A thematic analysis of the most highly cited scholarship in the first decade of blended learning research

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ABSTRACT

Blended learning, which combines face-to-face and online learning modalities, is a heterogeneous and steadily developing area of design and inquiry. With the expansion and maturation of blended learning research, voices enter the conversation in increasing numbers and diversity. This study continues the work begun by Halverson, Graham, Spring, and Drysdale (2012), which determined the most frequently cited books, edited book chapters, and articles on blended learning, as well as the journals in which these highly cited articles appeared. After finding where the conversations about blended learning were happening and which scholars were at the forefront of these conversations, we now look at what the conversations on blended learning are really about. Using thematic analysis, we uncover the methodologies, research questions, and theoretical frameworks in this scholarship, and then discuss the implications of these findings for blended learning research. In doing so, we promote further understanding of the center of this emerging area of study.

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1. Introduction

Blended learning is rapidly emerging as a domain of practice and of research. Across discipline and context, at individual instructor and institution levels, educators are experimenting with blended learning. Research in this domain is not limited by field or discipline; as a result, it is divergent, lacking a center point. This lack of cohesion raises a question: Where are the conversations about blended learning being held, and what are they really about?

Halverson, Graham, Spring, and Drysdale (2012) began searching for the center of this emerging area of study by finding the most impactful scholarship and research on blended learning as measured by citations. Using Harzing's (2011) Publish or Perish software, which retrieves and calculates academic citations from Google Scholar, they determined the most frequently cited books, edited book chapters, and articles on the subject of blended learning, as well as the journals in which the highly cited articles appeared, during the years 2000–2011. Their research provided a useful starting point for determining works with significant currency, resonance, timeliness, and influence. Their findings helped determine where the conversations about blended learning were happening and which scholars were at the forefront of these conversations.

Now we delve deeper, adopting the techniques of thematic analysis to better understand what is being discussed in the most impactful publications of the domain. Our current research analyzes the 60 most impactful articles and 25 most impactful book chapters to determine what methodologies were being used, which research questions were being addressed, and what theoretical frameworks were being referenced. We believe that additional concrete evidence about research questions, methodologies, and theoretical frameworks will improve not only future research, but also future practice of blended learning. For example, a better understanding of the theoretical frameworks being utilized in blended learning scholarship can strengthen the quality of research as well as the cohesion between research and practice.

This interest in the substance of the most impactful conversations in blended learning research will be investigated using these research questions:

Methodological trends
1. What methodologies are being employed by the top-cited scholars?

Topical trends
2. What is the range and frequency of topics being explored in blended learning research?
3. What theories do these scholars draw on to support their study of blended learning?

In this article we begin with a brief review of the methods used in Halverson et al. (2012) to identify our sample of the most impactful research on blended learning. Next we discuss the methods used for our

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thematic analysis. We then present the results of our analysis and finally discuss the implications for the future of research on blended learning.

2. Methods

2.1. Overview

In Halverson et al. (2012) we determined whose work was most frequently cited in other scholarship and in what journals and books these publications appeared.

The current study follows up on our previous research, providing a detailed thematic analysis of the content of the top-cited articles (Appendices A and B) and book chapters (Appendix C), in order to address the research questions of our study. Answering these questions required manuscript coding, described in greater detail below.

2.2. Search procedure and selection criteria

Halverson et al. (2012) used Harzing's (2011) Publish or Perish, a software program which retrieves and tabulates academic citations from Google Scholar, to determine which publications on the subject of blended learning have been most frequently cited in other academic publications. We searched using phrases about blended or hybrid learning and initially came up with more than 26,000 retrievals. However, we discarded those findings which did not fit in our definition of blended learning—the combination of face-to-face instruction with computer-mediated instruction (Graham, 2006). We also limited our search to publications in English and to the years 2000 through 2011; no applicable publications were listed in Publish or Perish prior to the year 2000.

We then selected the most frequently cited publications for analysis in our study—the top 50 articles, the top 25 book chapters, and the top 10 books. Because our system favored older publications that have had more time to accrue citations, we also included any 2010 publications cited at least 10 times, any 2009 publications cited at least 15 times, any 2008 publications cited at least 20 times, and any 2007 publications cited at least 25 times; this brought 12 newer articles to our attention. Two of these younger publications (Bernard et al., 2009; Hoic-Bozic, Mornar, & Boticki, 2009) had already ascended to the top 50 list without this additional consideration, leaving us with a total of 60 top-cited articles.

Halverson et al. (2012) quantified the impact of these articles, gathered information on the contributing authors and the journals publishing these works, and measured the context areas of these publications. We found that higher education is the context of most top-cited publications on blended learning, with 66.1% of the top-cited publications focused solely on the higher education setting. Nearly 20% focused on all settings, 12.5% focused on corporate/organizational training, and only two publications (1.8%) focused on the K–12 arena. For additional information and for charts and visuals, see Halverson et al. (2012).

2.3. Manuscript coding: Thematic analysis of top-cited works

The current research follows up on Halverson et al. (2012) by carrying out a thematic analysis of the 60 articles and 25 edited book chapters most cited in the domain of blended learning. We coded the articles in the following areas: methodologies (data analysis techniques), agenda (research questions or purpose statements), and theoretical frameworks. Two trained researchers independently categorized methodological trends for each publication. Any disagreements were then resolved between them, with assistance from a third coder when necessary. Then each researcher drew from the coding scheme used by Drysdale, Graham, Spring, and Halverson (2013) to open-code topical trends (research questions and theoretical frameworks). Both researchers reviewed and readjusted open-coding data until they agreed on categories and placements.

2.3.1. Categories for methodological trends

We categorized documents into empirical and non-empirical methods of data analysis. Empirical studies were further subdivided into descriptive statistics, inferential statistics, and qualitative analysis; non-empirical studies were sorted into explanation/literature review and model/theoretical treatment (see Table 1). We coded only those methodologies that contributed significantly to the analyses and conclusions of the research, but we did allow publications to be coded in more than one subcategory (the dominant not simply "trumping" the weaker). Publications which utilized more than one type of data analysis were coded *combined*. We also noted those publications which used empirical research to develop or apply a model or theoretical framework, considering this the "gold star" to which blended learning research should aspire.

2.3.2. Coding for topical trends—Research questions and purpose statements

We extracted all research questions and/or purpose statements from the top-cited articles and book chapters in order to determine topical trends. We then utilized the coding system developed by Drysdale et al. (2013), who coded the research questions from 205 doctoral dissertations and master's theses in the domain of blended learning based on the open-coding pattern suggested by Emerson, Fretz, and Shaw (1995). In round one, we coded the research questions and/or purpose statements from the chosen publications into the pre-existing categories from Drysdale et al. (2013). Questions which did not seem to fit into pre-existing categories were set aside and uncertainties about fit were noted. In round two, the two researchers discussed uncategorized questions and then grouped into new categories that were distinctive and informative. Additionally, questions with uncertainties about fit for a particular category were resolved through group negotiation. In the final round, we made slight changes to the categorization schema from Drysdale et al. (2013) to match our present findings. Subcategories from Drysdale et al. that were not represented among the selected publications were dropped; a new category, *exploration*, was created to capture the numerous articles focused on exploring and defining the domain of blended learning research.

