Journal of Online Learning Research (2015) **1**(2), 219-239

Design and Enactment of Online Components During Four Blended Learning Courses

NICOLA WAYER
Champlain College, United States
nwayer@champlain.edu

KENT CRIPPEN
University of Florida, United States
kcrippen@coe.ufl.edu

KARA DAWSON
University of Florida, United States
dawson@coe.ufl.edu

This study investigated the ways in which four K-12 teachers, following professional development in blended learning, designed the online portion of their blended learning courses and how these online components were ultimately enacted with students. Specifically, the study investigates what kind of content, resources, or activities were developed online; how content, resources, or activities were enacted with students; and how blended learning practices differed across content areas. Findings revealed that the online components of these courses varied in how much they were enacted as designed; levels of online student activity; the amount of control students had over time, place, path, and/or pace; and whether the online components were oriented towards learning from technology or learning with technology.

In its *National Educational Technology Trends: 2011* report, the State Educational Technology Directors Association (SETDA) identified blended learning as an innovative learning model that encourages students to engage with technology in a student-centered approach (Jones, Fox, & Levin, 2011). While the growth in K-12 online learning has been driven primarily by state-led virtual schools, a growing number of blended learning programs for K-12 students are appearing at district and school levels (Watson, 2008). The growth in blended learning for K-12 students can be attributed to the fact that it offers flexibility, can be more cost effective, and has the potential to personalize pedagogy, allowing students to work at their own pace (Staker, 2011). Online and blended learning have also been identified as a means of expanding learning time for students in both virtual and traditional schools (Cavanaugh, 2009). In 2009, the United States Department of Education (USDOE) released a meta-analysis finding that "instruction combining online and face-to-face elements had larger advantage relative to purely face-to-face instruction than did purely online instruction" (p. xv) and that "classes with online learning (whether taught completely online or blended) on average produce stronger student learning outcomes than do classes with solely face-to-face instruction" (Means, Toyama, Murphy, Bakia, & Jones, 2009, p. 18) It is noteworthy that the results of this study were derived mostly from research in post-secondary settings as the authors identified only a small number of studies contrasting online and face-to-face learning at the K-12 level. (Means, Toyama, Murphy, Bakia, & Jones, 2009).

The existing research on online and blended learning describes overall outcomes for students (in terms of efficacy as an instructional approach) but does not provide specific information about the kinds of resources or activities that teachers use, or the variety of instructional purposes for which they are designed. There is a need for more information about what occurs in the online portion of blended courses in terms of what kind of content, resources, or activities are developed in the learning management system (LMS) (Graham, 2006); how content, resources, or activities are enacted with students; and how blended learning practices differ across content areas.

To address this need, we examined how four high school teachers, following professional development (PD) in blended learning, designed the online portion of their blended courses and how the online components were ultimately enacted with students. Teachers' course shells in the LMS were used as data in order to understand how they designed and enacted the online portion of their blended course. The online course shells, as artifacts of practice, served as a proxy to teachers' professional knowledge as it applied to their teaching practice (Cochran-Smith & Lytle, 1999). All four teachers were part of a pilot implementation of blended learning in a K-12

school in the southeastern United States, all had extensive classroom teaching experience, and all had been at the school for at least five years. Three of the four teachers had some experience with blended and online learning but none had participated in related professional development. For this reason, we decided to focus our inquiry on how the teachers designed and enacted the online portion of their blended learning course. Specifically, the purpose of this study was to investigate the ways in which four high school teachers, following online PD in blended learning, designed and enacted the online component of their blended learning course.

REVIEW OF RELEVANT LITERATURE

In comparison to face-to-face and fully online instruction, the combination of the two in the form of blended learning is relatively new and less researched, particularly in the field of K-12 education. Blended learning is generally defined as a mixture of face-to-face and online learning or computer-mediated instruction, combining instructional modalities (or delivery media) and instructional methods (Allan, 2007; Bersin, 2004; Graham, 2006; Watson, 2008). Some definitions include the requirements that students must be formally supervised in part at a brick-and-mortar location away from home and at least in part in an online setting and that there should be some element of student control over time, place, path, and/or pace (Staker, 2011). These definitions differentiate between a more structured approach that blends online and face-to-face delivery with courses that are web-enhanced or web-facilitated, courses that are essentially face-to-face but use a LMS or website to distribute course materials (Allen, Seaman, & Garrett, 2007; Garrison & Kanuka, 2004; Ross & Gage, 2006). Blended learning may include a mix of synchronous and asynchronous learning activities; take place in a range of formal settings, such as a classroom, to informal settings, such as a home; and may vary in terms of the relationships among those in the learning process e.g., individual learning, group learning, or development of a learning community (Allan, 2007; Watson, 2008). There is no single pre-determined division of face-to-face and online learning; it is a mix of any percentage of face-to-face and online learning activities in which the online activities and resources wrap around face-to-face activities or wherein the face-to-face activities wrap around online activities and resources in order to enhance the engagement of learners (Allen, Seaman, & Garrett, 2007). The Sloan Consortium has suggested that blended courses should have between 30 percent and 79 percent of their content online (Watson, 2008; Allen & Seaman, 2013), but, based on specific models of blended learning by Staker and Horn (2012), this distinction seems arbitrary. Blending may occur within a single activity, within

the broader scope of a course, across a program that mixes online and face-to-face courses, or at an institutional level (Graham, 2006; Ross & Gage, 2006). The test for "true" blended is the effective integration of the online with face-to-face such that the two modes are merged as complementary components of a single, blended approach (Garrison & Kanuka, 2004; Osguthorpe & Graham, 2003).

