious part of a greater whole” [27]. In an educational context, a Hybrid/Blended course does not necessarily use a computer and the Internet, but it is increasingly common for this to be the case.

Further defining these approaches, but mixing the two terms, Blended learning has been described as a hybrid instructional approach combining aspects of e-learning and a traditional classroom environment [28]. An alternative description, favoured by the authors, is “courses that deliver material both face-to-face and online ... [where] ... students interact with instructors both online and face-to-face” (p.142) [24]. Research shows that this combination may promote learner-centred and active learning [29], however it has been suggested that this hybrid mixture of off-campus and on-campus activities is difficult to explain to prospective students [30].

A potential solution to the confusion is to define courses specifically by their construction. The public University System of Georgia (USG) [31] defines the following:

- *Fully online*: All or nearly all the class sessions are delivered via technology (96% to 100% online).
- *Partially online*: Technology is used to deliver more than 50% of class sessions (51% to 95% online).
- *Hybrid*: Technology is used to deliver at least one class session up to 50% of class sessions.
- *Campus/on-site*: No class sessions are replaced by online technology.

The relationship between traditional, online, and hybrid courses, is displayed in Figure 1.

III. COURSE DESIGN

The *CSCI 1150* course had traditionally been taught face-to-face, in both spring and fall semesters. In 2011, a Desire-to-Learn (D2L) component was developed, (a tool the students have previous experience of), where the content

was made available online, with PDF ‘slides’ that closely followed the associated textbook. Students were also provided with access to interaction tools (e.g., e-mail, chat, discussion forums) as well as a set of assessment tools (e.g., quizzes, assignments and exams).

The course content has been refined in subsequent years (2012-2014) to include additional required reading material, as well as a better-defined set of discussion forums, (one per textbook chapter) where students are encouraged to interact during the semester.

This refinement aims to provide fresh stimuli to the course, in order to promote students’ learning through questioning, investigating, challenging, seeking feedback, and learning through interactions with peers and tutors [32]. Technologies such as discussion forums can provide the opportunity for learners to be active in creating their own knowledge and understanding by allowing them to create, own, retrieve and exchange information within them [33]. The face-to-face sessions are then used to explore the course content, and the online interactions, in order to further develop the students’ understanding. This overall course design may be seen as consistent with the “flipped classroom” [34], and is presented in a 50:50 ratio, causing it to be described as Hybrid delivery under the University System of Georgia [31].

From spring 2012, the course assessment has also been completed online, with each element assigned a proportion of the overall grade: Assignments – 40%; Quizzes – 10%; Midterm exam – 25%; Final exam – 25%. This was then further supplemented from fall 2013, with the online forum interactions being rewarded 2%, of the weighting, reducing the Midterm and Final exams to 24% each. The online interaction based on Discussion Forums weighting has subsequently been increased to 10% in spring 2014, causing the Midterm and Final exams to be reduced to 20% each.

A. Automatic vs. Manual Grading

A learning management system like D2L provides

advantages to both instructor and student. It is possible to automate the process of quiz/exam delivery as well as grading, subsequently freeing significant instructor time.

The online quizzes for the hybrid course have 10 questions each, which are automatically generated from a database of 3000+ questions, all of which have the same difficulty level. The quizzes are automatically graded, immediately after the deadline, providing students with instant access to both the grade and the correct solutions. Students can then use this information to identify where they went wrong, which can then be discussed with the instructor.

The drawback in automating the process of delivery and grading come from the fact that some type of problems, such as those requiring essay-type answers, are difficult to automate, as they require manual grading for optimum accuracy and to provide personalized feedback. For this reason, the manually graded assessment has greater weighting in the overall final grade.

B. Deadlines and Penalties

Each assessment component has strict completion deadlines. Assignments have to be completed in 3 weeks, with a deadline enforced through the D2L submission system. Late submission was not accepted, and failure to submit an assignment would almost certainly result in dropping a grade, as the assignment weight was 10% of the final outcome.

For the Quizzes, each weighted at only 1% of the final grade, there is a 2-3 week timeframe during which each can be taken, offering the students flexibility in their learning.

As previously identified, the Midterm and Final exams were also given online, with a 12-hour window where they are 'live' and can be taken. Each exam consists of 10 problems, with 80% of the responses being manually graded. Each exam is weighted at 20%, with no late submissions permitted.

The final, newest element of assessment, which is based on the interactions in the discussion forums, has a one-month timeframe where posting is allowed to a particular forum. After the expiration time the students can still read, but not post, to the specific forum, providing a continuous source of information. The discussion forum contributions are weighted at 10% of the final grade, with contributions evaluated subjectively by the instructor; being measured both quantitatively and qualitatively.

