

Article

## Student Engagement and Blended Learning: Making the Assessment Connection

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**Abstract:** There is an increased focus on student engagement and blended approaches to learning in higher education. This article demonstrates how collaborative learning applications and a blended approach to learning can be used to design and support assessment activities that increase levels of student engagement with course concepts, their peers, faculty and external experts, leading to increased student success and satisfaction.

**Keywords:** student engagement; collaborative learning applications; blended learning; assessment

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### 1. Introduction

Over the past decade, there has been an increased focus on the topic of student engagement in higher education in light of rising tuition costs and concerns about student success and retention rates [1]. In order to address these issues, Littky and Grabelle [2] advocate for a curriculum redesign that stresses relevance, rigor, and relationships (3R's of engagement). It has been suggested that such a redesign would enable students to meaningfully engage in sustained learning experiences that may lead to a state of optimal flow, which Csíkszentmihályi [3] defines as “the mental state of operation in which the person is fully immersed in what he or she is doing by a feeling of energized focus, full involvement, and success in the process of the activity” [3] (p. 9). Pink [4] suggests that students can achieve this state of “flow” by educators providing them with opportunities to become “driven”

learners who have a sense of purpose, are autonomous, and are focused on mastery learning. And, Fullan [5] stresses that optimal flow is achieved by creating learning environments that focus on purpose, passion, and play (3P's of engagement).

In 1998, the National Survey of Student Engagement (NSSE) was developed as a “lens to probe the quality of the student learning experience at American colleges and universities” [6] (p. 3). The NSSE defines student engagement as the amount of time and effort that students put into their classroom studies that lead to experiences and outcomes that constitute student success, and the ways the institution allocates resources and organizes learning opportunities and services to induce students to participate in and benefit from such activities. Five clusters of effective educational practice have been identified based on a meta-analysis of the literature related to student engagement in higher education. These benchmarks are [6]:

- (1) Active and collaborative learning
- (2) Student interactions with faculty members
- (3) Level of academic challenge
- (4) Enriching educational experiences
- (5) Supportive campus environment

Recently, the educational research literature [7] has indicated that blended approaches to learning might provide an optimal environment for enhancing student engagement and success. The idea of blending different learning experiences has been in existence since humans started thinking about teaching [8]. The on-going infusion of web-based technologies into the learning and teaching process has highlighted the potential of blended learning [9,10]. Collaborative web-based applications have created new opportunities for students to interact with their peers, teachers, and content.

Blended learning is often defined as the combination of face-to-face and online learning [11,12]. Ron Bleed, the former Vice Chancellor of Information Technologies at Maricopa College, argues that this is not a sufficient definition for blended learning as it simply implies “bolting” technology onto a traditional course, using digital technologies as an add-on to teach a difficult concept, or adding supplemental information. He suggests that blended learning should be viewed as an opportunity to redesign how courses are developed, scheduled, and delivered through a combination of physical and virtual instruction: “bricks and clicks” [13]. Joining the best features of in-class teaching with the best features of online learning that promote active, self-directed learning opportunities with added flexibility should be the goal of this redesigned approach [14–16]. Garrison and Vaughan [17] echo this sentiment when they state that “blended learning is the organic integration of thoughtfully selected and complementary face-to-face and online approaches and technologies” [17] (p. 148). A survey of e-learning activity conducted by Arabasz, Boggs and Baker [18], over ten years ago, found that 80 percent of all higher education institutions and 93 percent of doctoral institutions offer hybrid or blended learning courses.

Most of the recent definitions for blended courses indicate that this approach to learning offers potential for improving how we deal with content, social interaction, reflection, higher order thinking, problem solving, collaborative learning, and more authentic assessment in higher education, which could potentially lead to a greater sense of student engagement [16,19,20]. Moskal, Dziuban and Hartman [21] further suggest that “blended learning has become an evolving, responsive, and dynamic

process that in many respects is organic, defying all attempts at universal definition” [21] (p. 15). In this chapter, the author defines blended learning as the intentional integration of synchronous and asynchronous learning opportunities.

The literature also suggests that the use of collaborative learning applications such as social networking sites, blogs, and wikis has been increasing in higher education courses but that there has been a lack of corresponding research about how these tools are impacting student learning and engagement [22]. Can these tools be used to design and support assessment activities that increase the level of student engagement with course concepts, their peers, faculty and external experts, potentially leading to increased student success and satisfaction in a blended learning environment?

A study was conducted to investigate the impact of collaborative learning applications (e.g., blogs, wikis, clickers, social media sharing, and networking applications) on student learning and engagement in first year undergraduate courses designed for blended learning. The study addressed the following questions:

- (1) How are instructors designing assessment activities to incorporate student use of collaborative learning applications in blended courses?
- (2) How do students perceive the value of these digital tools?
- (3) Is there a correlation between the use of these tools, the level of perceived student engagement, and academic achievement in blended courses?