Research on Blended Learning

In comparison to the amount of research that has been published on fully online learning, the body of literature on blended learning is limited. The majority of published papers on blended learning are positive accounts of unique examples by blended learning enthusiasts (Gerbic, 2011), focusing on higher education settings. Halverson, Graham, Spring, and Drysdale (2012) conducted a search for the most-cited articles, chapters, books, and journals on blended learning between 2000 and 2011. In their analysis, Halverson et al. observed that only 1.8% of the top cited-publications focused on blended learning in K-12 settings while 66.1% focused on higher education, 20% focused on all settings, and 12.5% focused on corporate or organizational training. The majority of publications on blended learning focus on student engagement and outcomes with little focus given to teacher/instructor perspectives (Gerbic, 2011).

In comparing blended learning with face-to-face and fully-online learning, Means et al. (2009) conducted a meta-analysis on online learning and found that blended instruction "on average, had stronger learning outcomes than did face-to-face instruction alone" (p. 19) with a stronger effect size for blended than fully-online or traditional face-to-face instruction. It is important to note that comparing online and face-to-face programs is complicated by the fact that many students enrolled in online or blended programs are doing so for a specific reason, such as for credit recovery or enrichment, resulting in a selection bias. Furthermore, the variations in settings of online and blended learning programs and the supports available to students are many and may complicate comparisons with face-to-face programs (WestEd, 2008).

Studies of blended learning in higher education suggest that blended learning allows for increases in the quality and quantity of interactions within a course, thus increasing student engagement and satisfaction (Garrison & Kanuka, 2004; Kuo, Belland, Schroder, & Walker, 2014). In an empirical study to compare types of blended learning environments and student achievement, a group of 93 third graders in Taiwan were randomly placed in groups of fully online, blended with student-peer interaction, and blended with student-teacher interaction. The students in both blended groups performed significantly better than the fully online group; there was no

significant difference in achievement between the two blended groups (Chen, 2012). This supports the notion that increased student-student and student-instructor interaction contribute to increases in student achievement. These kinds of interaction are key to success in online and blended courses (Anderson & Kuskis, 2007; Kuo, Belland, Schroder, & Walker, 2014; Wilson & Stacey, 2004).

Taking a blended approach and using a LMS to structure content has been shown to increase college students' perceptions of themselves as learners, increase levels of engagement, increase confidence, help students to become more autonomous learners, and help students to place more value on feedback (Snodin, 2013). Increased levels of student-instructor, student-student, and student-content interaction are factors that have been shown to contribute to student success (Anderson & Kuskis, 2007) and promote higher order thinking skills (Shea, 2007). Whereas fully online environments could make some students feel isolated, a blended environment would seem to promote open communication and a sense of community. According to Horn and Staker's (2011) definition of blended learning, the online aspects of blended courses give students control over the time, place, path, and/or pace that they interact with course content, thus promoting a focus on individual learning and making instruction more student-driven than instructor-controlled.

Blended Learning in K-12 Contexts

Given the amount of growth in the field of K-12 online learning, there has been little research on blended learning in K-12 contexts. It is currently unknown how many students are engaged in some form of blended learning. In a 2007 survey of school district administrators about the extent and nature of online learning in K-12 schools, an estimated 700,000 students were enrolled in at least one online or blended course, and 66% of the responding districts stated that they expected growth in their blended enrollments (Picciano & Seaman, 2007). In a 2009 follow-up survey, the estimated number of students had increased to 1,030,000 (Picciano, Seaman, Shea, & Swan, 2011), or a 47% growth.

The delivery of blended learning in K-12 settings is varied. A 2010 report on K-12 blended learning programs identified six models of blended learning (Staker, 2011). While this report is widely referred to with regard to blended learning, it is not based on empirical research. Staker and Horn (2012) have since revised the framework from six models to four, defined as: 1) Rotation, including Station-Rotation, Lab-Rotation, Flipped-Classroom, and Individual-Rotation; 2) Flex; 3) Self-Blend; and 4) Enriched-Virtual. The rotation model, and the four sub-classifications of rotation, account for transitions between face-to-face instruction and online activity on

a fixed schedule. In the "station rotation" approach, students rotate within a given course among classroom-based modalities. In the "lab rotation" approach, students rotate within a given course among locations within a traditional school campus. In the "flipped classroom" approach, content and instruction is delivered online and teacher-guided practice takes place in the traditional classroom on a fixed schedule. The fact that content is primarily delivered online sets this approach apart from students merely doing assignments online and outside of school. The "individual rotation" model is rotation within a given course or subject that is customized to individual students and may not require them to rotate to all available stations or modalities. With the "flex" model, teachers provide on-site support on a flexible, as-needed basis through face-to-face tutoring sessions and small group instruction. The "self-blend" model is the most common form and involves students choosing which courses to take online in an à la carte fashion while taking other courses in a face-to-face format. For the "enriched-virtual" model, students divide their time between learning in a traditional brick-and-mortar campus and learning remotely online, on a less structured schedule than the "flipped classroom". Many enriched-virtual programs began as fully online virtual school programs but morphed into blended programs in order to provide students with face-to-face learning experiences (Staker & Horn, 2012). For any of these models to be successfully implemented, teachers need training in related pedagogies and technologies in order to deliver content in a range of formats and to design appropriate assessments (Watson, 2008).

