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Current Research in Blended Learning

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1. Background and Definition of Blended Learning

Blended learning (BL) is being adopted worldwide in higher education, corporate training, and K-12 education. Many have predicted that BL would "emerge as the predominant model of the future" (Watson, 2008, p. 3), become the "new traditional model" (Ross & Gage, 2006, p. 167), or the "new normal" in course delivery (Norberg, Dziuban, & Moskal, 2011, p. 207). The first section of this chapter will explore how BL is being defined and what we know about its adoption pace.

1.1 Definition of BL

Despite its current popularity, the term *blended learning* is defined variously across institutions (some using the term *hybrid*). Researchers have expressed frustration over unclear definitional contours of the BL ecosystem (see Oliver & Trigwell, 2005; Teng, Bonk, & Kim, 2009), and much of the early research in BL has attempted to describe and chart its boundaries. In the third edition of this book (see Graham, 2013), more space was given to exploring definitional questions:

1. What is being blended?
2. Should reduced seat time be part of the definition?
3. Should the quantity of online instruction be part of the definition?
4. Should quality factors be part of the definition?

In the past five years, definition issues in higher education have changed little. However, in the K-12 sector, where online instruction often occurs within brick-and-mortar schools, the Clayton Christensen Institute has popularized a definition emphasizing an "element of student control over time, place, path and/or pace" in the online portion of the blend as well as the

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importance of integrated instruction between the online and face-to-face modalities (Horn & Staker, 2014, p. 34).

Because researchers have little control over the definition of an organically developing term, *blended learning* might be viewed as a boundary object (Norberg, Dziuban, & Moskal, 2011): an element shared across communities of practice, "plastic enough to adapt to local needs and constraints, yet robust enough to maintain a common identity across sites. . . .weakly structured in common use . . . strongly structured in individual site-use" (Star & Griesemer, 1989, p. 393).

Agreement seems widespread that BL integrates face-to-face and online learning. Beyond that, individual researchers and institutions differ in limiting definition boundaries. Some require a reduction in face-to-face seat time, while others specify levels of online or face-to-face instruction. In a review of the BL literature and implementation practices in the United Kingdom, researchers recognized benefits to a broadly structured definition:

> We noted from the interviews that some institutions have developed their own language, definitions or typologies to describe their blended practices. We suggest that this poor definition [of blended learning] may be a strength and part of the reason why the term is being accepted. The lack of definition allows institutions to adapt and use the term as they see fit, and to develop ownership of it. (Sharpe, et al., 2006, p. 17)

In this chapter, blended learning will be defined as learning experiences that integrate face-to-face and online instruction (Graham, 2006, 2013). Accepting such a broad definition of BL forces researchers to describe and study specific models and pedagogies used in BL contexts.

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1.2 Growth of BL

Despite widespread anecdotal evidence of BL adoption across education sectors, quantifying adoption rates has proven difficult. Reasons for the difficulty include (a) different institutions define BL differently, (b) most institutions lack formal mechanisms for labeling BL courses, and (c) the choice to blend is often made by instructors without institutional oversight.

At the university level, early survey research of faculty, designers, and administrators (N=562) found that 93% of the respondents were already using BL in some way, although approximately 60% were using BL in 20% or fewer of their courses (Bonk, Kim, & Zeng, 2006). These findings were limited in generalizability because the survey respondents were all early adopters of online technologies. At about the same time, the eLearning Guild (2003) reported 85.2% of organizations participating in their corporate training (N=192) were using BL solutions, with 33.9% using BL in 20% or fewer of their courses.

For over a decade the Online Learning Consortium (formally the Sloan Consortium) has sponsored survey research tracking online use in higher education in the U.S. In one of the early reports, data were collected from chief academic officers (N=994) to disambiguate blended learning from online learning in general (Allen & Seaman, 2003). The report defined BL as having 30-79% of content delivered online; online learning as 80+% online delivery. Researchers found that 55.6% of institutions offered both blended and online courses, 9.6% offered only blended courses, 16% offered only online courses, and 18.8% offered neither (Allen & Seaman, 2003). A few years later the U.S. Department of Education commissioned a study of distance education in degree-granting postsecondary institutions, asking specifically about courses “formally designated” as

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hybrid/blended online—defined as "a combination of online and in-class instruction with reduced in-class seat time for students" (Lewis & Parsad, 2008, p. 1). The study found that 35% of institutions offered blended courses and that out of 12.2 million distance education enrollments, 12% were in blended courses.