The use of collaborative learning applications was examined in seven, first-year blended learning courses from different disciplines at Mount Royal University in Canada (Biology, Business, Child and Youth Studies, Communication Studies, Economics and General Education—Controversies in Science and Creativity in the Workplace).

## 2. Theoretical Framework

The collaborative constructivism framework developed by Garrison and Archer [23] and the theoretical foundations of the National Survey of Student Engagement (NSSE) underpin this research study. Garrison and Archer [23] trace the origins of collaborative constructivism back to Dewey [24] who argued that “meaningful and educationally worthwhile knowledge is a process of continuous and collaborative reconstruction of experience” [23] (p. 11). They indicate that meaningful and worthwhile learning outcomes are facilitated in a collaborative environment where individual students are recognized and supported, a variety of perspectives are presented and examined, and misconceptions are diagnosed.

The NSSE examines the relationship between student engagement and student success in higher education institutions throughout the world [25]. The NSSE conceptions of student engagement in higher education are grounded in several decades of prior research, and particularly in four key antecedents: Pace’s [26] “quality of effort” concept, Astin’s [27] theory of student involvement, Chickering and Gamson’s [28] principles of good practice in undergraduate education, and Pascarella and Terenzini’s [29] causal model of learning and cognitive development.

### 3. Methods of Investigation

An action research [30] and case-based method [31] were utilized for this study. This approach consisted of a mixture of quantitative (e.g., online surveys) and qualitative (e.g., interviews, focus groups) research methods.

#### 3.1. Data Collection

Data was collected from two iterations of the seven, first-year blended learning courses over a two-year period. A total of 273 students and 8 instructors participated in this study. This project received Mount Royal University Ethics Approval and both students and instructors signed informed consent forms. The consent forms offered the participants confidentiality and the ability to withdraw from the study at any time.

The data collection process began with pre-course interviews with all the instructors involved in the seven blended courses. The purpose of these interviews was to identify how instructors were planning to use collaborative learning applications, in alignment with assessment activities, to help students achieve the intended course learning outcomes.

A 75 item online survey was designed to collect demographic data, information concerning student use of collaborative learning technologies, and perceptions about student engagement. Items used in the survey were derived from the Classroom Assessment of Student Engagement (CLASSE—the classroom version of the *National Survey of Student Engagement*) [32] and the *EDUCAUSE Centre for Applied Research Study of Undergraduate Students and Information Technology* [33]. The *Flashlight Online Survey Tool* [34] was used to administer the survey to both students and faculty in all seven blended courses. The survey was deployed during the tenth week of the semester, in two iterations of each course. The tenth week was selected so that students would have had sufficient exposure to the collaborative learning applications in their blended courses to provide the author with meaningful feedback and so that there would be time for a student focus group meeting before the end of the semester.

Student focus groups were facilitated and digitally recorded using a standardized protocol by an undergraduate research assistant (URA) during the eleventh week of the semester for the first iteration of each course. The URA was an education student who received training from the author of this study and she used a series of open-ended questions, generated from the survey results, to guide the focus groups. These focus groups were limited to the first iteration of each course due to budget constraints. Approximately ten students attended each of the seven focus groups (e.g., one for each blended course), which provided an opportunity to discuss and verify the findings from the online surveys.

Students' level of use of *Blackboard*, the institutional learning management system (LMS), was also assessed using page hits per student per course. Academic achievement was defined as students' final grade in the blended course under study.

Reports were prepared for each of the seven blended courses and post-course interviews were digitally recorded with each of the instructors at the end of the semester depending on when the second iteration of the course took place. In addition, a focus group lunch was held with all the instructors in order to review and discuss the preliminary data collected.

### 3.2. Data Analysis

#### 3.2.1. Quantitative Data

Descriptive statistics (frequencies, means, and standard deviations) were calculated for individual survey items. Scale scores were computed for the following engagement-related parameters using methods described elsewhere ([http://nsse.iub.edu/#construction\\_of\\_nsse\\_benchmarks](http://nsse.iub.edu/#construction_of_nsse_benchmarks)): active and collaborative learning; student-faculty interaction; level of academic challenge; and engagement in effective educational practices. A scale score reflecting intensity of students' course-related digital technology use was calculated based on responses to selected survey items. Cronbach alpha coefficients were utilized to assess the internal reliability of calculated scales. Descriptive statistics (range, mean, and standard deviation) were used to depict level of use of the LMS. Pearson correlation coefficients and analysis of variance were used to assess the association between engagement measures, digital technology use, and academic achievement.

#### 3.2.2. Qualitative Data

Interviews and focus group sessions were digitally recorded and transcribed by the URA. A constant comparative approach was used to identify patterns, themes, and categories of analysis that “emerge out of the data rather than being imposed on them prior to data collection and analysis” [35] (p. 390). These transcripts were reviewed and compared with the responses from the open-ended online survey questions in order to triangulate themes and patterns.