2.3.3. Coding for topical trends—Theoretical frameworks

Articles in the models/theoretical (non-empirical) category sought to prove, disprove, or build on a particular theory. We extracted those theories which served as a basis for research and/or argumentation in the publication, but not those which were merely cited for background or context. In addition, we used Gibbons and Bunderson's (2005) *explore*, *explain*, *design*, a framework that categorizes research based on the purpose of the inquiry, in order to categorize and analyze the types of models and theories used in blended learning research.

3. Findings and discussion

In this section we discuss the methodological and topical trends in the top-cited publications on blended learning. Understanding these trends provides a clearer sense of what has been important in the first decade of blended learning research and may improve future research by strengthening awareness of existing gaps in the knowledge base. Moreover, this understanding can also improve the practice of blended learning. Finally, we hope that a better understanding of the theoretical frameworks being utilized in blended learning scholarship can provide a common underpinning to research efforts in this domain.

3.1. Methodological trends

Our findings on data analysis methods are presented in Fig. 1. Recall that we coded some publications in more than one subcategory, and thus totals may be more than 85, and percentages may add up to more than 100%. Overall categories were recorded as follows: 43 publications (51%) used empirical methods only, 27 (32%) used non-

Table 1
Data analysis used in top-cited articles and chapters.

Design	Description	Methods/characteristics
Empirical		
Descriptive	Used descriptive statistics	Mean, median, standard deviation
Inferential	Used inferential statistics	Experiment, causal, correlation, ANOVA, Chi-Square, *t*-tests, *p*-value, factor analysis, component analysis
Qualitative	Used interpretive and descriptive qualitative analysis	Case study, naturalistic inquiry, interview, focus group, open-ended survey, quote, phenomenology, ethnography, interpretative lens
Non-empirical		
Lit review/explanation	Focused on introducing or explaining blended learning	Tendency to focus on blended learning in a general sense, as opposed to specific contexts or developments
Model/theory	Suggested, extended, or applied a theory thoroughly	Exclusion of frameworks merely cited to provide background or context
Combined		
Combination	Used more than one kind of empirical data analysis	Any multiplicity of data analysis, regardless of which or how many
Gold Star	Used both empirical analysis and theory or model development	Development or refinement of a theory or model through empirical research

empirical methods only, and 15 (18%) used both empirical and non-empirical methods. *Combined*—mixing any methods of data analysis—was by far the most frequently used technique (47 publications, more than half). Within the empirical methods category, descriptive statistics were employed for the data analysis in 35 of the 85 top-cited publications (41%). Demographic data about participants or context were not coded as descriptive unless directly connected to questions about teaching, blending, technology, and so forth: in Ocak (2011), for example, Table 1 lists descriptive statistics about faculty characteristics including number of years using blended strategies and amount of daily use of internet and media in blended instruction. The second most common empirical data analysis approach was qualitative, used in 32 of the top-cited publications (38%). A few publications reported gathering qualitative data but did not analyze these data; we did not include these in our counts. The type of empirical data analysis least used was inferential statistics, employed in 26 publications (31%). The non-empirical category review/explanation included 29 publications (34%). Introduction of new theory or development of existing theories was found in 19 publications (22%); of these, only 11 (13%) combined theory building with empirical research, which we referred to as the *gold star*

(see Appendix D). We found it interesting that gold star publications had the lowest average number of citations; this may be due in part to the fact that 4 of the 11 were published in 2009, 2010, or 2011 or it may indicate a current lack of interest in theory building research. The low number of gold star publications confirmed what Graham (2013) argued: "Many studies consider theory only as background information or as a lens to describe findings or outcomes; few attempt to contribute substantively to the conversation about theory" (p. 340). More will be reported later about the theoretical frameworks employed by these 11 publications.

3.2. Topical trends: Research questions

Coding of research questions yielded ten primary topics, nine of which were based on the themes identified by Drysdale et al. (2013). We added the topic *exploration*, because many of the publications addressed exploratory issues surrounding the nature, benefits, and definitions of blended learning. We utilized the detailed subtopics of Drysdale et al. as well, but dropped some that did not align with the top-cited publications. Publications that addressed more than one topic were
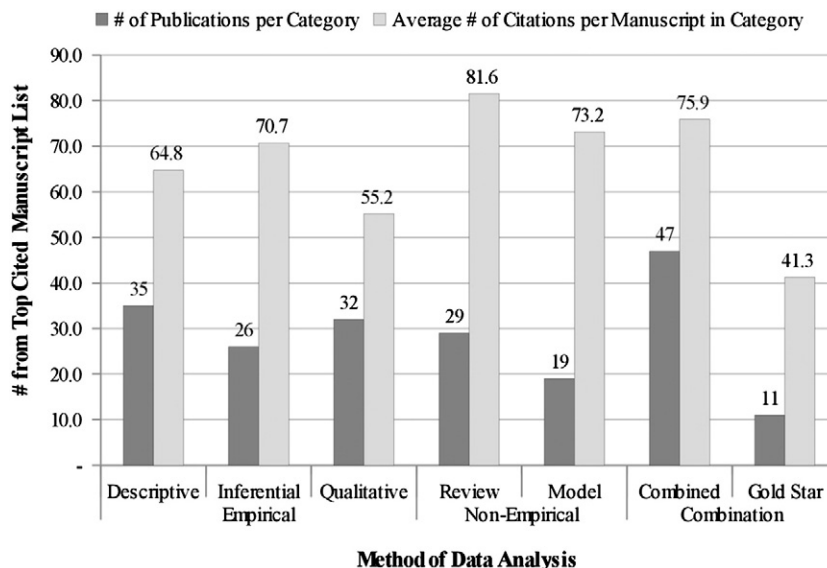

Fig. 1. Data analysis (N = 85): Total number of publications using each type of data analysis. *Note.* Some publications were coded in more than one subcategory, with *combined* being those that used more than one type of data analysis. *Gold star* indicates publications which combined theory building with empirical research.

Table 2
Categories with number of publications (#) and percent of total publications (%) addressing each primary topic.

Topic	#	%	Subtopics
Instructional design	35	41.2%	Models, strategies and best practices, design process, implementation, and environment and course structure
Disposition	27	31.8%	Perceptions, attitudes, preferences, student expectations, and learning styles
Exploration	25	29.4%	Nature and role of BL, benefits and challenges, current trends and future predictions, position/persuasion, purposes for BL, and transformative potential
Learner outcomes	24	28.2%	Performance outcomes, student satisfaction, engagement, motivation and effort, independence in learning, and retention rates
Comparison	15	17.6%	Blended vs face-to-face vs online, blended vs face-to-face, and blended vs online
Technology	15	17.6%	Comfort with, effect of, types of, uses/role of, and implementation of
Interaction	12	14.1%	General interaction, student-to-student, student-to-instructor, collaboration, community, and social presence
Demographics	4	4.7%	Student, institutional,
Professional development	3	3.5%	
Other	4	4.7%	International issues, role of instructors

coded for multiple topics; thus it was possible for percentages to add up to more than 100% (see Table 2). In the following sections, the findings for each primary research topic will be discussed in detail.