At the K-12 level, the *Keeping Pace with K-12 Online Learning* reports (http://www.kpk12.com/reports/) have provided a broad view into K-12 online learning practices in the U.S. since 2004. The 2011 report noted that "most district programs are blended, instead of fully online," but the reports do not provide numbers that distinguish between blended and fully online (Watson, Murin, Vashaw, Gemin, & Rapp, 2011, p. 4). Picciano and Seaman (2007, 2009, 2010) have conducted three national surveys that distinguished the extent of the blended growth from fully online growth in U.S. K-12 institutions. Their survey of U.S. district school administrators (N=366) revealed that during the 2005-06 school year 32.4% of districts had at least one student taking a blended course, with 27.1% additional districts planning to implement blended courses in the coming three years (Picciano & Seaman, 2007). A follow-up survey a couple of years later (N=808) indicated that 41% of districts were implementing BL with 21.2% additional districts planning to implement in the following three years (Picciano & Seaman, 2009). Additionally, the 2009 report showed that of the approximately 23,000 blended enrollments, 1% were in grades K-5, 20% in grades 6-8, and 78% in grades 9-12. The 2010 survey, which focused specifically on high school administrators (N=441), showed that 38% had at least one student enrolled in a blended course (Picciano & Seaman, 2010).

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2. Blended Learning Models and Theory

Models and theory provide a common language and focus for scholarly communities creating and extending knowledge (Dubin, 1978). Burkhardt and Schoenfeld (2003) noted that a "reasonably stable theory base . . . allows for a clear focus on important issues and provides sound (though still limited) guidance for the design of improved solutions to important problems" (p. 6) and that "a lack of attention to coherent theory building leaves us looking balkanized and incoherent, the whole . . . being less than the sum of its parts" (p. 13). In model and theory development, the BL domain is in its adolescent years, with important maturing needed ahead (Graham, Henrie, & Gibbons, 2014). Like related domains, including distance education (Moore, 2004) and educational technology (Roblyer, 2005; McDougal & Jones, 2006), BL research must overcome its growing pains and improve its research quality by focusing more directly on models and theories.

Models and taxonomies of BL may also provide guidance for practitioners. The third edition of this handbook presents several of the most prominent BL models for K-12, higher education, and corporate training contexts (Graham, 2013). The Horn and Staker (2014) taxonomy of blends, which has evolved in minor ways, continues to provide the dominant language and terminology of practitioners and advocates for K-12 blended learning. In higher education and corporate training few new models have been developed, and current models tend to focus on surface-level physical dimensions of the learning environments, with a few very general high-level pedagogical approaches. Future models to need to focus more directly on pedagogical rather than physical dimensions of the blend. Graham, Henrie, & Gibbons' (2014) systematic review of models and theory in blended learning research categorized them into three distinct types proposed by Gibbons and Bunderson (2005): *explore*, *explain*, and *design*.

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Theoretical frameworks such as the *community of inquiry*, with constructs of social, teaching, and cognitive presence, continue to be widely used (Garrison & Vaughan, 2008; Kineshanko, 2016).

While some of the research in BL is solidly grounded in theory, most of it has sought to describe or solve localized challenges without contributing to coherent theory development. Many studies consider theory only as background or as a lens to describe findings or outcomes; few attempt to contribute substantively to the conversation around theory. Just as distance learning required theory to focus researchers on psychological rather than physical distance (Moore, 2013), BL needs theories to focus scholarship on the substantive psycho-social issues that make it distinct.