## 4. Findings

This section begins with a demographic and digital technology ownership profile of the study participants followed by a summary of the results for each of the three research questions:

- (1) How are instructors designing assessment activities to incorporate student use of collaborative learning applications in blended courses?
- (2) How do students perceive the value of these digital tools?
- (3) Is there a correlation between the use of these tools, the level of perceived student engagement in these courses, and academic achievement in blended courses?

### 4.1. Demographic Profile and Technology Ownership of the Study Participants

#### Student Demographics

In order to establish a context for the study findings, the student version of the online survey asked a series of demographic questions. The survey response rate was 53% for students ( $n = 273$ ) and 100% for faculty ( $n = 8$ ). The demographic profile of the students is summarized in Table 1.

The vast majority of respondents were first year students who were employed and commuted to campus. Respondents were primarily under the age of twenty-five. Over two-thirds were female. The demographic profile of student participants reflected that of the university as a whole with respect to gender, age, employment status, residence, and level of course enrollment [36].

**Table 1.** Survey respondent demographics.

<b>Item</b>	<b>Percentage/Number</b>
Female	69%
24 years of age or less	82%
Employed (part-time 62%; full-time 13%)	75%
Average hours of work per week	16
Off-campus accommodation within driving distance	84%
First year of studies	75%
Average number of courses enrolled in/semester	4
Core course in program	78%

#### 4.2. Student Digital Technology Access and Use in the Classroom

Questions from the *EDUCAUSE Applied Research Study of Undergraduate Students and Information Technology* [33] survey were used in order to establish the types of digital technologies that students had access to outside the classroom and what kinds of technologies they were using in their courses. Student digital technology access is illustrated in Table 2.

**Table 2.** Student technology access and proficiency.

<b>Technology Access and Proficiency</b>	<b>Percentage</b>
Personal rating of computer skills as intermediate/advanced	63/34
Access to high-speed home Internet connection	96
Have your own cell phone	95
Have your own MP3 digital music player	88
Have your own laptop computer	82

These results suggest that most survey respondents had access to high-speed Internet connections, cell phones, MP3 players, and laptops outside of the classroom. In the *EDUCAUSE Applied Research Study of Undergraduate Students and Information Technology for 2011*, eighty percent of the students surveyed also had access to a laptop computer. This EDUCAUSE study [33] and a *Pew Internet and American Life* report [37] indicate that laptops have overtaken desktops as the computer of choice for adults under the age of 30.

Fourteen survey items measured frequency of students' use of collaborative learning applications in blended courses under study using a four-point scale (very often, often, sometimes, never). Results are displayed in Table 3.

This table clearly demonstrates that students used digital technologies primarily to access online course materials and communicate with the instructor and other students. More advanced applications such as virtual worlds (e.g., Second Life) and mashups were rarely used by students in the courses that were studied. These findings mirror the results of the *EDUCAUSE Applied Research Study of Undergraduate Students and Information Technology for 2011* [33].

**Table 3.** Course digital technology use.

<b>Technology</b>	<b>Often/ Very Often</b>	<b>Never/ Sometimes</b>
Accessed <i>course materials online</i> (i.e., via Blackboard site, course wiki, etc.)	96%	4%
Used <i>email</i> or a <i>discussion forum</i> to communicate with the instructor(s) of this course	49%	51%
Worked in <i>teams or groups</i> using information and communication technology (i.e., clickers, Blackboard, wikis, blogs, Google Docs, etc.)	48%	52%
Used a <i>MRC Library online database</i> (i.e., EBSCO, ProQuest, etc.) to find material for a course assignment or project	38%	62%
Used <i>real-time communication tools</i> (i.e., Elluminate, cell phone, chat group, Internet, instant messaging, etc.) to discuss or complete an assignment with classmates in this course	38%	62%
Used a <i>social networking application</i> (i.e., Twitter, Facebook, MySpace, Ning, etc.) for discussion of course material, assignments or project work	34%	66%
Used <i>clickers</i> (i.e., personal response systems) in class	32%	68%
Used a computer and/or a digital projector to make a <i>class presentation</i>	32%	68%
<i>Wiki</i> or other <i>collaborative writing tool</i> (e.g., Google Docs, etc.) for course assignments or projects	27%	73%
<i>Media sharing application</i> (i.e., YouTube, Flickr, Podomatic, Slideshare) to create, share or access information for a course assignment or project	18%	82%
<i>Blog</i> for course related work such as assignments or projects	13%	87%
<i>Social bookmarking tool</i> (e.g., Delicious, Furl, Connotea, etc.) to manage/organize and share online resources in this course	5%	95%
<i>Virtual world application</i> (i.e., Second Life, The Palace, Moove, etc.) for course assignments or project work	2%	98%
<i>Mashup application</i> (i.e., Visuwords, Quintura, Intel's Mash Maker, etc.) for course assignments or project work	1%	99%