C. Interaction

Two types of written discussions are frequently used in a hybrid course: synchronous and asynchronous. Whereas synchronous discussion requires participants to log in at a predetermined time and simultaneously join the discussion, asynchronous activities allows users to organize, read, and post messages at their own pace, as dictated by their preferred schedule.

Where online/hybrid course designers have opted for the use of discussion forums, they play an important role, often making up the major part of the students' activities and

providing evidence of attendance, class participation, and sometimes assessment [35]-[38]. The delayed element to asynchronous communication, can allow participants more time to consider their responses, promoting deeper consideration and reflection of the subject [39][40]. Despite this, it has also been argued that scholarly thinking regarding assessment of online discussion has not kept pace with the growing popularity of such practices [41].

The asynchronous interactions in CSCI 1150 employ e-Mail, a News system, and Discussion Forums, the latter consisting of one primary thread per textbook chapter. The News system is an efficient tool for the instructor to provide students with updates about the course, however it is a unidirectional communication tool - from instructor to students.

Online synchronous interaction was implemented in CSCI 1150 through a Chat channel. It has been observed that the channel is mainly used immediately prior to the Midterm and Final exam period, serving as an emergency notification tool for the student if/when something goes wrong with the online exam session.

The other synchronous interaction occurred in the traditional in-class face-to-face meetings. As part of the Hybrid course, students meet with their instructor once a week, for a 75-minute session, where they can discuss and ask/answer questions. Attendance is not mandatory and it has been observed that by the middle of the semester an average of 60% of the students attend these sessions.

Online interaction was stimulated through the relationship between this activity and the assessment. Ten per cent of the final grade is awarded for the discussion forum posts, with each student being expected to provide at least three posts per thread, each of 200 words or more, as well as responding to classmates' questions. At the end of the semester, the student with the highest number of quality posts receives a further 10% towards their final grade; the other students receive lower additional percentages, representative of their contributions.

IV. METHODOLOGY

The CSCI 1150 course, a service course at Armstrong State University, Georgia, USA was observed over a period of 4 years, through seven semesters (Spring and Fall, 2011 to 2014). The course was delivered by traditional face-to-face methods in 2011, and was then converted to Hybrid delivery for 2012-14. There is no entry requirement for the course.

The average class size was 25, and the students included in the data collection ranged from 19 to 42 years of age, with a female to male ratio of 1.7 to 1. The analysis of the experimental data is straightforward. The outcomes for students previously undertaking the course in the traditional format are compared to the outcomes for students undertaking the hybrid formats.

The data collected consists of the students' final grades, failure rates and withdrawal rates. To further evaluate the hybrid delivery method, the students' asynchronous