3. Blended Learning Research

Research related to blended learning is rapidly increasing. Drysdale et al. (2013) identified and analyzed over 200 English language dissertations studying blended learning practices. Similarly, Halverson et al. (2012) identified the most cited journal articles, book chapters, books, white papers, authors, and journals publishing blended learning research, following up with a thematic analysis of the research questions and inquiry methodologies used in the studies to identify strengths and areas for future research (Halverson et al., 2014). Because fewer than 5% of the articles in the Drysdale et al. (2013) and Halverson et al. (2012, 2014) studies focused on blended learning issues and contexts outside of North America, Spring et al. (2016a, 2016b, 2017) conducted a series of studies to better understand the landscape of BL across seven worldwide regions. This group interviewed international researchers, locating the most cited articles and authors and using a network analysis to identify citation patterns and themes. While it is too ambitious to cover all of the emerging BL research themes, this section

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will address some of the most important research related to (a) institutional issues, (b) faculty issues, and (c) student issues.

3.1 Institutional Issues

Educational institutions are in the crossroads of change with increasing pressures to effectively meet the needs of a larger and more diverse group of students. Top institutional issues include institutional change and adoption, learning access, and cost effectiveness.

3.1.1 Institutional Change and Adoption.

Blended learning can influence institutions' capacity to meet strategic goals such as increasing student access, maintaining student success and satisfaction, and managing growth (Dziuban, Hartman, Cavanagh, & Moskal, 2011). Adoption of BL is increasing across institutions, but generally through extension of existing practice rather than radical change (Collis & van der Wende, 2002). Significant interest has been shown in how institutions can provide leadership supporting effective BL adoption and implementation.

Minimal research exists on K-12 institutional adoption of BL. However, the book *Blended: Using Disruptive Innovation to Improve Schools* includes institutional strategies focused for administrative stakeholders around the theory of disruptive innovation. For higher education a 2013 special issue of *The Internet and Higher Education* focused on BL policy and implementation. In this issue Taylor and Newton (2013) studied facilitators and barriers to institutional BL implementation, including the central role of senior leadership in that process. Garrison and Vaughan (2013) documented two case studies of Canadian institutions where institutional vision and leadership provided sustained support and resources, enabling the institutions to better realize their missions. Additionally, Graham, Woodfield, and Harrison (2013) studied six higher education institutions and developed a three-stage framework for

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institutional adoption, with 12 indicators across the categories of *strategy*, *structure*, and *support*. This framework was applied in two follow-up studies looking at the institutions' transition from the *awareness/exploration* phase to the *adoption/early implementation* phase (Porter, Graham, Spring, & Welch, 2014) and at institutional decisions facilitating or impeding the adoption of BL practices among faculty (Porter, Graham, Bodily, & Sandberg, 2016).

3.1.2 Access to Learning

Access issues drive much of BL's worldwide growth. Bloemer and Swan (2015) studied *informal blending* (students completing their degrees with both online and campus-based courses), determining that students' average credit hours taken per semester was increasing because of improved access. A 2007 survey of 366 U.S. school districts, representing approximately 3,632 schools and 2 million students, identified five primary reasons for online and BL options:

1. Offering courses not otherwise available
2. Meeting needs of specific student groups
3. Offering advanced placement or college-level courses
4. Reducing students' scheduling conflicts
5. Enabling failed courses to be retaken (Picciano & Seaman, 2007, p. 9)

All of these reasons involve access to educational opportunities that would be too costly to provide in traditional ways. Online and blended options can thus address small and rural schools' needs as well as diverse students' needs like advanced placement and credit recovery. A BL initiative at Rochester Institute of Technology (RIT) targeted students who were deaf or hard of hearing, as well as English language learners (ELLs; Long et al., 2007), improving access to classroom participation as discussions shifted from the face-to-face contexts to asynchronous

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discussion forums. Satisfaction levels for both subgroups were higher than for the normal student population.

In higher education, costs for participating in traditional learning options are too high for many potential students whose work, family situation, or other commitments preclude a rigid school schedule. Flexible online options reduce costs associated with time and place scheduling, but many forfeit access to a high-touch, relationship-oriented environment with instructors and peers. BL options provide opportunities for benefit/cost tradeoffs relevant to students' individual circumstances and preferences. Blended options may particularly interest institutions reaching out to non-traditional learners in local communities where they are well known and trusted; this idea, called *localness*, has been emphasized by Sloan Consortium grant funding (Mayadas & Picciano, 2007).