#### 4.3. Assessment Practices and Collaborative Learning Applications

Instructors were asked in pre- and post-course interviews about how they were designing course assessment activities to incorporate student use of collaborative learning applications. All instructors indicated that they were using *Blackboard*, the institutional learning management system, as a “base camp” with hyperlinks to collaborative learning applications, which provided opportunities for student self-reflection, peer review, and instructor assessment feedback. The institutional learning management system provided students with a common portal (e.g., URL) so that they did not have to remember and find a series of web-based addresses for the interactive learning technologies (Figure 1).

A range of collaborative learning applications were used to support assessment practices in each of the seven blended courses. Digital technologies that were used in specific courses were identified from the interview and focus group transcripts. For example, students used blogs (e.g., *Blogger* and *Word Press*) for self-assessment feedback and reflection in the Child Studies and Creativity in the Workplace courses. At the beginning of the semester, students posted an initial journal entry about their personal learning goals for the course and what they thought they already knew about the course content. Then

at the end of the semester, students created a final journal entry that reflected on what they had learned and how they had changed, grown, and developed throughout the course. In the Child Studies course, the students were also required to post blog entries related to each major course project and assignment (Figure 2). The purpose of these entries was to have students intentionally reflect about what they learned through the process of completing the assessment activity and how they could apply this learning to their future course studies or careers.

**Figure 1.** Blackboard as the course “Base Camp”.

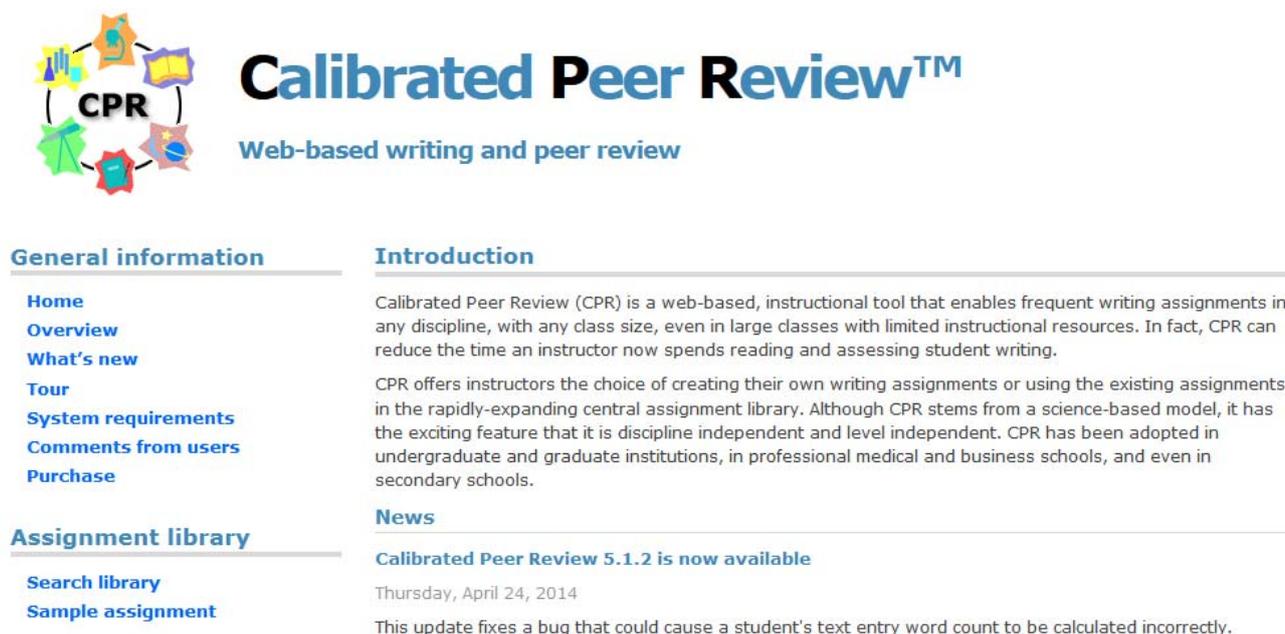
**Figure 2.** Course assignment reflections.

In addition, students in the Creativity in the Workplace course constructed course portfolios using *Google Sites* in order to showcase their assignments and reflections.