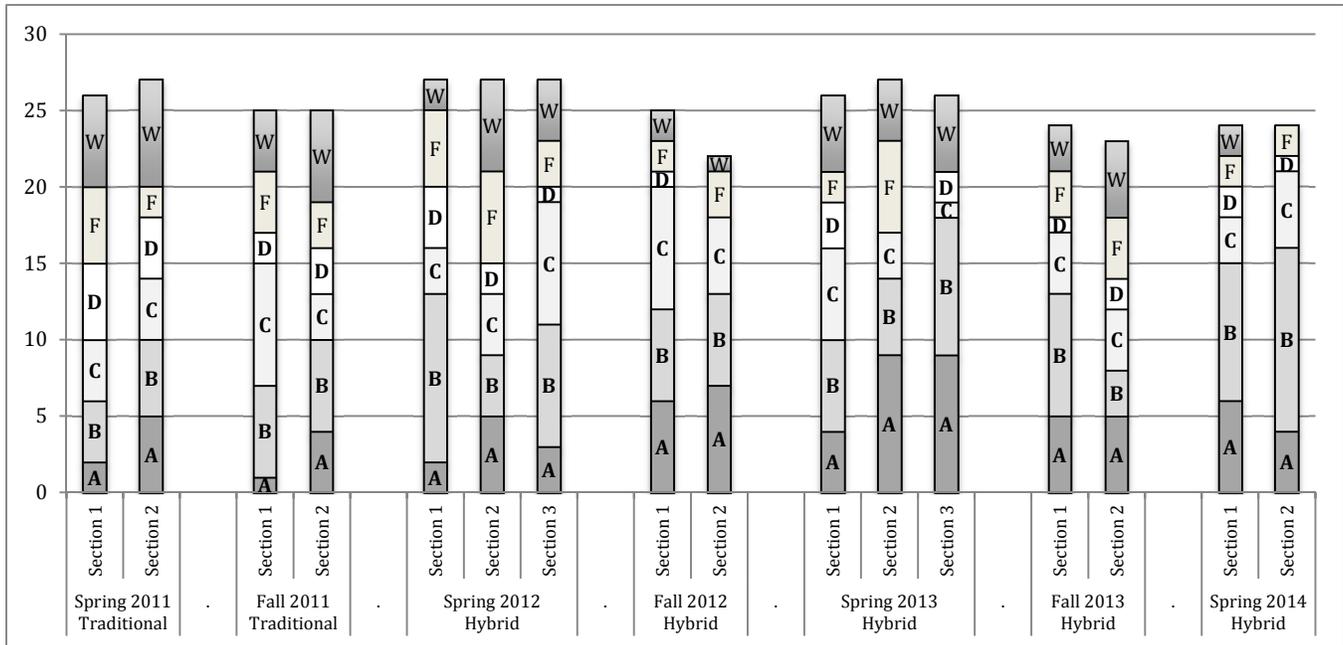


Figure 2 Total Number of Enrolled Students, Number of Each Final Grade and Number of Withdrawals, per Cohort. (Grades A-D, F=Fail, W=Withdrawn)

interactions are also investigated. The rate and volume of posts in the online forum are analysed in consideration of the changes in the course structure.

V. COURSE EVALUATION

The final outcomes for the students are displayed in Figure 2, and these show no significant difference between the traditional course that was delivered in 2011, and the subsequent hybrid delivery, with the course mean grade fluctuating between B and C (except for the anomalous D mean for the Spring 2011 Section 1). There is, though, some suggestion, albeit slight, that the course outcomes may be improving, with a median of grade B appearing more regularly in the recent hybrid courses (Table 1); but whether this is due to the delivery method, or some external factor, cannot be determined.

The goal of a blended/hybrid learning experience is “to provide a mix of both on-line and face-to-face experiences which support each other in achieving desired learning outcomes” [42], and whilst Universities are already experimenting with this style of learning, “the term is still relatively new therefore leaving many to question how the mixing of online and mobile learning with face-to-face interaction will actually improve student experience now and in the long term” [43]. However, it has been demonstrated that traditionally delivered, subject-intense courses can be converted to a ‘blended/hybrid’ delivery approach with “as good, if not better outcomes”, if they are well-designed with high quality content and regular interaction [44]. Students in the hybrid format pay no “price” for this mode of instruction in terms of exam scores, and overall performance [7].

In other sectors of the economy, the use of technology has increased productivity, measured as outputs divided by inputs, and has even often increased output. Bowen at al [7] showed that a hybrid-learning system did not increase outputs (student learning) but could potentially increase productivity by using fewer inputs.

When considering the course attrition rates, it is important to note that students are allowed to withdraw without penalty before an identified deadline – usually just after the Midterm exam. This allows failing students to leave with a ‘clean record’, meaning they can retake the course in the future, should they wish to. Despite this, there is positive

Table 1. MEAN AND MEDIAN GRADES FOR THE COHORTS

	Mean Grade	Median Grade
Spring 2011 Section 1	D	D
Spring 2011 Section 2	C	C
Fall 2011 Section 1	C	C
Fall 2011 Section 2	B	B
Spring 2012 Section 1	B	B
Spring 2012 Section 2	C	C
Spring 2012 Section 3	C	C
Fall 2012 Section 1	C	B
Fall 2012 Section 2	C	B
Spring 2013 Section 1	C	C
Spring 2013 Section 2	C	B
Spring 2013 Section 3	B	B
Fall 2013 Section 1	B	B
Fall 2013 Section 2	C	C
Spring 2014 Section 1	C	B
Spring 2014 Section 2	B	B