3.1.3 Cost Effectiveness

Cost effectiveness drives higher education institutions towards BL approaches (Betts, Hartman, & Oxholm, 2009). With BL courses the University of Central Florida, has lowered costs by improving scheduling efficiency and reducing need for physical infrastructure (Dziuban et al., 2004, 2011). The National Center for Academic Transformation supported early research to determine whether universities could engage in large-scale course redesign that would decrease cost and improve learning outcomes (http://www.thencat.org). They offered $6 million in grants to 30 institutions to engage in course redesign with detailed cost analysis. Half of the designs included BL with reduced classroom seat time; seven involved significant technological enhancements with no reduction in seat time, and eight moved completely online with some optional face-to-face class sessions (Graham & Allen, 2009). Twigg (2003) reported total cost savings across all the projects of $3.6 million each year, with institutional reductions ranging

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from 20% to 84%, with an average savings of 40%. The projects reported quality improvements including completion rates, student satisfaction, retention rates, and attitudes towards subject matter.

Historically corporations have more effectively reported cost effectiveness than higher education institutions. However, Blain (2010) reported that only 3% of global companies and 26% of European companies measure return on investment (ROI). A large-scale study by Bersin and Associates (Bersin, 2004) of BL training programs in 16 large corporations found that almost all generated an ROI of 100% or better. Blended programs reduced costly training inefficiencies in wait time, hours and salaries, and facilities, among others. Institutions reporting significant ROI due to BL training included Avaya (Chute, Williams, & Hancock, 2006), Microsoft (Ziob & Mosher, 2006), IBM (Lewis & Orton, 2006), and Intel (Mahesh & Woll, 2007).

3.2 Student Issues

Students are the main clients of blended learning solutions. Their learning issues include effectiveness, engagement, and satisfaction.

3.2.1 Learning Effectiveness

BL includes characteristics of environments with demonstrated potential to directly impact learning. Media studies resulting in "no significant difference" have taught researchers that although the physical affordances of an environment can enable or constrain particular pedagogical methods, the active ingredient in learning is the pedagogy rather than the medium (Clark, 1983). Although the physical characteristics of learning environments (e.g., online or face-to-face) are not causal factors, they may represent classes of pedagogies distinct enough that differences may be measured in meta-analyses where actual causes have not been identified.

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At least five published meta-analyses have looked specifically at BL as a moderating variable. Zhao and colleagues' (2005) meta-analysis considered 12 moderating factors and found that instructor involvement (76 studies) had the greatest impact, largely enabling "studies that used a combination of technology and face-to-face education [to produce] the most positive outcomes" (p. 1863). A (2006) meta-analysis by Sitzmann et al. compared effectiveness of web-based instruction (WBI) and BL with classroom instruction (CI). Outcomes in declarative (104 studies) and procedural knowledge (18 studies) were analyzed separately: BL was determined more effective than CI, with effect sizes of +0.34 for declarative and +0.52 for procedural knowledge. BL effects on outcomes were much larger than the effect sizes for pure WBI compared with CI, which were +0.07 for declarative and -0.15 for procedural knowledge. Additionally, Bernard et al. (2009) meta-analysed distance education (DE) courses comparing synchronous (5 studies), asynchronous (37 studies), and mixed (blended; 7 studies), finding no significant difference among the DE modalities. However, the low number of studies in the non-asynchronous categories suggested need for further research.

The U.S. Department of Education sponsored a meta-analysis considering contrasts between online and traditional face-to-face learning (Means et al., 2010, 2013), with 50 different contrasts from 45 published studies. In 21 of the 50 cases, online learners had opportunities for face-to-face contact with an instructor; these were considered BL. The primary findings of the study claimed that "classes with online learning (whether taught completely online or blended) on average produced stronger student learning outcomes than did classes with [only] face-to-face instruction. The mean effect size for all 50 contrasts was +0.20, $p < .001$" (p. 18). When the data were disaggregated to compare the effects from the purely online contrasts (29 cases) with the

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BL contrasts (21 cases), researchers found BL to be superior, with a mean effect size of +0.35 compared to a mean effect size of +0.05 for purely online.