Personal response systems (e.g., clickers) were used in the Biology and Controversies in Sciences courses for study group quizzes and discussion prompts. Crouch and Mazur [38] describe how clickers can be used to support a form of peer instruction. The process begins with the teacher posing a question or problem. The students initially work individually toward a solution and “vote” on what they believe is the correct answer by selecting the desired numbered or lettered response on their clicker. The results are then projected for the entire class to view. For a good question, there is usually a broad range of responses. Students are then required to compare and discuss their solutions with the person next to them in the classroom in order to come to a consensus. Another “vote” is taken but this time only one response or clicker per group can be utilized. In most circumstances, the range of responses decreases and usually centers around the correct answer. An alternative to this process, in the Controversies to Science course, was to have groups of students generate the quiz questions in advance of the classroom session.

Students in the Biology course also made use of UCLA’s *Calibrated Peer Review* (CPR) tool to provide peer feedback on laboratory reports (Figure 3).

**Figure 3.** Calibrated peer review tool.



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**Introduction**

Calibrated Peer Review (CPR) is a web-based, instructional tool that enables frequent writing assignments in any discipline, with any class size, even in large classes with limited instructional resources. In fact, CPR can reduce the time an instructor now spends reading and assessing student writing.

CPR offers instructors the choice of creating their own writing assignments or using the existing assignments in the rapidly-expanding central assignment library. Although CPR stems from a science-based model, it has the exciting feature that it is discipline independent and level independent. CPR has been adopted in undergraduate and graduate institutions, in professional medical and business schools, and even in secondary schools.

**News**

**Calibrated Peer Review 5.1.2 is now available**

Thursday, April 24, 2014

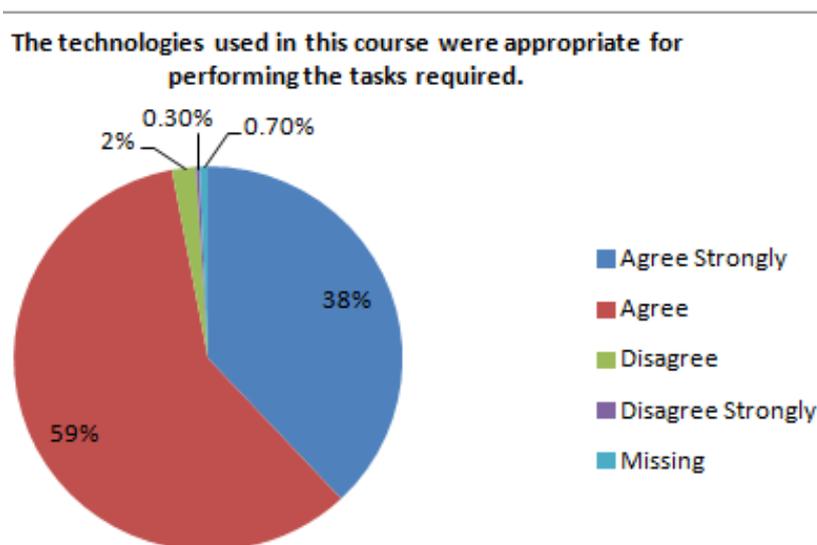
This update fixes a bug that could cause a student's text entry word count to be calculated incorrectly.

The social networking application *Facebook* and the group tools in the *Blackboard* learning management system were used by students in the Communication and Child Studies courses to facilitate communication, collaboration and construction of team-based projects. A wiki (e.g., *MediaWiki* server) was used by students as a collaborative writing space in the Business course to co-create a set of class notes, which were used to prepare for the midterm and final exams. And, in the Economics course, students used commercial problem solving software (e.g., *The Learning Manager* (TLM) and *Lyryx Learning*) for low and medium-stake self-assessment exercises throughout the semester. This type of rapid formative assessment provides students and instructors with weekly feedback on student performance [39].

#### 4.4. Student Perceptions of Assessment Practices and Collaborative Learning Applications

Survey responses suggest that students perceived high value in the above-noted assessment activities and associated use of collaborative learning technologies. In terms of course satisfaction, 97% of the students who completed the online survey agreed or strongly agreed that the digital technologies used in the study courses were appropriate for performing the assessment tasks required (Figure 4). Further, 92% of the students agreed or strongly agreed that they would recommend these courses to other students.

**Figure 4.** Appropriate technologies for performing the required course assessment tasks.



Students commented in each of the focus groups that the most effective aspects of the seven blended courses were the use of the collaborative learning applications, team-based project work, and empathetic instructors. Least effective aspects of these blended courses were the increased workload, lack of clear directions for out-of-class activities, and the emphasis on self-directed learning. In terms of improving the assessment practices in the courses, students recommended that collaborative learning technologies be used to provide more frequent assessment feedback, and that clearer explanation and examples of the required assignments be given. The students also suggested that there should be an increase in the number of low to medium stake assessments, more group work, and a better distribution of assignment deadlines throughout the semester (e.g., avoid having all the major papers, projects, and exams due in the final weeks).

#### 4.5. Associations between the Use of Collaborative Learning Applications, Engagement and Academic Achievement

Cronbach alpha coefficients for computed scale scores are summarized in Table 4. All approach or exceed the acceptable level of 0.70 recommended by Nunally [40].