THE STUDY DESIGN

The purpose of this study was to investigate the ways in which four high school teachers, following online PD in blended learning, designed and enacted the online component of their blended learning course. The following research questions guided the study:

1. Which model of blended learning did each teacher choose in designing their courses?
2. To what extent were teachers able to enact the online components of their courses as designed?
3. How did the design and enactment of the online components differ across the content areas?

Context and the Professional Development

Due to changes in state law, all students in the state where this study was conducted must participate in an online or blended course as a requirement for high school graduation, and all school districts must provide online and blended learning opportunities for students. The school featured in the current study serves approximately 1,150 students in kindergarten through twelfth grades with a demographic makeup that mirrors the overall demographics of the student population of the entire state. The school was in the inaugural year of a pilot program to provide blended learning opportunities in-house as part of a five-year implementation plan towards offering blended learning for all grades 9-12 and eventually offering fully online courses.

In preparation for the first year implementation, a pilot group of seventeen teachers participated in an online PD course on blended learning in order to deepen their understanding of terminology, practices, and standards (both academic content standards and the International Association for K-12 Online Learning (iNACOL) standards for quality online courses). Spread over eight weeks, the PD was structured in four modules (Figure 1). Each module included content material and resources, discussion forums, and an application activity that pushed teachers to think critically and apply their new knowledge.

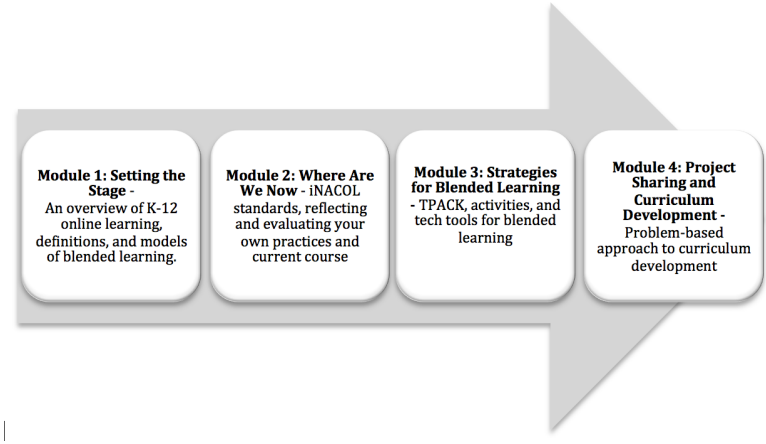


Figure 1. The progression of four modules used in the online PD.

As a capstone experience, participants created an online course shell for the first semester of their content area courses. Although Staker and Horn's models were covered in the online PD, teachers were not directed to follow

a particular model, and were allowed to design their courses independently. These shells were then implemented with students and became the primary data source for this study.

Delimitations

This study was limited to teachers that participated in the online PD course on blended learning. To create a unit of analysis for case study, this study was further limited to members of the ninth grade teaching team, as it was the only grade level to implement blended learning strategies in every subject area. Because this case study is bounded in one grade level of one K-12 school, findings may not be generalizable to other contexts.

This study relied on LMS log data as the primary evidence for addressing our research questions. While this offered a rich source of information, it limited the scope of inquiry to only including those elements that were part of the LMS (i.e. use of outside URL's cannot be tracked). A log entry, or log event, was generated each time a student accessed a distinct page or resource within the LMS; multiple visits to the same page or resource would result in multiple log events. In analyzing the data, it was noted that the structure of activities, such as quizzes, could artificially inflate the total number of log events if each item required accessing a separate page. However, quizzes were not largely utilized in the courses with the greatest degrees of blending (biology, English, and health/physical education) while quizzes were the only thing students accessed in the algebra course.

Methodology

Our methodology took the form of a multiple case study design (Creswell, 2009) that was bounded by the beginning of the 8-week online PD course in May through the end of the first semester in January of the following year. Data were collected from the first semester of the academic school year, from August to January, including 90 school days within 148 calendar days. Although participants in the PD spanned the middle and high school grades, participants for this study were selected from the pool of ninth grade teachers who completed the PD, created course shells in different content areas, and enacted those shells with students. Four participants from the content areas of algebra, biology, English, and health/physical education (HPE) met all criteria and were defined as the individual cases for study. These teachers all had extensive classroom teaching experience and had been at the school for at least five years. The algebra, biology, and English teachers all had some experience with blended and online learning as teachers and learners while the HPE teacher had no experience.

Data Sources and Analysis

Data were collected from the LMS and included the content (e.g., resources, materials, and activities) of the course shells as well as quantitative activity log data produced by student activity in the course shells. Course content was studied using content analysis (Smith, 2000) and was coded based on a number of variables:

- Course organization (e.g., as modules, weeks, or topics);
- Structure and organization of content (e.g., clear introduction, identification of objectives, readings and resources, and delineation of what is face-to-face versus what is online);
- Types of instructional resources (e.g., content information – print (e.g. PDF of a chapter), content information – multimedia (e.g. online video), procedural information (e.g. lab directions), downloadable activity (e.g. worksheet), online activity within the LMS (e.g. online quiz in the LMS), or online activity outside the LMS (e.g. activity on another website);
- Instructional purpose of resources (dissemination of content information, dissemination of procedural information, group discussion, introduction of new concepts or skills, skills practice or review, and assessment);
- Instructional approach (collaboration or cooperative learning, group discussion, research activity, direct instruction / lecture presentation, other);
- LMS tools used.