3.2.1. Instructional design

Of the top-cited articles and chapters, 41% had research questions about instructional design, with subtopics about models, strategies and best practices, design process, implementation, and environment and course structure (see Table 3).

Drysdale et al. (2013) coded models together with strategies and best practices, finding that 18.5% of their graduate research manuscripts fell into this category. In comparison, we separated these items into two categories: 18.8% of our publications addressing models, with 14.1% studying strategies and best practices. Had we left the two subtopics together, this category would have by far outnumbered any other subtopic addressed.

Few of the top-cited publications on blended learning have looked closely at design process. One publication that did, Kirkley and Kirkley (2004), considered instructional design processes and support tools among the areas that must be considered when designing these blended learning environments. (Other major areas, they argued, were the theoretical framework, the affordances and limitations of specific

technologies to be employed, and the specific instructional methodologies and strategies.) Since *design* is a core activity in knowledge creation, along with *explore* and *explain* (Gibbons & Bunderson, 2005; Graham, Henrie, & Gibbons, in press), increased attention to design processes and design-based instructional theories can assist practitioners desirous to tailor blended learning to their specific needs (Graham, 2013).

Another area receiving little attention in high-impact publications is implementation (3.5%). Graham, Woodfield, and Harrison (2013) noted that the gap in research about implementation and adoption of blended learning may be due in part to disagreement about how to define and measure blended learning. Their research outlined various stages of institutional-level blended learning adoption including (1) awareness/exploration, (2) adoption/early implementation, and (3) mature implementation/growth.

In the introduction to a special issue of *The Internet and Higher Education* focused on blended learning policy and implementation, Owston (2013) wrote,

> The need for alignment of goals at all levels of the academy from senior administration through to students as well as the necessity for an advocate at the early stages of implementation are identified as two major prerequisites for successful scaling up of blended learning.

If goal alignment is such a "critical factor in scaling blended learning" (p. 3), as Owston argued, then further research into the facilitative processes and strategies is vital to our understanding of how to scale blended learning implementation.

3.2.2. Dispositions

Nearly one-third (31.8%) of the top-cited publications had research questions or purpose statements focused on dispositions: asking questions about perceptions, attitudes, preferences, expectations, and learning styles (see Table 4). This widespread focus, an increase over the percentage found in Drysdale et al. (2013) (38.5%), is not surprising for many reasons. Dispositional data are fairly easy to collect. Moreover, proponents of the fledgling domain of blended learning are still quite self-conscious over whether blended learning might be perceived as inferior to traditional learning. They are concerned with whether student preferences, attitudes, and expectations about technology in the classroom affect their experience in blended learning settings. Since some have argued that dispositions are best learned by being around others who have those dispositions (Katz, 1988), blended learning proponents may feel concerned for the effect of lost face-to-face interaction between learners and instructors.

Within the topic of dispositions, the subtopic of perceptions was most widely studied, with student (14.1%) perceptions receiving much greater attention than faculty (2.4%) or administrator (1.2%) perceptions. A similar gap was noted in Drysdale et al. (2013): within the dispositions category, "for every sub-topic, more emphasis was placed

Table 3
Subtopics of the primary topic instructional design: 35 manuscripts—41.2% of total.

Subtopic	#	%	Example research question
Models	16	18.8%	Singh (2003): "*To provide a model* to create the appropriate blend by ensuring that each ingredient, individually and collectively, adds to a meaningful learning experience" (p. 51).
Strategies & best practices	12	14.1%	Swenson & Evans (2003): "*Best practices and developments* in hybrid courses are considered in this chapter" (p. 28).
Design process	3	3.5%	Kirkley and Kirkley (2004): "In this article, the challenges and issues of *designing* next generation learning environments using current and emerging technologies are addressed. An overview of the issues is provided as well as *design principles that support the design of instruction and the overall learning environment*" (p. 42).
Implementation	3	3.5%	Graham & Robison (2007): "How *prevalent* is blended learning at BYU? How is blended learning *changing instructional practices* at BYU?" (p. 86)
Environment & course structure	2	2.4%	Ausburn (2004): "The purpose of the study was to *identify the instructional features* selected as most important by this group [of adult learners] and to compare the group rankings with those of various sub-groups based on learner variables frequently identified in the literature as related to preference and performance in distance learning" (p. 329).

Table 4
Subtopics of the primary topic disposition: 27 manuscripts—31.8% of total.

Sub-topic	#	%	Example research question
Perceptions	12	14.1%	
Students	9	10.6%	Smart and Cappel (2006): "This study examines *students' perceptions* of integrating online components in two undergraduate business courses" (p. 201).
Faculty	2	2.4%	Woods et al. (2004): "What *perceptions do faculty have* of how certain blackboard features enhance or elevate… their assessment of student work and instructional capabilities in the face-to-face classroom setting?" (p. 284)
Administrator	1	1.2%	Picciano and Seaman (2007): "What is the perceived importance of online and blended learning for K–12 school programs?" (p. 17)
Preference	7	8.2%	
Student	6	7.1%	Ausburn (2004): "The purpose of the study was to identify the instructional features *selected as most important by this group [of adult learners]* and to compare the group rankings with those of various subgroups based on learner variables frequently identified in the literature as related to *preference* and performance" (p. 329).
Faculty	1	1.2%	Leh (2002): "Like the students, I [professor & author] enjoyed the flexibility hybrid courses provided" (p. 36).
Attitude	2	2.4%	
Students	1	1.2%	Olapiriyakul and Scher (2006): "The purpose was to study *students' attitudes* between two dichotomous comparisons— one is the comparison between hybrid learning and distance learning, and another is the comparison between hybrid learning and face-to-face learning" (p. 291).
Faculty	1	1.2%	Condie and Livingston (2007): "[The purposes were] to determine the impact of the SCHOLAR programme on the learning and *teaching experiences* and… to find out the extent to which the teachers' practices had been influenced by the introduction of the online/e-learning components" (p. 340).
Learning styles	5	5.9%	Olapiriyakul and Scher (2006): "The last study was conducted in order to find the correlation between *the learning styles of students* and their performance on examinations" (p. 291).
Expectations	1	1.2%	Kim & Bonk (2006): "[T]he study makes predictions regarding the changing roles of online instructors, *student expectations and needs* related to online learning, pedagogical innovation, and projected technology use in online teaching and learning" (p. 23).

on students than on faculty" (p. 96). Not all publications specifically focused on perceptions about the experience of blended learning itself; in So and Brush (2008), for instance, blended learning was the context for investigating students' perceived levels of collaborative learning, social presence, and satisfaction (see p. 322). The researchers found highly positive student reactions, indicating satisfaction with the overall learning experience in the blended learning course: "Overall, it appeared that (a) the course structure, (b) emotional support, and (c) communication medium were the most critical factors associated with student perceptions" of collaborative learning, social presence, and satisfaction (p. 330).