**Table 4.** Alpha coefficients for computed scales.

Scale	Cronbach Alpha
Engagement in effective educational practices (20 items)	0.83
Active and collaborative learning (7 items)	0.78
Student-faculty interaction (6 items)	0.71
Level of academic challenge (6 items)	0.68
Intensity of course-related technology use (12 items)	0.69

Correlation coefficients for the association between student final course grades and engagement measures are shown in Table 5. Several small to moderate, statistically significant correlations were observed.

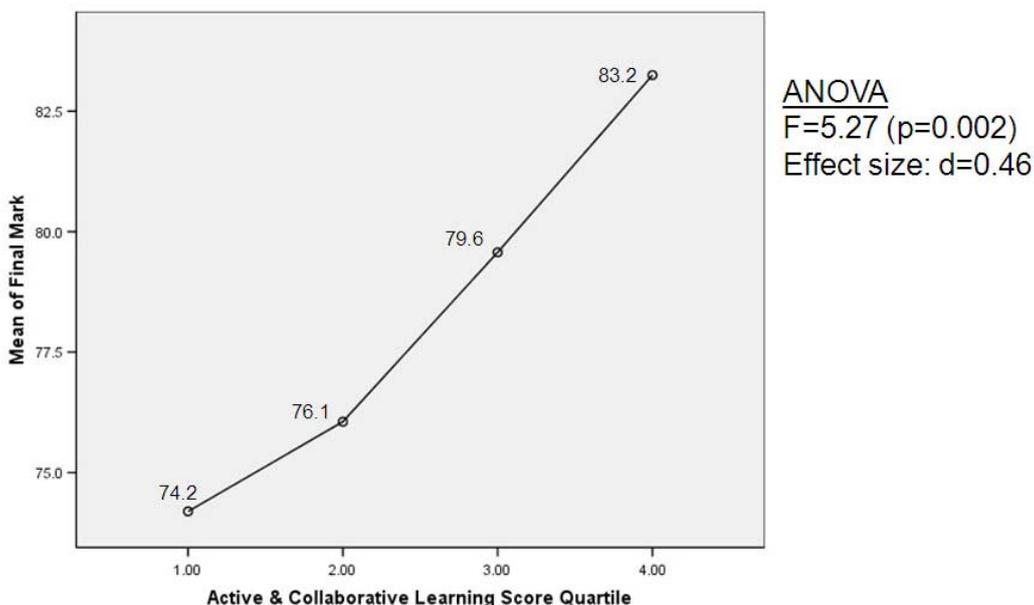
**Table 5.** Correlations: Final grades and engagement measures.

Variables	r
Engagement in effective educational practices	0.303 **
Active and Collaborative Learning (ACL)	0.260 **
Level of Academic Challenge (LAC)	0.181 *
Student Interactions with Faculty Members (SFI)	0.148 *

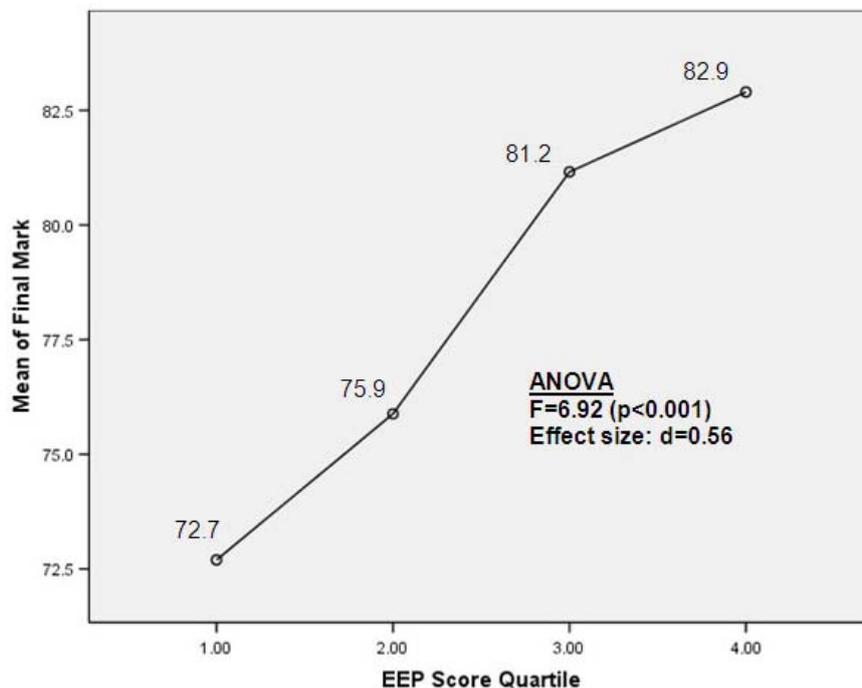
\*  $p < 0.05$ ; \*\*  $p < 0.001$ .