Defining the design for each course involved coding and interpretation of the content in the course shell that focused on choices of tools and activities, their apparent instructional purpose, and how they guided students to build understanding of the content with technology. This interpretation was then used to classify the model of blended learning.

For enactment, quantitative analysis involved descriptive statistics for the use of different tools and activities in each course by date and time during the semester. Variables calculated from the activity logs included:

- The number of times a course was accessed during school hours and during non-school hours;
- The number of school days and non-school days a course was accessed;
- The number of students accessing the course during school hours and during non-school hours; and
- The dates and times course resources were accessed by students.

For each case, these variables were assessed holistically and compared to the design classification and model definitions. Finally, the findings for each case were compared sequentially. This cross-case comparison was intended to shed light on how teachers used the online course shells for different instructional purposes, learning tasks, and how teachers enacted blended learning strategies differently by content area. Next, we present the individual case results, then the results of the cross-case comparison.

CASE RESULTS: DESIGN AND ENACTMENT OF BLENDED LEARNING

For each case we describe the design used by the teacher, including the model of blended learning to answer the first research question. We then describe student use of the online materials and discuss the extent to which the online portion of the course was enacted as designed to examine the second research question.

Case I. Algebra

The blended design of the algebra course was centered on lesson quizzes used to identify students who needed remediation. Based on their quiz scores, students were to complete a number of online activities before retaking the lesson quiz. The algebra course fit the model of individual rotation, as not all students were required to participate in the online portion of the course, and the online medium was used as a tool for selective remediation. Analysis of student activity showed that the lesson quizzes and activities were not actually used by students and that the only activities that were used were the chapter tests, accounting for 87.9% of all course activity. Nearly all of the student activity in the course occurred during school hours (87.8%), suggesting that use of the online materials was teacher-directed. The course was designed with an emphasis on formative assessment and remediation, but when enacted the course materials were used for summative assessment only. The algebra course was not enacted as designed.

Case II. Biology

The biology course was designed with five unit modules for the first semester, but only the first, second, third, and fifth unit modules were used. The emphasis in the online portion of this course was on content delivery and assignment collection, accounting for 98.8% of all log activity. The biology course was an example of a flipped classroom approach, with students working with the online materials outside of school hours on a regular basis. Based upon the nature of the required activity with these materials, content delivery was inferred as the primary instructional purpose. For example, in one module students watched video lectures in preparation for an

in-class lab and activities to create a model, a chart and presentation, and work in the class garden. With this format, the face-to-face classroom time was available for hands-on activities. Analysis showed that students accessing lecture-oriented content materials outside of the classroom accounted for 23.1% of log events.

With 41.9% of all log activity occurring outside school hours, online activities afforded "some element of student control over time, place, path, and/or pace" (Staker, 2011, p. 3). The high percentage of times that students viewed the entire course (51.7%) suggests that they used the online course as a calendar or syllabus to follow, a place to get assignment directions (28.2%), submit work (9.9%), and view content resources (8.2%). The evidence suggests that the biology course was enacted as designed.

Case III. English

The English course was designed around a writing partnership between students at the high school and a class of English Education graduate students from a nearby university. The course involved the use of the assignment tool to facilitate communication between the high school students and their graduate student writing partners, the discussion forums for peer feedback, and the quiz tool for self-assessment. Within the LMS, activities were structured to support the collaboration process. This course was an example of station rotation where students alternated between online and teacher-led instruction with collaborative activities in both environments. It appeared that the rotation was a means to facilitate conferencing and peer conferencing as part of the writing process in the classroom, and students were also regularly active in the online portion of the course outside of school hours, with activity on 125 calendar days out of 139, accounting for 21.1% of all log events.

Student activity during school hours was high (79.9%), suggesting that work in the online portion of the course was largely teacher-directed. The volume of activity outside of school hours showed that students had some control over time, place, path, and/or pace. The high traffic for each of the tools (discussion forums, 28.7%; quiz activity, 14.8%; assignment views and submissions, 17.3%) suggests that collaboration was taking place as designed. The English course was enacted as designed.

Case IV. Health/Physical Education (HPE)

The nature of the HPE course was to focus on students' individual personal fitness, to help them better understand health issues, to reflect on their present lifestyle, and to implement positive lifestyle changes. The HPE course fit into the station rotation model as students rotated within the classroom between online activities using the classroom computers and other

activities such as workouts. However, the use of rotation model for the face-to-face portion of the course pre-dated the blended learning initiative; it had been used previously to rotate between activities such as lectures and workouts. The addition of the online activities only served as a new station in the regular rotation.

The online portion of the course was used 89.2% of the time during school hours, suggesting that its use was primarily teacher-driven as part of the everyday face-to-face instructional time. Online activities centered on content delivery and discussion of health issues. The discussions were for students to reflect on what they had learned and to discuss how it related to their personal lives. Only three of the five modules for the first semester were used, so while the activities were implemented as intended, the course was not fully enacted as it was designed. Table 1 summarizes which model of blending was represented by each case, the extent to which teachers were able to enact the online components of their courses as designed, and the total number of log events, or times that a page or resource within the course was accessed, for each course during, and outside of, school hours.