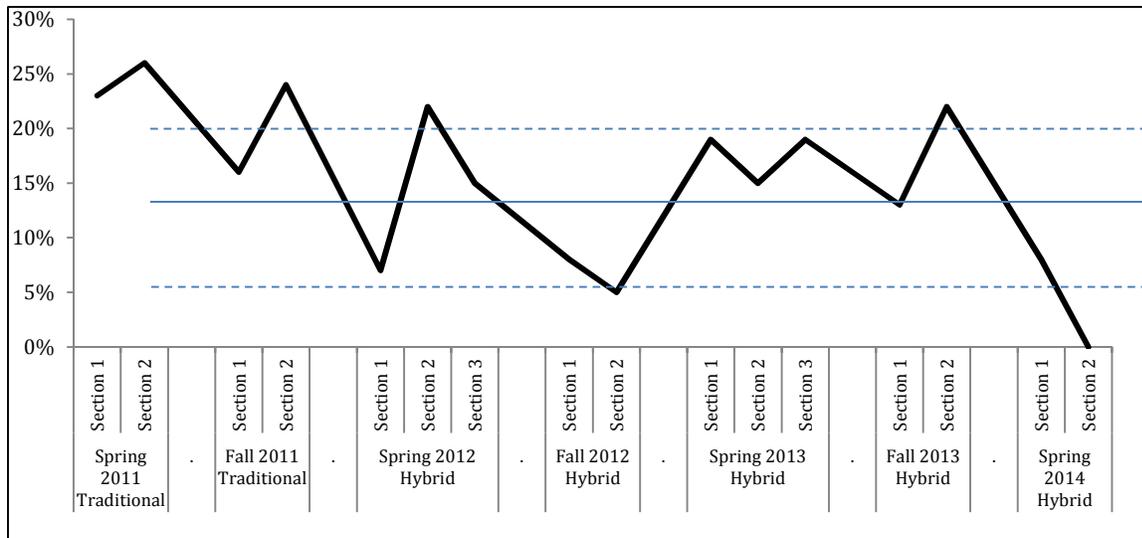


Figure 3. Course Attrition by Percentage of Total Enrolled Students (showing Mean and SD)

indication that attrition rates are reducing, as illustrated in Figure 3. However this is unlikely to improve significantly under the current withdrawal policy.

As previously identified, asynchronous interactions through e-mail are primarily exchanged around (1-2 days, before and after) a major deadline for an assignment or exam. For example 76.5 % of the e-mails received for sections 1 and 2 during Spring 2014, were specifically targeted on questions around major assessment components. Students also tend to interact little amongst themselves using the e-mail system, with only 36% of the e-mails sent being student to student communications.

For the online interactions measured only through the Discussion Forums (from Fall 2012 to Spring 2014), a quantitative analysis of the forum contributions (number of authored posts and number of read posts) reveals, unsurprisingly, that there is a direct dependency between the grading weight of the online interaction and the number of posts in the forum. Evidence shows that the higher the

assessment grade percentage, the higher volume (and quality, in the instructor’s opinion) of forum posts made by the students, as shown in Figure 4.

VI. LIMITATIONS

This is a small-scale study and the data was drawn from a specific course, with a limited number of participants. The study may have been influenced by factors specific to the student groups, which are not immediately evident from the findings. Also, experiences external to the course content and delivery may have contributed to student outcomes and opinions.

VII. CONCLUSIONS AND FUTURE WORK

In this paper, Hybrid/Blended learning is discussed in the context of the existing terminology. The design and main components of a course that was morphed from a traditional format to a hybrid one, is then described.

The course analysis and evaluation focuses on the

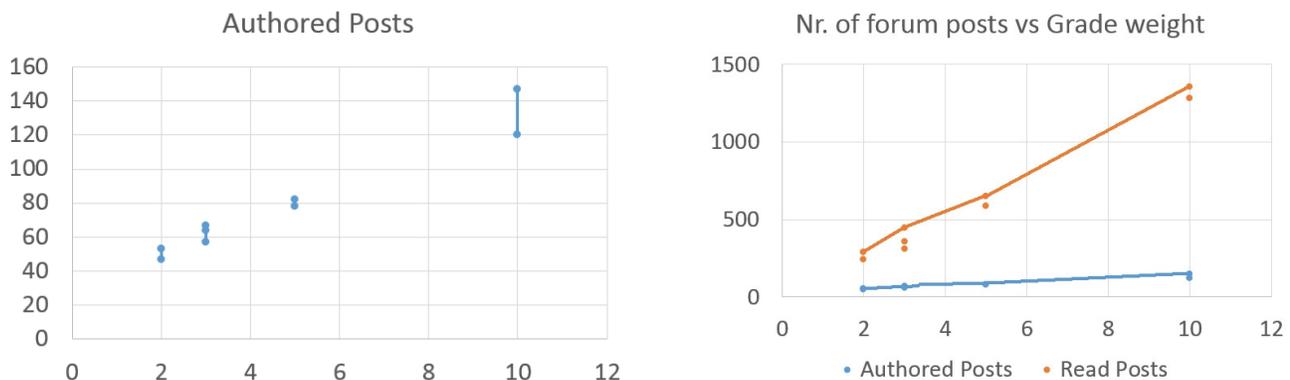


Figure 4. Relationship between the grading weight (2 , 3, 5, 10%) of the final grade and the number of authored/read posts in the forums

outcomes for students that undertook the course in the traditional format, and the outcomes for students undertaking the revised hybrid formats. It is shown that students in the hybrid format pay no “price” for this mode of instruction in terms of pass rates, exam scores, or performance. Moreover, they can be motivated to interact online with slight adjustments in the grading policy, which promotes participation, and improves students’ computer skills.

The evidence supports the hypothesis that well-designed interactive hybrid systems in higher education, have the potential to achieve at least equivalent educational outcomes as traditional courses, while opening up the possibility of freeing up significant resources that could be redeployed more productively. This alone is cause for this style of delivery to be recommended.

The course structure will continue to be reviewed, in consideration of student outcomes, to promote higher final outcomes.

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