3.2.3. Exploration

The exploration topic was a new category created while coding the high-impact publications; it was not borrowed from Drysdale et al. (2013), although some of the subtopics we placed in this category were included by Dysdale et al. as "others." We found that almost one-third (29.4%) of the top-cited publications addressed issues under exploration such as the nature and role of blended learning; benefits and challenges to blended learning; current trends in and future predictions about blended learning; persuasion (position) or argumentation for or against blended learning; purposes for blended learning; and the transformative potential of blended learning (see Table 5).

One of the most prevalent subtopics within the exploration category was nature and role of blended learning (10/6%). This finding makes sense: In a young domain, publications that explore the nature and role of the new instructional paradigm are frequently cited in subsequent literature on it. Garrison and Kanuka (2004), the top-cited article in blended learning research (Halverson et al., 2012), which was coded in this subtopic, stated,

> The purpose… is to discuss the emerging trend in higher education to blend text-based asynchronous Internet technology with face-to-face learning—often referred to as simply blended learning. We posit that blended learning is an effective and low-risk strategy which positions universities for the onslaught of technological developments that will be forthcoming in the next few years. (p. 96)

Similarly, the top-cited chapter, Graham (2006), also fell into this subtopic, addressing basic questions of nature and role, such as "What is blended learning? Why blend?" (p. 3).

The subtopic of current trends and future predictions (10.6%) received commensurate attention among top-cited publications, and the subtopic of benefits and challenges (9.4%) followed closely. Picciano and Seaman (2007) studied "the issues and barriers that impede the development of online and blended learning in K–12 schools" (p. 17). Among their other stated purposes were determining the extent of

Table 5
Subtopics of the primary topic exploration: 25 manuscripts—29.4% of total.

Subtopic	#	%	Example research question/purpose
Nature & role of BL	9	10.6%	Picciano and Seaman (2007): "What is *the nature and extent of online and blended learning in K–12 schools* in the United States?" (p. 17)
Current trends & future predictions	9	10.6%	Bonk et al. (2006): "Instructors and administrators in postsecondary institutions in North America (primary) were surveyed to explore *the current status and future directions* of education in higher education settings" (p. 551).
Benefits & challenges	8	9.4%	Graham et al. (2005): "This article provides an overview of blended learning environments (BLEs) and outlines *the most common benefits and challenges* identified in the research literature" (p. 253).
Position/persuasion	4	4.7%	Oliver & Trigwell (2005): "[T]*here is little merit in keeping the term 'blended learning'* as it is currently understood. It is either inconsistent (and so useless as a way of understanding practice) or redundant" (p. 21).
Purposes for BL	4	4.7%	Laurillard (2007): "This paper proposes a modeling tool to help [technology-enhanced learning] innovators construct a plan for improved learning benefits, and controlled teaching *costs*" (p 28). The paper examines what technology-enhanced learning "changes will mean for the deployment of the *most important resource* in the education system: teachers' and learners' *time*" (p 22).
Transformative potential	1	1.2%	Garrison and Kanuka (2004): "The purpose of this paper is to provide a discussion of *the transformative potential of blended learning* in the context of the challenges facing higher education" (p. 95).

Table 6
Subtopics of the primary topic learner outcomes: 24 manuscripts—28.2% of total.

Subtopic	#	%	Example research question
Performance	14	16.5%	Riffell and Sibley (2005) hypothesized that students in the hybrid course would show more evidence of *learning gains* than their counterparts in the traditional course and thus *score higher on a post-course assessment test* (p. 219).
Satisfaction, student	7	8.2%	Utts et al. (2003): "We examined differences in student performance, *student satisfaction* and investment of both student and instructor time" (n.p.).
Engagement	4	4.7%	Aspden and Helm (2004): "The purpose of this paper, then, is to explore *student engagement* and interaction in the context of a blended environment" (p. 246).
Independence in learning	3	3.5%	Lynch and Dembo (2004): "This study reviewed the distance education and *self-regulation* literatures to identify learner *self-regulation* skills predictive of academic success in a blended education context" (p. 1).
Motivation and effort	2	2.4%	Klein et al. (2006): "Hypothesis 1: Learners in the blended learning condition will have higher *motivation to learn* compared to learners in the classroom condition" (p. 670).

online and blended learning in K–12 schools in the United States and establishing a baseline for future research. Arbaugh et al. (2009) were likewise interested in trends and predictions, proposing to "examine and assess the state of research of online and blended learning in the business disciplines with the intent of assessing the state of the field and identifying opportunities for meaningful future research" (p. 71). Rivera, McAlister, and Rice (2002), for instance, sought to document the "benefits and limitations" (n.p.) of blended, traditional, and online learning settings, especially in regards to student performance, student satisfaction, and instructor experiences.

We were surprised to find research questions on transformative potential in only one top-cited publication: Garrison and Kanuka's (2004) article, cited in blended learning research more than any other (Halverson et al., 2012). We expected that with such frequent citations more publications would be discussing this potential: In fact, in Halverson et al. (2012) we wrote,

> If Garrison and Kanuka's top-cited article is any indicator (2004), researchers of blended learning are interested in the transformative potential of blending. Other top-cited publications interested in the potential to transform learning are Dziuban et al. (2005, 2006), Graham and Robinson (2007), and Garrison and Vaughan (2008). (p. 397)

Yet even these noted publications did not form research questions or a purpose statement around transformation.

3.2.4. Learner outcomes

Learning outcomes, which considered performance, student satisfaction, engagement, independence in learning, and motivation and effort, were treated in 28.2% of the top-cited publications (see Table 6). This percentage is substantially lower than that found in dissertation/thesis research: Drysdale et al. (2013) revealed that more than half (51.5%) of the examined theses and dissertations had research questions focused on learner outcomes. We believe this difference may be due to the different purposes of research done by graduate students and research submitted to top-cited publications. The former look for narrow research topics with collectable data; learner outcomes provides such a focus. The most impactful publications, however, may have been so frequently cited because they were *not* narrowly focused, but addressed larger concerns (such as the very nature of blended learning, as discussed in the previous section).

Overall, the subtopic most frequently addressed was performance (16.5%), being featured in twice as many top-cited publications as the next subtopic within learner outcomes (student satisfaction, 8.2%). The lack of attention to other components of learner outcomes was at times surprising: Only 4 publications addressed engagement in their research topics, yet close to half of the top-cited publications used the term *engagement* within the text of their work. While blended learning may be viewed as an advantageous way to combine best practices and re-engage learners, and the term *engagement* is used frequently in

blended learning literature, more focused and grounded research on learner engagement in blended learning must still be done. Since important learner outcomes include more than just performance metrics such as grades, perhaps with passage of time and gains in confidence, blended learning research on other aspects of learning will receive more attention.