Table 1

Models of Blending and Extent of Enactment

Course	Model of Blending	Extent of Enactment	Total log events during school hours	Total log events outside school hours
Algebra	Individual Rotation	Not enacted as designed	6044	839
Biology	Flipped Classroom	Fully enacted	4511	2555
English	Station Rotation	Fully enacted	43599	11693
HPE	Station Rotation	Partially enacted	10487	1237

CROSS-CASE RESULTS: CONTENT AREA DIFFERENCES

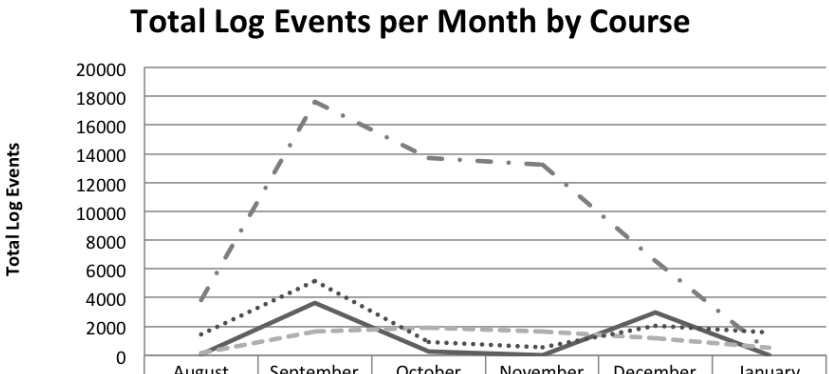
Cross-case analysis (research question 3) showed differences between the content areas in 6 main categories: (1) design, (2) place of online activity, (3) time of online activity, (4) enactment of online activities, (5) degree of blendedness and (6) use of technology.

Design. The algebra course focused on remediation and assessment, the biology course focused on content delivery and collecting students' work, the English course focused on collaboration and creation, and the HPE course focused on personal reflection and group discussion. The similarities among the courses involved the application of concepts from the PD course, particularly strategies and technology tools suggested in the third module.

Each module in the PD course began with an overview of the topic and listed learning objectives. They next provided lecture material and outside readings and resources, followed with a group discussion question, and concluded with an assessment activity that asked the participants to apply what they had learned to their personal teaching context. Although modules within the courses varied in scope with some built around a unit, some around a lesson, and some around a week, the overall structure of each of the courses followed the structure modeled in the PD course. In choosing resources and activities to include in their courses, all four teachers selected a variety of online materials that enriched the course content. Activities on websites outside the LMS generally fell into two categories: those for content delivery, such as mini video lectures or tutorials and those for review, such as interactive skills practice games or review quizzes. The biology, English, and HPE courses all contained resources for the dissemination of both content and procedural information while the algebra course focused on assessment and remediation. The biology and HPE courses used the online medium to introduce new concepts or skills while the algebra and English courses did not. All four courses contained resources for skills practice or review and assessment such as online review games, practice assignments, or video tutorials.

Place of online activity. In all four of the courses, the majority of online activity occurred during school hours, suggesting that use of the online medium was teacher-driven and part of the face-to-face instructional time and activity. The difference in percentages of use during school hours versus outside of school hours is an indicator of whether the online medium was used mainly as an in-class tool. The biology course had the most activity outside of school hours with 36.2% of log events for the semester occurring outside of school hours while the HPE course had the lowest percentage at 10.6%. Table 1 shows the total number of log events during and outside of school hours for each course.

Time of online activity. Use of the online course material by month across the courses was distinct. The English course continually registered the most activity each month, but the biology course was most consistent in the activity levels month-to-month. Both the algebra and HPE courses showed spikes in activity in September and December, when chapter tests were given. Compared to the other courses, the biology course gave students the most control over time, place, path, and/or pace, a hallmark of blended learning. Figure 2 shows the total log events per month for each course and creates a visual display of how consistently students accessed the LMS each month.



	August	September	October	November	December	January
Algebra	39	3614	225	5	2999	1
Biology	150	1618	1932	1629	1162	553
English	3857	17611	13731	13263	6571	259
HPE	1437	5176	919	550	2063	1579

Figure 2. Total Log Events per Month by Course.

Enactment of online activities. Data from the activity logs in the LMS also provided an indication of how the online components of these courses were enacted. Since all of the activities and resources that were designed in the online portion of the course were used, we found that the online component of the English course was enacted as designed. However, the biology course did not use every online component, but activity logs indicated that the majority were used as intended. The HPE course was designed with five online modules, but only three of them were enacted; all but one activity was used in the three enacted modules. Students never used the majority of the online activities in the algebra course; the course was not enacted as designed.

Degree of blendedness. The Sloan Consortium defines blended courses as having between 30 percent and 79 percent of their content online (Watson, 2008; Allen & Seaman, 2013). By that definition, two of the four courses would qualify as blended: biology and English, while the algebra and HPE courses were more activity-based and the online portion constituted a much smaller part of the overall course. This study used a broader definition: education in which instruction and content are delivered in part through online delivery with some element of student control over time, place, path, and/or pace and at least in part at a supervised brick-and-mortar location away from home (Staker, 2011). By this definition, the biology, English, and HPE courses all qualify as blended courses because they gave

students some control over time, place, path, and/or pace, and combined online and face-to-face instructional modalities. As enacted, the algebra course did not allow students that flexibility, and the online medium was utilized for instructional purposes only in the classroom under the teacher's direction. One way to look at this difference in how the courses were enacted is to view them on a spectrum of degrees of blendedness. Figure 3 shows the four courses relative to each other on a continuum between less blended and more blended.