Most recently in 2014, Bernard et al. conducted another meta-analysis, using 117 studies comparing classroom instruction (CI) with blended learning (BL) conditions. The BL condition outperformed the CI condition with an effect size of (g+=+0.33). The study also analyzed interaction patterns of student-instructor (s-i), student-student (s-s), and student-content (s-c) during BL. If two types of interaction were involved, the effect size was (g+=+0.44); if all three types occurred it was (g+=+0.47). Among possible moderating variables tested, the effect size was the largest (g+=+0.59) when the purpose for using technology in BL was for "cognitive support."

This evidence of outcome differences in online, blended, and face-to-face learning warrant study. However, causal factors leading to these outcomes are not understood. Zhao et al. (2005) suggested instructor involvement as a critical factor, and Bernard et al. (2014) considered student-instructor interaction as an important treatment effect. The Means et al. (2010, 2013) outcomes similarly credited instructor-directed learning environments with the largest pedagogical effect. However, these studies did not identify specific aspects of instructor involvement/interactions resulting in qualitative differences between a face-to-face or synchronous high-fidelity environment and asynchronous text-based learning. Nor did they suggest whether instructor involvement might be more critical for declarative versus procedural learning. The Means et al. study reported opportunity for face-to-face time with the instructor during instruction to be one of the significant moderating variables for online learning. However, the Bernard study, which attempted to differentiate between learning declarative or procedural knowledge, seemed to imply no significant moderating effect of human interaction on acquiring

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declarative knowledge. Others have argued that improved outcomes may have more to do with learners' increased time on task in the BL environment (Sitzmann et al., 2006; Means et al., 2010).

While the meta-analyses give a broad view of BL impact in experimental studies, many non-experimental studies have also considered BL learning effectiveness. The Research Initiative for Teaching Effectiveness at the University of Central Florida (UCF), an early institutional adopter of BL, conducted a multi-year study involving tens of thousands of students examining success rates (C- grade or above) of their online, blended, and face-to-face course offerings. Accounting for college, gender, and modality, they found that while college was the best predictor of success rates, within colleges the success rates for BL were higher than either face-to-face or entirely online courses for both genders (Dziuban et al., 2004). A study looking at success rates of BL offerings at the Rochester Institute of Technology (with a high representation of students with hearing impairment) reported 95% completing courses with a grade C- or above (Starenko, Vignare, & Humbert, 2007). Larson and Sung (2009) went beyond academic performance, finding that 52% of BL students had increased interest in the subject matter more than online or face-to-face participants.

As previously mentioned, more research is needed to identify quantity and quality factors of blended designs that impact achievement and success rates. Shea and Bidjerano (2011) used the community of inquiry framework to analyze levels of teaching presence and social presence in blended and fully online learning environments, including relative impact of these constructs on cognitive presence. The BL students reported higher levels of all three components of the teaching presence construct (instructional design, discourse facilitation, and direct instruction) and two of the three social presence components (affective communication and open

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communication with instructor and other students). Researchers have reasoned that these factors could explain why meta-analyses show students in blended courses outperforming students in purely online courses.

3.2.2 Student Engagement

Researchers have correlated student engagement with many positive outcomes including academic achievement, satisfaction, and persistence, but no consensus exists for defining and measuring student engagement (Reschly & Christenson, 2012). A prominent model found in the *Handbook of Research on Student Engagement* notes three domains for engagement: behavioral, emotional, and cognitive (Fredricks, Blumenfeld, & Paris, 2004). Additionally, engagement can be studied at various levels including institutional, school, course, or activity (Skinner & Pitzer, 2012). Online technologies have increased the range of ways engagement can be measured, including analytics to access real-time data beyond the typical end-of-course self-report survey (Henrie, Halverson, & Graham, 2015). One study used learning management system log data and brief activity-level surveys to document variations in learner engagement across a semester, finding that clear instructions and relevant activities were more impactful than modality (Henrie, Bodily, Manwaring, & Graham, 2015).