3.2.5. Comparison

The topics comparison and technology both received attention in 17.6% of the top-cited publications, compared to Drysdale et al.'s (2013) findings of 21.5% and 13.7% respectively. In top publications including comparison, more attention has focused on blended learning compared to traditional *and* online settings (9.4%) than to online (1.2%) or to traditional, face-to-face settings (7.1%) (see Table 7). Among the topics researched in these comparison studies were achievement and performance (Bernard et al., 2009; Brown & Liedholm, 2002; Olapiriyakul & Scher, 2006; Rivera et al., 2002; Tuckman, 2002; Utts, Sommer, Acredolo, Maher, & Matthews, 2003); active learning (Riffell & Sibley, 2005); engagement (Chen, Lambert, & Guidry, 2010); investment of student and instructor time (Utts et al., 2003); problem-based collaborative learning (Taradi, Taradi, Radic, & Pokrajac, 2005); sense of community (Rovai & Jordan, 2004); and student–instructor interaction (Riffell & Sibley, 2005). The meta-analysis of Mean, Toyama, Murphy, and Baki (2013) similarly found that "studies of blended instruction found a larger advantage relative to face-to-face instruction than did studies of purely online learning" (p. 29), suggesting the possible explanation that these blended learning instructional settings "tended to involve more learning time, additional instructional resources, and course elements that encourage interactions among learners" (p. 36).

3.2.6. Technology

Like the topic of comparison, the topic of technology was addressed in 17.6% of the top-cited publications (see Table 8). The most highly cited publication with a research question on technology was Kim and Bonk (2006), which was part of a broader longitudinal study to understand the use of technology in higher education and in corporate training instructional settings. The authors surveyed college instructors and administrators who were members of either the Multi-media Educational Resource for Learning and Online Teaching (MERLOT) or the Western Cooperative for Educational Telecommunications (WCET). The respondents indicated that they expected a shift from about 25% of classes being blended at the time of the survey to the vast majority of courses having some Web component by 2010. They also "envisioned the Web in the next few years more as a tool for virtual teaming or collaboration, critical thinking, and enhanced student engagement than as an opportunity for student idea generation and expression of creativity" (p. 27–28). Klein, Noe, and Wang (2006) had the highest number of total citations as well as the highest number of citations per year in the two most prevalent subtopics: comfort with technology and effects of technology. Their research hypothesized that motivation to learn

Table 7
Subtopics of the primary topic comparison: 15 manuscripts—17.6% of total.

Subtopic	#	%	Example research question
Blended vs face-to-face vs online	8	9.4%	Rovai and Jordan (2004): "The purpose of the present study was to examine how sense of community differed *across fully traditional, blended, and fully online courses*" (p. 4).
Blended vs face-to-face	6	7.1%	Tuckman (2002): "The purpose of the study was to *compare the academic performance for… students taking the traditional classroom version of the course to those taking the computer-mediated ADAPT version*" (p. 264).
Blended vs Online	1	1.2%	El Mansour & Mupinga, 2007: "The main purpose of this study is to describe students' experiences in *hybrid and online* courses" (n.p.).

(and thus learning outcomes overall) would be affected by perceptions of technology as a barrier or an enabler.

3.2.7. Interaction

The topic of interaction was part of a research question or purpose statement in 14.1% of the top-cited publications (Table 9). In these publications we found, as did Drysdale et al. (2013), a complete inattention to learner–content interaction, although learner–learner and learner–instructor interactions were treated (Moore, 1989). This gap is surprising, given the fact that proponents of blended learning care deeply about the interactivity of learner–content interaction and learner–human interaction. As Dziuban, Hartman, and Mehaffy (in press) have argued, blended learning practitioners must repeatedly ask themselves about the intersection of content, human intervention, and technology: What can I do best, and what do I relegate to technology? Aspden and Helm (2004), for instance, used qualitative methods to examine whether particular "properties of the blended environment… enable or facilitate interaction and the making of connections," keeping students connected and engaged with each other and with the institution itself even during "non-university time" (p. 249).

3.2.8. Additional minor trends: Demographics, professional development, other

Matters of demographics have not been heavily addressed in top-cited publications, where only 4.7% had research questions investigating student or institutional demographics. Faculty demographics were not studied at all (see Table 10). Drysdale et al. (2013), although they found greater general focus on demographics (with 14.1% of graduate dissertations and theses studying demographics), also found a paucity of studies of faculty demographics in particular (with only 2% examining the topic). We would like to see more discussion about faculty needs.

Only 3.5% of top-cited publications addressed the topic of professional development (see Table 10): One studied professional development supporting blended learning initiatives (Kaleta, Skibba, & Joosten, 2007); one investigated professional development carried out in a blended format (King, 2002); and one combined both purposes, examining faculty experience with blended learning while learning about blended learning (Vaughan & Garrison, 2005). Considering the technological and pedagogical innovations that are required in blended

learning and that could invite additional professional training, scant attention is being paid to professional development in top-cited publications. One reason for this may be that the individuals providing professional development, being in administrative as opposed to research roles, are given few resources for or incentives to publish.

Under the heading *other* we categorized some important yet less common topical trends: international issues and the role of the instructor (see Table 10).

Only two (2.4%) of the top-cited publications addressed international issues. Jones (2006) looked at the impact that blended learning was having on higher education, using a case study from Wales, noting that "there is a paucity of research on blended learning from universities in the United Kingdom" (p. 182). Jung and Suzuki (2006) investigated "the emerging practice of blended learning in Japan and discusse[d] a variety of instructional approaches in blended learning in the context of a liberal arts college in Japan" (p. 267). Both of these top-cited works were chapters in *The Handbook of Blended Learning* by Bonk and Graham (2006), the top-cited book on blended learning (Halverson et al., 2012).

This very small representation within our findings does not reflect the actual attention to blended learning in the international context, however. A parallel project in our research group that is currently examining blended learning in international contexts has already located more than 700 manuscripts connected to non-North American contexts (Welch & Spring, personal communication). Thus we know that there is a significant amount of blended learning research happening in international settings. However, it appears that international research on blended learning has not gained prominence in terms of being cited by other scholars: The vast majority of the articles have fewer than 10 citations, and many have zero. Our colleagues have made some preliminary observations. First, many of these international studies are not published in the most widely cited international journals, which may decrease the exposure they receive and thus the citations they accrue. Additionally, a significant number of the researchers seem to be outside of the North American blended learning research community as a whole, as evidenced by their bibliographies (many of which seem to cite local scholars instead of prominent international blended learning scholars). This tendency to be outside the mainstream is further evidenced by a lack of common blended learning terms: for example, several scholars do not use the terms *blended learning* or *hybrid learning*,

Table 8
Subtopics of the primary topic technology: 15 manuscripts—17.6% of total.