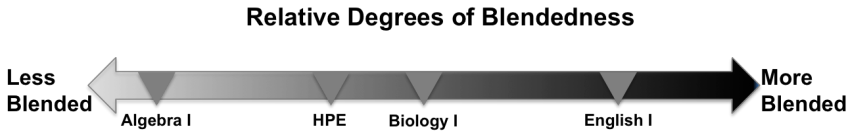


Figure 3. Relative Degrees of Blendedness.

Staker and Horn (2012) use "instruction and content" as part of the definition for blended learning in order to differentiate online learning from just the use of online tools for learning. If blended learning is the effective integration of the online with the face-to-face such that the two modes are merged as complementary components of a single, blended approach (Garrison & Kanuka, 2004; Osguthorpe & Graham, 2003), then the four courses profiled in the study could be judged to have different degrees of blendedness, or what Osguthorpe and Graham (2003) called "strengths of environment" (p. 229) along the continuum between face-to-face and fully online. A course with a greater degree of blendedness would be one in which the mix of online and face-to-face is the most integrated while a course with a lesser degree of blendedness would be one in which the online and face-to-face remain more separate and distinct. For example, in the English course it would be more difficult to distinguish between purely online and purely face-to-face activities because the two are so integrated and students participate in the same activities at school and at home. As designed, the English course could most easily be adapted as a fully online course. Closer to the face-to-face end of the spectrum are the HPE and algebra courses that primarily utilized the online activities as part of the face-to-face instructional time. Placement in the continuum does not suggest that one course is superior to another or that one is blended and another is not; rather, it shows how they compare to each other in the degree of blendedness. Courses with a higher degree of blendedness could most easily be adapted into fully online courses.

Use of technology. Cross-case analysis also assessed how the design and enactment of the online components of each blended learning course implemented technology for instruction. Jonassen, Howland, Moore, and Marra

(2003) describe an approach to learning with technology as "knowledge construction, not reproduction; conversation, not reception; articulation, not repetition; collaboration, not competition; and reflection, not prescription" (p. 15) as opposed to one of learning from technology, or the assumption technology is a tool for delivering and communicating messages, that students comprehend those messages, and learn from them just as they would from listening to a teacher's lecture (Jonassen, Howland, Moore, & Marra, 2003). Based on analysis of the online contents of each course, inferences were made as to whether the course more represented learning from technology or learning with technology. Figure 4 places the four courses on a spectrum between learning from technology and learning with it.

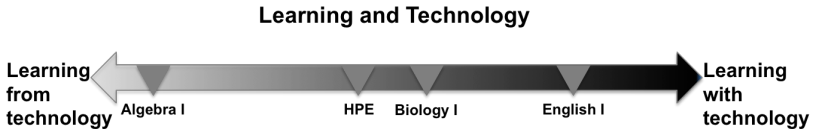


Figure 4. Relative emphasis across the courses related to learning and technology.

Each of the four courses included links to outside websites with readings, videos, and tutorials. How these web resources were used varied from course to course. In the algebra course, students took a lesson quiz and then participated in online activities prescribed by their score on the quiz. These activities included watching video tutorials, playing online review games, and practice solving equations using online manipulatives. Of the four courses, the algebra course most represented an example of learning from technology. Compared to the algebra course, the HPE course was less focused on learning from technology, but still emphasized online videos and informational health websites to inform students about health issues. Based on their understanding of the topic, students were asked to reflect on how they could apply the information to their personal lifestyle and create a post in a discussion forum. However, students were not asked to create anything new, collaborate with others, or do any kind of research and knowledge-building on their own. Moving toward the center of the spectrum, the biology course contained examples of both learning from technology and learning with technology. The course had numerous online resources for students that included video podcast lectures, demonstration simulations, and games – all of which exemplify a replacement of teacher lecture with electronic presentation. However, the biology course also asked students to conduct online research on topics and to use online tools to construct concept maps or cartoons to demonstrate some aspect of the concepts learned, examples

of learning with technology. The English course lies on the learning with technology end of the spectrum. A wide variety of online readings and multimedia resources were included for students to refer to or use as inspiration for literary analysis writing assignments. The high school students were matched with English Education graduate students in a writing partnership. In the course, the assignment tool was used to facilitate communication and collaboration between writing partners; the discussion forums were used for peer feedback; and the quiz tool was used for self-reflection throughout the writing process. At the end of the unit, students selected pieces of their work and compiled them into online portfolios using weebly.com, which also contained student-created pages about themselves. The English course exemplified an approach of learning with technology by giving them opportunities for knowledge building, conversation, articulation, and reflection.