Though often used to justify blended approaches, improved student engagement is not frequently studied. Analysis found that over half of the most frequently cited 85 articles and chapters mentioned engagement, but only four directly addressed research questions related to this construct (Halverson et al., 2012, 2014). Much of the blended learning engagement research stays at a general level, not specifying pedagogical features that might impact engagement. For example, a 2007 survey (institutions = 45, N = 23,706, blended course enrollment = approximately 70%) found a positive correlation between measures of engagement and students'

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use of course-related learning technologies (Chen, Lambert, & Guidry, 2010). Vaughan (2010) used the *National Survey of Student Engagement* and description to explore positive impacts on students' active learning in redesigned blended courses required by an institutional initiative. Alternatively, a study by Delialioğlu (2012) compared student engagement between lecture and problem-based approaches in blended courses and found higher levels of engagement with the latter. Halverson's (2016) research looking at engagement in the online and face-to-face portions of blended courses at two institutions found that students experienced engagement differently in the two modalities. However, she was not able to determine how the differences might be connected to pedagogical practices distinct between the modalities. Qualitatively oriented research, including a cross-case analysis of student experiences with BL, documented the varying barriers to engagement faced by students with different backgrounds and needs (Holley & Oliver, 2010).

3.2.3 Student Satisfaction

Research has found that learner satisfaction in BL courses is influenced by students' expectations, goals, and preferences as well as by the course design and implementation. For example, a learner expecting no instructor interaction might be well satisfied with a moderate interaction level, while a student expecting high interaction might be dissatisfied with the same experience.

Vignare (2007) suggested a need to identify and benchmark the elements leading to satisfaction in BL environments. Dziuban, Moskal, & Hartman (2005) used factor analysis to identify two dimensions of satisfaction—*learning engagement* and *interaction value* —then later identified eight elements contributing to learner satisfaction in online and blended courses (Moskal, Dziuban, & Hartman, 2010). Rothmund (2008) also found a correlation between

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learner interaction and satisfaction in blended courses. Akyol, Garrison, & Ozden (2009) confirmed that students valued both social presence and teaching presence in their BL experiences.

Because student satisfaction is connected to learner dispositions as well as course design, some researchers have hypothesized that student satisfaction with BL would be moderated by learner characteristics. For example, satisfaction of non-traditional adult learners may be significantly influenced by the convenience, flexibility, and low cost of BL (Moskal, Dziuban, & Hartman, 2010). Researchers at the University of Central Florida investigated ways satisfaction might be influenced by generation (e.g., millennials, boomers, genXers); they found significant differences, with millenials being least favorable towards blended environments (Dziuban, Moskal, & Hartman, 2005; Dziuban, Moskal, Brophy-Ellison, & Shea, 2007; Dziuban, Moskal, & Futch, 2007). Another study used Kolb's (1984) Learning Style Inventory to determine whether students with different learning styles had different satisfaction profiles in a blended course (Akkoyunlu & Soylu, 2008), hypothesizing that assimilators (oriented towards information & ideas) would be more satisfied by online components, while divergers (oriented towards people & feelings) would be drawn to the face-to-face components of the blend. Significant differences were found between the two groups on all six measured elements of the blended environment. Assimilators scored the online and face-to-face components as a close first and second place, while divergers distinctly valued the face-to-face environment over the online aspect. Graff (2003) also looked at learning styles in blended courses and found significant differences. Students with "intuitive" learning approaches (judgments based on feelings) experienced less sense of community than other students. Rovai & Jordan (2004) dealt with sense of community in fully online, blended, and traditional face-to-face courses, finding

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that blended learning experiences had build a stronger sense of community among students than either fully online or traditional courses.

Available evidence shows that many learners value both the richness of interactions in a face-to-face environment and the flexibility, convenience, and reduced costs associated with online learning. This combination may be why most research finds high student satisfaction with BL options. However, researchers must recognize that, as with learning effectiveness, the pedagogical possibilities (e.g., interaction levels, learner choice) enabled by the modality are what lead to satisfaction. Research looking at over a million course evaluations across different course formats showed that "modality does not impact the dimensionality by which students evaluate their course experiences" (Dziuban & Moskal, 2011, p. 236).