Subtopic	#	%	Example research question
Comfort with	5	5.9%	Klein et al. (2006): "The effects of learner characteristics, *perceived barriers and enablers*, and delivery mode on course outcomes will be partially mediated by motivation to learn" (p 675).
Effect of	5	5.9%	Bonk et al. (2002): "The purpose of this research was to investigate *how various distance-learning technologies affect student learning* in a high-level course in the military" (p.97).
Types of	3	3.5%	Hall and Davison (2007): "To what extent can *blog technology* serve as a means of encouraging interaction between students in a module cohort?" (p. 165).
Uses/role of	3	3.5%	Woods et al. (2004): "What *primary uses do the faculty make* of Blackboard to support or otherwise augment their face-to-face instruction?" (p. 284).
Implementation of	1	1.2%	Wang, Shen, Novak, and Pan (2009): The studied "system allows students to customize means of content-reception based on when and where they tune into the broadcast. The system also supports short text messaging and instant polls. This article describes this system in detail, and also reports results from *a formal implementation of the system* in a blended English classroom of 1000 students (with about 800 being online)" (p. 674).

Table 9
Subtopics of the primary topic interaction: 12 manuscripts—14.1% of total.

Subtopic	#	%	Example research question
Student-to-student	4	4.7%	Hall and Davison (2007): "To what extent can blog technology serve as a means of encouraging *interaction between students* in a module cohort?" (p. 165).
General interaction	3	3.5%	Aspden and Helm (2004): "The purpose of this paper, then, is to explore student engagement and interaction in the context of a blended environment" (p. 246).
Collaboration	3	3.5%	Taradi et al. (2005): The purpose is "to identify the impact of a blended problem-based learning *collaborative learning* environment on student learning outcomes" (p 35).
Community	3	3.5%	Rovai and Jordan (2004): "The purpose of the present study was to examine how *sense of community* differed across fully traditional, blended, and fully online courses" (p. 4).
Student-to-instructor	2	2.4%	Riffell and Sibley (2005): "We expected that a greater proportion of students in the hybrid class would: rate the quality of *interaction with the instructor* as higher or equal to that in other courses they had taken" (p. 219).
Social presence	1	1.2%	So and Brush (2008): "What are the relationships among and the important factors related to students' perceived levels of collaborative learning, *social presence*, and satisfaction?" (see p. 322)

but rely on more basic descriptions such as "partially online, partially face to face". In fact, this difference in terminology would have excluded them from our search results, since we searched using *hybrid* and *blended* cognates. Perhaps the most significant reason why this international research is receiving so little attention is because nearly all of the publications are quite narrow in their scope. The overwhelming majority of these publications focus on a single case of blended learning within a single setting within a single country, and very few articles step back and look at blended learning on a regional or an international level. It would be helpful to have more publications that examine blended learning across continents (Welch & Spring, personal communication).

We were also surprised to find that only 2.4% of the top-cited publications addressed the role of instructors (see Table 10), consistent with the gap we have perceived in attention to faculty concerns in blended learning research. The faculty component must not be ignored when looking at the blended learning ecosystem. Zhao, Lei, Yan, Lai, and Tan (2005) have suggested that instructor involvement may be the critical factor behind the recognized but not well-understood outcome differences of online, blended, and face-to-face learning. Moreover, blended learning has the potential to overcome some of the dissatisfaction of some instructors with types of online learning in which minimal interaction between teacher and student leaves the instructor feeling reduced to the role of assignment grader (Hawkins, Barbour, & Graham, 2011, 2012). Research on the role of instructors in blended learning could help us better understand how to maximize the benefits of instructor involvement, both for learners and for instructors.

3.3. Topical trends: Theoretical frameworks

As stated previously, 19 top-cited publications attempted to develop existing theory or propose new theory. These publications deserve additional attention, for "[a]s blended learning research increases, theoretical frameworks should be developed to address the issues unique to blended learning environments" (Graham, 2013). To analyze these articles, we used Gibbons and Bunderson's (2005) framework for categorizing types of research and theoretical inquiry: *explore*, *explain*, and *design*. This framework was also used by Graham, Henrie, et al. (in press) to analyze types of models and theories in the blended learning research. We use it here to reveal the purposes and types of the models and theories used in the 19 top-cited publications.

The *explore*, *explain*, *design* framework categorizes academic research according to the purpose of the inquiry. *Explore* research seeks to discover what exists in our observations by defining and categorizing, as practiced by natural scientists as they catalog things found in the natural world. *Explain* research investigates causal or correlational relationships within a phenomenon, a type of inquiry typical to most scientific research by which variables are identified and influenced to observe reactions and outcomes. *Design* research proposes means for creating something that achieves a desired

goal. For example, to create instructional theory which outlines instructional interventions to influence student learning is a type of design research.

An example of an *explore* model found in the 19 publications analyzed in this section is Jung and Suzuki's (2006) framework for analysis of instructional approaches to learning, which categorizes types of blends based on four instructional approaches: open interaction, knowledge creation, efficient management, and information dissemination. This model was used to categorize and analyze different types of blended learning experiences, as well as to identify effective strategies employed in each of those types of blends. This work, along with *explore* research on blended learning in general, brings clarity to the various constructs defined as blended learning.

An example of an *explain* model among these 19 articles is Wu, Tennyson, and Hsia's (2010) research model for BELS learning satisfaction, which identifies six variables of interest that share correlational relationships with learner satisfaction: computer self-efficacy, system functionality, content feature, interaction, performance expectations, and learning climate. Relationships among these variables and with learner satisfaction were empirically tested to better understand the nature of the relationships. Like Wu, Tennyson, and Hsia, much of scientific research aims to create models that aid in prediction and explanation by identifying and testing relationships among variables. In analyzing the blended learning research, we have found a need for more *explain* research to clarify our observations of blended learning experiences, including student performance and satisfaction, as well as to guide future designs of blended learning.

Most of the articles analyzed in this section were categorized as *design* models. As we reviewed the models and theories categorized as *design*, we found the following four patterns by which *design* models were being used or described:

1. *A framework to guide design*. Specific areas or concepts are identified that designers, administrators, and instructors should consider in the design and implementation of blended learning.
2. *An evaluation tool*. Concepts, standards, or principles are identified that should be considered in evaluating blended learning.
3. *A design process model*. Guidance is given in the process one should take in designing blended learning.
4. *An instructional model*. A course or activity is described, including guidance on content delivery, participant interaction, and organization of the course.

Table 11 explains the classification of design models using these four categories. The *design* models discussed here provide needed guidance to help designers, instructors, administrators, and other stakeholders make informed decisions on the design and implementation of blended learning.

It is striking that of those 19 publications, only 2 utilize the same theoretical framework: the community of inquiry framework proposed for

Table 10
Subtopics of the primary topics demographics (4 manuscripts, 4.7% of total), professional development (3 manuscripts, 3.5% of total), and other.