DISCUSSION

This study sought to identify which model of blended learning was represented in each course across the four content areas (research question 1). Although the study was situated at a single school in a single grade level, three forms of Staker and Horn's (2012) rotation model (individual rotation, flipped classroom, and station rotation) of blended learning were present. The other three of Staker and Horn's (2012) blended models (flex, self-blend, and enriched-virtual) were not represented. The findings provide more information about what occurs in the online portion of blended courses in terms of what kind of content, resources, or activities are developed in the LMS and how content, resources, or activities are enacted with students. The teachers in this study designed their courses based on the structure they were presented with in the PD course and selected the model of blending that appeared to best match their existing curriculum. The English teacher designed the online portion of her blended course to further the writing partnership program. The biology teacher had previously experimented with using online resources in her course and expanded the scope of this to create a more fully flipped classroom. The HPE teacher designed the online portion of her course to fit into her existing rotation schedule. The algebra teacher had not been using technology in her course previously, and the design of the online portion of her blended course served as an auxiliary support rather than a primary means of instruction. The biology and English courses appeared to have come the closest to the ideal of effective integration and the bringing together of online and face-to-face components into complementary cohesion. It is notable that both of these teachers had more experience with blended teaching: the English teacher had been working to gradually develop the online writing partnership for five years while the biology

teacher had begun to implement online exams in her course in the school year prior to this study. Future research should explore this area further, expanding the focus to include teachers' attitudes toward, and experience with, blended learning as factors in their approach to the design process.

This study also looked at the extent to which teachers enacted the online components of their blended courses (research question 2), with student activity within the LMS used as a metric for enactment. Activity log data showed which activities and resources students accessed as well as the dates and times they were accessed, or if they were accessed at all. We found that the English and biology courses were enacted mostly as designed. In the HPE course, not all modules were enacted, but students accessed all of the activities and resources in the modules that were enacted. In the algebra course, students accessed only the chapter quizzes or tests and not the activities and resources designed in the course. It is not uncommon in K-12 classes for teachers to be unable to enact all lessons as they planned. Interruptions such as special activities and standardized testing may prevent them from covering all the content in their curriculum. Students' progress and needs as learners may also impact the pace and direction of instruction. In the case of the algebra course, the online portion of the course was focused on remediation – something that may not have been needed and so was not enacted. In the algebra course, students are required to take state online end-of-course exams so the use of the online chapter quizzes and tests were a means of preparing students for the state assessment. For a course to be truly blended, the online portion of the course should be integrated with the course curriculum and made a part of all aspects of instruction. Integrating blended learning into the teaching and learning process should be another focus for teacher PD on blended learning and for future research.

While this study sought to identify how the design and enactment of blended learning differed across the content areas (research question 3), in one respect, the courses were similar. Across the cases, student-instructor and student-student interaction in the online environment were largely absent. The English course, built around a writing partnership, was the only of the four courses to exhibit student-instructor communication within the online environment. The course relied heavily on communication and collaboration between high school students and graduate students, who, in effect, acted as instructors. Given that the blended learning format offers so much flexibility in how and when students communicate, this was a missed opportunity for students to engage with each other and the content beyond the regular classroom discussion. It could be that the teachers felt in-class discussion was more valuable, more productive, or that they were better

able to monitor students' understanding through face-to-face discussion. This aspect could be better understood through teacher interviews or classroom observations.

Student-student interaction is just one aspect of student activity in a blended course. Students should interact with the instructor, each other, and the content in both the face-to-face and online portions of a course. The biology and English courses had more consistent activity, with students more regularly logging into the online portion of the course and accessing activities and resources, than the HPE or algebra courses. The biology and English courses contained more content material and required students to access resources on a more regular basis, causing them to have more student activity and a greater degree of blendedness.

CONCLUSION

This case study investigated the ways that teachers enacted blended learning following PD and how the design and enactment of courses differed across the content areas. We found that, although all four teachers had the same PD course, they designed and enacted the online portion of their courses quite differently. These differences spanned six categories: (1) design, (2) place of online activity, (3) time of online activity, (4) enactment of online activities, (5) degree of blendedness and (6) use of technology. Cross-case analysis showed that the teachers with more blended teaching experience were better able to enact their courses as designed, with more online activity outside the face-to-face classroom, with a higher degree of blendedness, with more student activity and engagement, and were more likely to use technology as a tool to learn with, not from. Based on these findings, future teacher PD in blended learning needs to emphasize how to develop activities that foster active learning and higher order thinking skills, as well as strategies for effective blending and managing a blended classroom environment.

Blended learning is increasingly seen as an important pedagogical approach (Picciano, 2009) rather than as a disruptive technological innovation (Christensen, Horn, & Staker, 2013). It has the potential to bring together the best of both worlds: the richness of the face-to-face classroom with the flexibility of the online medium. Within K-12 education, blended learning is still in its infancy and there is much to be explored. As this case study illustrates, more research must be done to understand how to make blended learning the effective integration of the online with the face-to-face such that the two modes are merged as complementary components of a single, blended approach.

References

Allan, B. (2007). Blended learning: Tools for teaching and training. London: Facet Publishing.

Allen, I.E., Seaman, J., & Garrett, R. (2007). Blending in: The extent and promise of blended education in the United States. Needham, MA: Sloan-C. Accessed from: http://sloanconsortium.org/sites/default/files/Blending_In.pdf.

Allen, I.E., & Seaman, J. (2013). Changing course: Ten years of tracking online education in the United States. Needham, MA: Sloan-C. Accessed from: http://babson.qualtrics.com/SE/?SID=SV_4SjGnHcStH5g9G5

Anderson, T. & Kuskis, A. (2007). Modes of interaction. In M. Moore (Ed.) *Handbook of distance education* (2nd ed.) (pp.295-309). Mahwah, NJ: Lawrence Erlbaum Associates.

Bersin, J. (2004). The blended learning book. San Francisco, CA: Pfeiffer.