3.3 Faculty Issues

Teaching faculty experience many challenges from the rapid growth of blended and online learning. While students drive the demand for blended learning, faculty have probably the most important influence in a blended course or program's success. Many important faculty issues need research, but this section will briefly focus on three: (1) faculty adoption, (2) faculty satisfaction and workload, and (3) professional development.

3.3.1 Faculty Adoption of BL

Faculty at both university and K-12 levels are being asked to teach in blended and online modalities. Brown's (2016) review of literature identified six factors influencing faculty adoption. External influencers were (a) technology interactions, (b) academic workload, (c) institutional environment, and (d) teacher-student interactions. Internal influencers were (a) instructor attitudes & beliefs and (b) instructor learning. Ocak (2011) interviewed 117 faculty across four higher education institutions and found the most significant barriers to faculty

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adopting blended practices involved (a) instructional processes (complex instruction, time demands , inadequate planning/organization, and ineffective communication), (b) community concerns (lack of institutional support and role stability), and (c) technical issues (difficulty with new technologies and limited internet access). Technical literacy, including internet self-efficacy as well as structural technology access issues at the institution are prominent factors in faculty adoption of tools that enable blended teaching (Buchanan, Sainter, & Saunders, 2013).

Finally, Porter & Graham (2016) compared faculty self-categorization of their adoption (Rogers, 1983) with actual adoption behaviors and found that their self-perception tended to be at higher levels than their conduct and activity. Using indicators from the *Blended Learning Institutional Adoption Framework* (Graham et al., 2013), she probed faculty about how specific institutional practices would influence their adoption decisions; results showed faculty in different adoption categories valued different types of institutional strategy, structure, and support. In a follow-up qualitative study, Porter et al. (2016) sought to understand how to address needs of faculty in the early and late majority adoption categories in order to increase their adoption of blended practices at the institution level.

3.3.2 Satisfaction and Workload

The University of Central Florida found that 88% of instructors were satisfied with teaching blended courses and that 81% were “definitely” willing and 13% “probably” willing to teach another blended course (Dziuban et al., 2004). This compares to the 87% faculty satisfaction with teaching purely online courses, with only 67% “definitely” willing to teach purely online again (Dziuban et al., 2004). All faculty involved in a BL pilot program at the University of Wisconsin were happy with their first blended teaching experience and were willing to recommend the approach to others (Aycock, Garnham, & Kaleta, 2002). However, in

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contrast a BL pilot project at the Rochester Institute of Technology found only 41% were willing to teach a blended course again (Vignare & Starenko, 2005).

Faculty satisfaction with online course redesign was influenced by factors associated with (a) student experience (satisfaction, interaction levels, performance, etc.), (b) instruction opportunities (recognition, reliable technology, collaboration opportunities, professional development, etc.), and (c) institutional support (workload, compensation, promotion and tenure issues, etc.) (Bolliger & Wasilik, 2009). Student factors were of first concern; faculty are not likely to be satisfied if their students' experience is not positive (Moskal, Dziuban, & Hartman, 2010). Using student ratings of faculty competence as an indirect measure of faculty satisfaction in blended and online contexts, Larsen & Sung (2009) reported student ratings of exceptional faculty competence for purely online (76%), blended (44%), and face-to-face (76%). Relationships with their students motivate and renew many teachers. Forms of online learning with minimal teacher-student interaction, particularly if the instructor feels reduced to assignment grader, can be unsatisfying for faculty (Hawkins, Barbour, & Graham, 2012, 2012). BL can add faculty satisfaction, (particularly for those accustomed to traditional teaching) by enabling some face-to-face relationships with students.

As with online learning, researchers recognize that BL faculty workloads may increase, especially for novice teachers (Colwell, 2006), with time required (a) to learn new technologies and teaching strategies, (b) to create and maintain online materials, and (c) to communicate with students by email and other ICT channels. Some recent work has been done for accurately measuring BL workload (Kennedy et al., 2015; Ryan et al., 2015; Tynan et al., 2015).