Subtopic	#	%	Example of research question
Demographics			
Student	3	3.5%	Brown and Liedholm (2002): "Can we identify any *student characteristics, such as gender, race, ACT scores, or grade averages, that are associated with better outcomes* in one technology or another?" (p. 445)
Institution	1	1.2%	Picciano and Seaman (2007): "*Who are the major providers* of online and blended learning courses to K–12 schools?" (p. 17)
Professional development	3	3.5%	King (2002): "[H]ow can hybrid courses contribute toward successful professional development experiences?" (p. 235)
Other			
International issues	2	2.4%	Jung and Suzuki (2006): "This chapter focuses on the emerging practice of *blended learning in Japan* and discusses a variety of instructional approaches in blended learning in the context of a liberal arts college in Japan" (p. 267).
Role of instructors	2	2.4%	Kaleta et al. (2007): "How did *instructors' roles* change as they implemented the hybrid model?" (p. 116)

distance education research by Garrison, Anderson, and Archer (2001). Akyol and Garrison (2011) used mixed methodology to study cognitive presence, a component of the community of inquiry system; Vaughan and Garrison (2005) gathered qualitative and descriptive data to understand how blended learning could support cognitive presence in a faculty development context. In general, the community of inquiry framework seems to be one of the most utilized theories for blended learning at this time; Graham (2013) noted that the most comprehensive work connecting distance education theories to blended learning is Garrison and Vaughan (2008). Although we do not analyze top-cited books in this study, Garrison and Vaughan (2008) was the second most frequently cited book on blended learning in Halverson et al. (2012), using the community of inquiry constructs of social, teaching, and cognitive presence to guide blended learning in higher education. The 17 other publications all suggested or developed *unique* theories and models, including (though not limited to) Badrul Khan's octagonal framework (Singh, 2003); Sloan-C's 5 pillars of online learning (Bourne, Harris, & Mayadas, 2005); the 3C-model of didactical components (Kerres & De Witt, 2003); the blended learning systems structure (BLESS) model (Derntl & Motschnig-Pitrik, 2005); the ADAPT (active discovery and participation through technology) model (Tuckman, 2002); the HELAM (hexagonal E-learning assessment model) (Ozkan & Koseler, 2009); Biggs' presage-process-product (3P) model of student learning (Bliuc, Ellis, Goodyear, & Piggott, 2010); Berge's framework for investigating the pedagogical, social, managerial and technological roles adopted by online and blended instructors (Kaleta et al., 2007); Rogers' innovation-decision process (Kaleta et al., 2007); and Graham's dimensions of interaction (2006). This theoretical diversity has a downside. Theories and models should be driving the conversations in the domain of blended learning, providing the language and variables around which those conversations coalesce. If we don't see multiple researchers using the same models and theories, then we are falling short of this important goal.

Additionally, whether a model is categorized as *explore*, *explain*, or *design*, empirical research can confirm its validity and strength. We were especially heartened by the 11 gold star publications which sought to propose, develop, or apply a theory through empirical research (see Appendix D). As stated above, two publications investigated the sphere of cognitive presence in the community of inquiry framework (Akyol & Garrison, 2011; Vaughan & Garrison, 2005); both of these were gold star. Nine other publications were also ranked as gold star, including two relatively "young" publications. Ozkan and Koseler (2009) proposed a "hexagonal e-learning assessment model (HELAM)" with six dimensions for LMS evaluation: supportive factors, learner perspective, instructor attitudes, system quality, information (content) quality, and service quality. They developed a survey instrument based on HELAM; tested it for content validity, reliability, and criterion-based predictive validity; and utilized an explanatory factor analysis to show that each of the model's six dimensions "had a significant effect on the learners' perceived satisfaction" (p. 1285). They triangulated their findings through descriptive and qualitative data as well. Another "young" publication, Wu et al. (2010), drew upon social cognitive theory to propose

a blended e-learning system (BELS) research model. They posited that three factors—learners' cognitive beliefs (self-efficacy & performance expectations), technological environment (system functionality & content feature), and social environment (interaction & learning climate)—would most impact student learning satisfaction. They utilized confirmatory factor analysis to test the reliability and validity of a student questionnaire and the partial least squares (PLS) method to validate the measurement and hypotheses. They reported that their empirical findings "indicate that computer self-efficacy, performance expectations, system functionality, content feature, interaction, and learning climate are the primary determinants of student learning satisfaction with BELS" (p. 155). These gold star publications combine empirical research with theory development in a way that can help to move our domain beyond "localized challenges" and towards the "coherent development of theory" (see Graham, 2013, p. 340).

4. Implications and conclusion

The purpose of Halverson et al. (2012) was to better understand where the major conversations about blended learning were occurring and to identify authors, journals, and manuscripts that were impacting the conversations. The purpose of this follow-up study was to better understand the substance of those conversations in the most impactful publications about blended learning.

This study does not review all research on blended learning, but it does give us a sense of what is being discussed in those publications which have been most highly cited in the blended learning literature.

Table 11
Blended learning design models.

Design category	Model
A framework to guide design	· Kerres and De Witt (2003): 3-C model of didactical components
	· Singh (2003): Khan's octagonal framework
	· Derntl and Motschnig-Pitrik (2005): BLESS model
	· Unwin (2005): Teacher training program implementation model
	· Wenger and Ferguson (2006): Learning ecology model
An evaluation tool	· Martyn (2003): Seven principles of good practice
	· Bourne, Harris, & Mayadas (2005): SLOAN pillars
	· Vaughan and Garrison (2005): Community of inquiry and practical inquiry model
	· Laurillard (2007): Cost–benefit modeling tool
	· Ozkan and Koseler (2009): Conceptual e-learning assessment model & HELAM
	·Akyol and Garrison (2011): Community of inquiry and practical inquiry model
A design process model	·Alonso et al. (2005): Systematic development of instruction and learning
An instructional model	· Tuckman (2002): ADAPT
	· Martyn (2003): Hybrid online model
	· Alonso et al. (2005): E-learning instructional model
	· Lewis and Orton (2006): Blended 4-tier learning model

Our findings show a significant amount of attention being given by blended learning researchers to the areas of instructional design (especially models, strategies, and best practices), disposition (especially student dispositions), exploration, and learner outcomes (especially performance metrics) (see Table 2). A fair amount of conversation in blended learning research is being held about topics of comparison, technology, and interaction. Less attention is being given to demographics (especially faculty demographics) and professional development—gaps which may indicate a failure to fully consider the support needs, shifting roles, and other concerns of a vital party in the blended learning ecosystem: the instructors. Indeed, our study found a dearth of teacher perspectives on blended learning, whether the focus was on roles, professional development, adoption, or implementation challenges, to name a few.