Cavanaugh, C. (2009). Getting students more learning time online: Distance education in support of expanded learning time in k-12 schools. Washington, DC: Center for American Progress. Accessed from: http://www.americanprogress.org/issues/2009/05/pdf/distancelearning.pdf.

Chen, W. (2012). An investigation of varied types of blended learning environments on student achievement: An experimental study. *International Journal of Instructional Media, 39*(3), 205-212.

Christensen, C., Horn, M., & Staker, H. (2013, May). Is k-12 blended learning disruptive? An introduction to the theory of hybrids. Mountain View, CA: Clayton Christensen Institute. Accessed from: http://www.christenseninstitute.org/wp-content/uploads/2013/05/Is-K-12-Blended-Learning-Disruptive.pdf.

Cochran-Smith, M. & Lytle, S.L. (1999). Relationships of knowledge and practice: Teacher learning in communities. *Review of Research in Education, 24*, 249-305.

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). Thousand Oaks, CA: Sage.

Garrison, D. R., & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *The Internet and Higher Education, 7*(2), 95-105.

Gerbic, P. (2011). Teaching using a blended approach – what does the literature tell us? *Educational Media International, 48*(3), 221-234.

Graham, C.R. (2006). Blended learning systems: Definition, current trends, and future directions. In C. Bonk & C. Graham (Ed.), T*he handbook of blended learning: Global perspectives, local designs* (pp. 3-21). San Francisco, CA: Pfeiffer.

Halverson, L., Graham, C., Spring, K., & Drysdale, J. (2012). An analysis of high impact scholarship and publication trends in blended learning. *Distance Education, 33*(3), 381-413.

Jonassen, D., Howland, J., Moore, J., & Marra, R. (2003). Learning to solve problems with technology: A Constructivist Perspective, 2nd ed. Upper Saddle River, NJ: Merrill Prentice Hall.

Jones, R. Fox, C., & Levin, D. (2011). State Technology Leadership Essential for 21st Century Learning, Annual report SETDA. Accessed from: http://www.setda.org/c/document_library/get_file?folderId=6&name=DLFE-1313.pdf.

Kuo, Y-C., Belland, B.R., Schroder, K.E.E., & Walker, A.E. (2014). K-12 teachers' perceptions of and their satisfaction with interaction type in blended learning environments. *Distance Education, 35*(3), 360-381.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2009). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies. Washington, DC: U.S. Department of Education. Accessed from: http://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf

Osguthorpe, R.T. & Graham, C.R. (2003). Blended learning environments: Definitions and directions. *Quarterly Review of Distance Education, 4*(3), 227-234.

Picciano, A.G. (2009). Blending with purpose: A multimodal approach. *Journal of Asynchronous Learning Networks, 12*(1), 7-18.

Picciano, A.G. & Seaman, J. (2007). K-12 online learning: A survey of U.S. school district administrators. Needham, MA: Sloan-C. Accessed from: http://sloanconsortium.org/sites/default/files/K-12_Online_Learning_1.pdf.

Picciano, A.G., Seaman, J., Shea, P., & Swan, K. (2011). Examining the extent and nature of online learning in American K-12 education: The research initiatives of the Alfred P. Sloan Foundation. *The Internet and Higher Education, 15*, 127-135. doi: 10.1016/j.iheduc.2011.07.004.

Ross, B. & Gage, K. (2006). Global perspectives on blended learning. Insight from WebCT and our customers in higher education. In C. Bonk & C. Graham (Ed.), *The handbook of blended learning: Global perspectives, local designs* (pp. 155-168). San Francisco, CA: Pfeiffer.

Shea, P. (2007). Towards a conceptual framework for learning in blended environments. In A.G. Picciano & C.D. Dziuban (Eds.) *Blended Learning Research Perspectives* (pp. 19-35). Needham, MA: SLOAN-C.

Smith, C.P. (2000). Content analysis and narrative analysis. In H.T. Reis & C.M. Judd (Eds.), *Handbook of research methods in social and personality psychology* (313-339). Cambridge, England: Cambridge University Press.

Snodin, N.S. (2013). The effects of blended learning with a CMS on the development of autonomous learning: A case study of different degrees of autonomy achieved by individual learners. *Computers & Education, 61,* 209-216.

Staker, H. (2011). The rise of K-12 blended learning. Mountain View, CA: Innosight Institute. Accessed from: http://www.christenseninstitute.org/wp-content/uploads/2013/04/The-rise-of-K-12-blended-learning.emerging-models.pdf

Staker, H. & Horn, M.B. (2012). Classifying k-12 blended learning. Mountain View, CA: Innosight Institute. Accessed from: http://www.innosightinstitute.org/innosight/wp-content/uploads/2012/05/Classifying-K-12-blended-learning2.pdf

Watson, J. (2008). *Promising practices in online learning: Blended learning: The convergence of online and face-to-face education.* Vienna, VA: International Association for K-12 Online Learning. Accessed from: http://www.inacol.org/cms/wp-content/uploads/2012/09/NACOL_PP-BlendedLearning-lr.pdf

WestEd. (2008). *Evaluating online learning: Challenges and strategies for success.* Washington, DC: U.S. Department of Education. Accessed from: http://www2.ed.gov/admins/lead/academic/evalonline/evalonline.pdf.

Wilson, G. & Stacey, E. (2004). Online interaction impacts on learning: Teaching the teachers to teach online. *Australasian Journal of Educational Technology, 20*(1), 33-48.