3.3.3 Professional Development

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Professional development preparing faculty for blended teaching is necessary, as the majority have limited experience in online or blended teaching and need guidance in redesign and implementation. Examples of effective programs supporting prospective BL faculty can be found at various institutions. Garrison & Vaughan (2008) at the University of Calgary have been proponents of the community of inquiry as a framework for professional development in blended teaching. The University of Central Florida (UCF) has followed up their excellent IDL6543 professional development course (Dziuban, Hartman, Cavanagh, & Moskal, 2011) with the openly available BlendKit online faculty development course (Moskal, Thompson, & Futch, 2015). The University of Wisconsin-Madison (Garnham & Kaleta, 2002; Aycock, Garnham & Kaleta, 2002) and Rochester Institute of Technology (Vignare & Starenko, 2005; Starenko, Vignare, & Humbert, 2007) also have exemplary offerings.

Ginsberg & Ciabocchi (2015) studied professional development for blended teaching at 116 institutions of higher education and reported on structural elements including (a) delivery mode, (b) participation incentives, (c) enrollment choice, and (4) participant outcomes (e.g., readiness to teach BL). Additionally, the study explored which elements of the professional development programs have been most/least successful and why? The study found that face-to-face (72%) was the most common delivery format provided, followed by asynchronous online instruction (55%), blended instruction (45%), and finally synchronous online instruction (30%). Top areas for improvement included providing incentives, requiring training, increasing number of training staff, and increasing institutional support/funding. While there is limited research on professional development practices specifically for K-12 teachers preparing to teach in blended contexts, there has been some research on PD for K-12 online teaching, which often includes blended contexts (Rice & Dawley, 2009;).

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Professional organizations in higher education and K-12 have created competencies for blended and online teaching on which systematic and sustained faculty professional development might be based (Klein, Spector, Grabowski, & de la Teja, 2004; Powell, Rabbitt, & Kennedy, 2014). However, little research has attempted to identify blended teaching competencies distinguishable from traditional or online competencies. Torrisi-Steele & Drew (2013) supported increased focus on technical pedagogy skills in the professional development.

4. Recommendations for Future Research

Although BL is often treated in terms of blending physical attributes of online and face-to-face instruction, its psycho-social relationships are the core of its research and design. Like engineering or architecture, education is a design-oriented field, concerned with tradeoffs involving cost, efficiency, and effectiveness. The foundational challenge of BL research is seeking to find ways of combining the strengths of both humans and machines so both can be maximized by blending them to benefit learners.

Although research shows some general patterns across the modalities of face-to-face, online only, and blended learning, the root causes for improved learning outcomes in BL contexts are not yet apparent. They will likely be grounded in the pedagogical practices enabled by blended learning, requiring research to examine more closely what happens at the activity level in different blends. Several studies report student and faculty satisfaction with BL; however, satisfaction data must be more closely linked with specific BL design features, discovering *how* BL designs impact both performance and satisfaction outcomes and learners' dispositions towards the subject matter, promoting learner persistence beyond a specific course.

Additionally, significant institutional issues should be explored. Issues affecting faculty satisfaction (e.g., workload, professional development) are underrepresented in the research.

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Other areas recommended for research include (a) impacts of interaction quantity and quality on outcomes, (b) relationships between face-to-face and online presence in building BL community and student engagement, and (c) correlation between time on task and BL outcomes. Garrison and Vaughan (2008) identified establishing and maintaining cognitive presence in blended communities as the top BL research need related to the CoI framework. Other researchers have suggested relationships between learner characteristics and success with different blends (Dziuban et al., 2007), particularly relevant as adolescent learners, who lack adult learning characteristics like high self-regulation, encounter BL.

Increasing use of blended learning in higher education, corporate training, and K-12 learning contexts requires more theoretically grounded research to guide practice. Scholarly knowledge is founded on theoretical development, including frameworks appropriate to the three important activities of knowledge creation (Gibbons & Bunderson, 2005). *Exploring* identifies, describes, and categorizes—documenting the wide range of blended learning models and developing taxonomies to enable meaningful systemization facilitating analysis of physical and pedagogical characteristics of the blends. *Explaining* via theoretical frameworks the *how* and *why* of BL outcomes possibly extends prominent distance learning theories to the BL context and develops new theories specifically created for understanding BL issues. *Designing* to create the bases for instructional theories will aid practitioners in tailoring BL to their specific needs.

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