To further probe the association between grades and effective educational practices (EEP), and between grades and active and collaborative learning (ACL), one-way ANOVA was conducted to test for differences in final grade by scale score quartile. As shown in Figures 5 and 6, differences in final grade were statistically significant by ACL and EEP score quartile. In both cases, a 10% differential in mean final grade is noted between students in quartiles 1 and students in quartile 4. Effect size (Cohen’s d) was moderate in magnitude in both cases.

**Figure 5.** Final course grades by active and collaborative learning (ACL) score quartile.

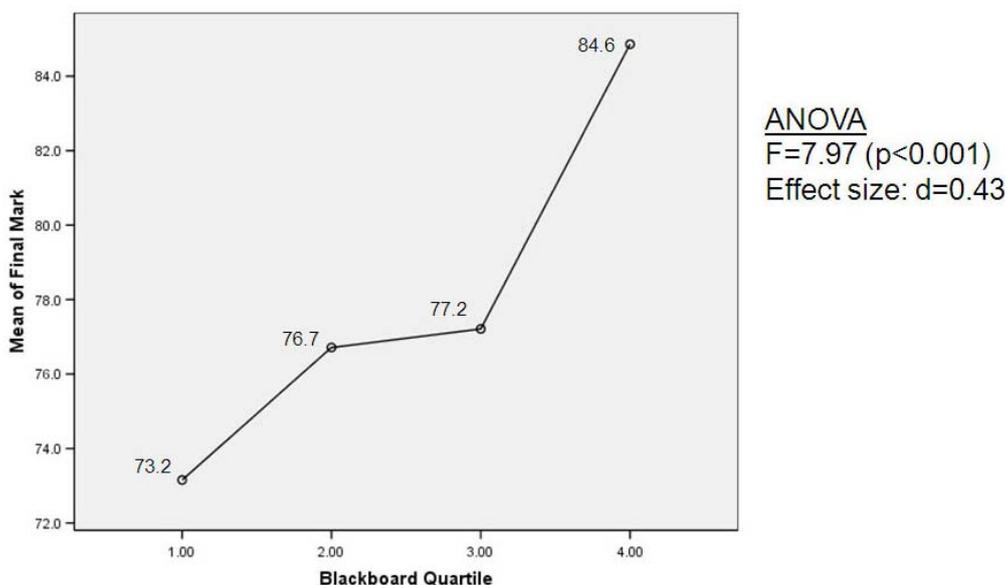


**Figure 6.** Final course grades by effective educational practices score quartile.



Pearson correlation coefficient for the association between levels of Blackboard use and final grade was 0.270 ( $p < 0.001$ ). One-way ANOVA was significant for differences in student grade by Blackboard usage quartile ( $F = 7.97, p < 0.001$ , Cohen’s  $d = 0.43$ , see Figure 7).

**Figure 7.** Final course grades by blackboard use quartile.



The association between intensity of course-related technology use and final grade was non-significant ( $r = 0.095, p > 0.05$ ). Correlations between intensity of course-related technology use, Blackboard use, and engagement measures are shown in Table 6. Moderate to strong correlations were observed between intensity of technology use and each of the engagement parameters.

**Table 6.** Correlations between engagement, blackboard use and intensity of technology use.

Engagement Indicators	Blackboard Use	Intensity of Course-Related Technology Use
Engagement in effective educational practices	$r = 0.270^{**}$	$r = 0.643^{**}$
Active and collaborative learning	$r = 0.177^{**}$	$r = 0.482^{**}$
Student-faculty interaction	$r = 0.189^{**}$	$r = 0.413^{**}$
Level of academic challenge	$r = 0.187^{**}$	$r = 0.339^{**}$

\*\*  $p < 0.01$ .

## 5. Discussion

The purpose of this study was to investigate the following three questions:

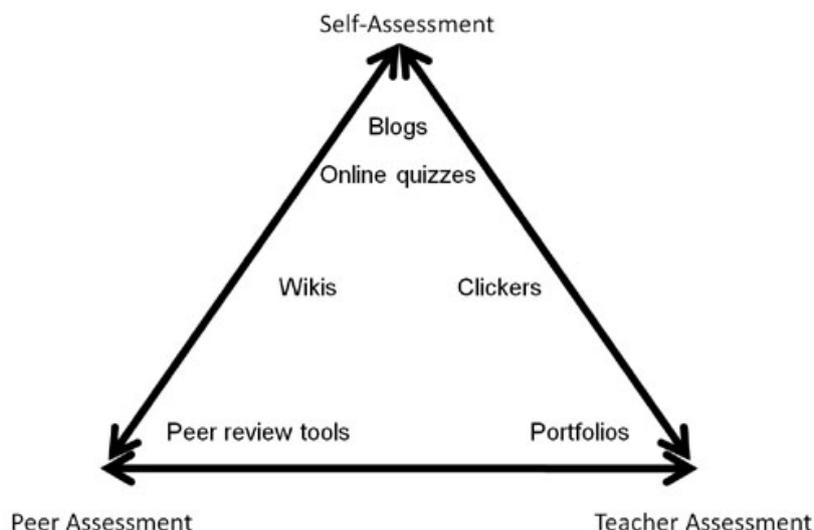
- (1) How are instructors designing course assessment activities to incorporate student use of collaborative learning applications in blended courses?
- (2) How do students perceive the value of these digital tools?
- (3) Is there a correlation between the use of these tools, the level of perceived student engagement in these courses, and academic achievement in blended courses?

### 5.1. Assessment Practices and Collaborative Learning Applications

With regards to the first question, a number of educational researchers [41,42] stated that assessment drives learning in higher education. Entwistle [43] indicates that the design of the assessment activity and the associated feedback can influence the type of learning that takes place in a course or program. For example, standardized tests with minimal feedback can lead to memorization and a surface approach to learning while collaborative group projects can encourage dialogue, richer forms of feedback, and deeper modes of learning.

All seven instructors involved in this study commented, in the post-course interviews, about how they are using collaborative learning applications to design activities that provide students with more frequent opportunities for formative self, peer, and instructor assessment feedback. For example, digital technologies, such as blogs, ePortfolios, and web-based problem solving software, are being used by the students for self-assessment activities. Additionally, tools such as the calibrated peer review tool, wikis, and clickers are enabling students to provide peer-assessment feedback to their classmates. Instructors, and in some blended courses external experts as well, are using all of these collaborative learning applications to observe student performance, diagnose student misconceptions, and provide additional formative assessment feedback. The use of collaborative learning applications to support a triad approach to assessment is illustrated in Figure 8.

An international call for a greater focus on assessment *for* learning, rather than on assessment *for just* measurement and accountability of student performance is well documented in the educational research literature [44]. The use of collaborative learning applications to support an increased focus on formative assessment practices may lead to Hattie's [45] vision of a visible teaching and learning framework where "teachers SEE learning through the eyes of their students and students SEE themselves as their own teachers" [45] (p. 238).

**Figure 8.** Triad approach to assessment.

### 5.2. Student Perceptions of Assessment Practices and Collaborative Learning Applications

The findings from the online surveys and focus groups clearly demonstrate that students perceive a high value of using collaborative learning applications to complete assessment activities, *if* these tools help make the process more effective and efficient. Twigg [46] warns of the dangers of using various forms of technology to create a “course and a half syndrome”. This is the common tendency to use collaborative learning applications to cover too much material and include too many assessment activities in a blended course. Both the students and instructors involved in such a blended course quickly become overwhelmed with “content” and forget about the “key concepts and ideas”.

### 5.3. Associations between the Use of Collaborative Learning Applications, Engagement and Academic Achievement

Consistent with prior research [47–49], this study found small to moderate correlations between final course grades and engagement-related measures such as active and collaborative learning, level of academic challenge, student-faculty interaction, and engagement in effective educational practices. This finding suggests that engagement in empirically-supported educational practices is associated with gains in student learning and development. It is a limitation of the present study, however, that controls for other correlates of achievement such as aptitude, prior achievement, and motivation were not in place. It is conceivable that students with the highest aptitude or the greatest motivation were also the students with the highest levels of engagement in these blended courses, raising questions about the observed association between engagement and achievement. Future studies of this type should seek to examine and control for a fuller range of variables thought to influence students’ academic achievement [26].

In addition, consistent with prior research [50] was the observed association between intensity of student digital technology use and measures of engagement. Indeed, moderate to strong correlations were noted between digital technology use and engagement-related parameters including active/collaborative learning, student-faculty interaction, level of academic challenge, and engagement in effective

educational practices. This finding appears to be in keeping with the manner in which collaborative learning applications were deployed in the blended courses under study, and suggests that when thoughtfully used, such digital technologies may have an important role to play in the engagement of today's learner. Whether digital technology use is a form of engagement on its own for current students, or a vehicle for engagement in effective educational practices such as active and collaborative learning is unclear [51], but may be a subject of future study.

## 6. Conclusions

The historical ideal of higher education has been to learn in collaborative communities of inquiry [52]. This study has demonstrated the potential of using collaborative learning applications to design and implement assessment activities to recapture this vision in first year, blended undergraduate courses. The key is to redesign blended courses for active and collaborative learning experiences that enable students to take responsibility for their learning and to validate their understanding through discourse and debate with their peers. The author's hope is that others will be able to use and build upon the results of this study in order to help students at other institutions effectively engage in their academic studies.

## Conflicts of Interest

The author declares no conflict of interest.

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