As noted, many of the top-cited publications had research questions or purpose statements involving instructional design, dispositions, and learner outcomes. We see an opportunity for further research juxtaposing these topics. Mean et al. (2013) noted that "practice variables," such as additional learning time, instructional resources, and course elements that encourage learner interaction, may contribute to the particularly positive outcomes for blended learning (see p. 36). Thus they argued that "experimental research testing design principles for blending online and face-to-face instruction for different kinds of learners is needed" (p. 2). Yet they also warned that studies have found that "design principles that have empirical support when applied to some kinds of learning content prove ineffective with other content" (p. 38). Furthermore, differences in design may interact with learner differences and preferences. Blended learning research can investigate the features of the learning environment which can be designed to find efficiencies for various learner types and preferences, content areas, instructor styles and preferences, and so forth.

This article confirms the findings from Graham, Woodfield, et al. (2013) that few *explain* models have been proposed for blended learning. Of the 19 articles coded as proposing or developing new theory, only two were categorized as developing *explain* models. This highlights a significant gap in scientific research that explains connections between blended learning and observed results. We found it interesting that although Graham, Woodfield, et al. (2013) identified a solid base of exploratory research that attempts to define and categorize the blended learning being observed in practice, much of that work was not found on the high impact article list. This may be because many definitions for blended learning exist and the field is not coalescing around a particular base that explores and defines blended learning or even referring to published definitions in their research.

No cohesive theoretical conversations became apparent when we examined the high-impact publications in blended learning. As we identified 19 top-cited publications that attempted to develop or suggest theoretical frameworks, we found only 11 that tried to build theory through empirical research. Blended learning needs substantive conversations about theory, and such conversations will not happen without supporting empirical research. Also as noted, the community of inquiry was the only framework that had been examined more than once in the list of articles analyzed for this project. The absence of discussion on proposed theory may be because blended learning is a relatively new research domain. The research using the discussed models and theories may not have been highly cited, or the work may be recent, precluding it from the list of publications analyzed in this article. Still more attention should be devoted to investigating current proposed theory and developing new theoretical work in blended learning in order to build our understanding and increase the effectiveness of blended learning designs.

Greater theoretical clarity can also improve research on learner engagement in blended settings. As mentioned before, only four of the top-cited publications addressed this topic specifically, even though close to half of them used the term in their writing. Learner engagement research has been impeded because the literature contains a "duplication of concepts and lack of differentiation in definitions" (Fredricks, Blumenfeld, & Paris, 2004, p. 65). This lack of differentiation may be even more pronounced among blended learning scholars who include the term without carefully defining its meaning or its constructs. Moreover, since effective "blending" is not unilaterally conceived or implemented, it remains unclear which blended designs best combine to increase cognitive and affective engagement and thereby student learning. Critically examining how blended designs impact student engagement would be abetted by theoretical frameworks that could guide practice and research by "focusing perspective, revealing knowledge, and suggesting alternatives" (Garrison, 2000, p. 3). Such frameworks can have practical implications for researchers, designers, and teachers in blended learning environments in their attempts to improve student engagement and learning outcomes.

Appendix A

Top 50 ranked articles as measured by total citations (Halverson et al., 2012, pp. 406–410)

#	Total cites	Ave. cites/yr	Authors	Title	Source
1	544	68.00	Garrison and Kanuka (2004)	Blended learning: Uncovering its transformative potential in higher education	The Internet and Higher Education
2	346	57.67	Ruiz, Mintzer, & Leipzig (2006)	The impact of e-learning in medical education	Academic Medicine
3	323	35.89	Osguthorpe & Graham (2003)	Blended learning environments: Definitions and directions.	Quarterly Review of Distance Education
4	294	32.67	Singh (2003)	Building effective blended learning programs	Educational Technology
5	244	30.50	Rovai and Jordan (2004)	Blended learning and sense of community: A comparative analysis with traditional and fully online graduate courses	The International Review of Research in Open and Distance Learning
6	234	32.71	Oliver & Trigwell (2005)	Can "blended learning" be redeemed?	E-learning and Digital Media
7	174	17.40	Brown and Liedholm (2002)	Can web courses replace the classroom in principles of microeconomics?	The American Economic Review
8	146	20.86	Bourne et al. (2005)	Online engineering education: Learning anywhere, anytime	Journal of Engineering Education
9	137	23.17	Kim and Bonk (2006)	The future of online teaching and learning in higher education: The survey says…	Educause Quarterly
9	137	19.57	Alonso, López, Manrique, and Viñes (2005)	An instructional model for web-based e-learning education with a blended learning process approach	British Journal of Educational Technology
9	137	13.70	Rivera et al. (2002)	A comparison of student outcomes & satisfaction between traditional & web based course offerings	Online Journal of Distance Learning Administration
12	131	26.2	Picciano and Seaman (2007)	K–12 online learning: A survey of U.S. school district administrators	Journal of Asynchronous Learning Networks
13	124	12.89	Kerres and De Witt (2003)	A didactical framework for the design of blended learning arrangements	Journal of Educational Media

Appendix A (*continued*)

#	Total cites	Ave. cites/yr	Authors	Title	Source
14	118	13.00	Oravec (2003)	Blending by blogging: Weblogs in blended learning initiatives	Journal of Educational Media
15	108	18.00	Klein et al. (2006)	Motivation to learn and course outcomes: The impact of delivery mode, learning goal orientation, and perceived barriers and enablers	Personnel Psychology
16	104	26.00	So and Brush (2008)	Student perceptions of collaborative learning, social presence and satisfaction in a blended learning environment: Relationships and critical factors	Computers & Education
16	104	14.86	Concannon, Flynn, & Campbell (2005)	What campus-based students think about the quality and benefits of e-learning	British Journal of Educational Technology
18	100	16.67	Ellis, Goodyear, Prosser, & O'Hara (2006)	How and what university students learn through online and face-to-face discussion: Conceptions, intentions and approaches	Journal of Computer Assisted Learning
19	99	12.38	Ausburn (2004)	Course design elements most valued by adult learners in blended online education environments: An American perspective	Educational Media International
20	94	9.40	King (2002)	Identifying success in online teacher education and professional development	The Internet and Higher Education
21	93	13.29	Derntl and Motschnig-Pitrik (2005)	The role of structure, patterns, and people in blended learning	The Internet and Higher Education
22	92	10.22	Martyn (2003)	The hybrid online model: Good practice	Educause Quarterly
23	86	17.20	Ginns & Ellis (2007)	Quality in blended learning: Exploring the relationships between on-line and face-to-face teaching and learning	The Internet and Higher Education
24	82	11.71	Taradi et al. (2005)	Blending problem-based learning with Web technology positively impacts student learning outcomes in acid–base physiology	Advances in Physiology Education
24	82	11.71	Vaughan and Garrison (2005)	Creating cognitive presence in a blended faculty development community	The Internet and Higher Education
26	78	11.14	Riffell and Sibley (2005)	Using web-based instruction to improve large undergraduate biology courses: An evaluation of a hybrid course format	Computers & Education
27	74	11.14	Bernard et al. (2009)	A meta-analysis of three types of interaction treatments in distance education	Review of Educational Research
27	74	7.40	Tuckman (2002)	Evaluating ADAPT: A hybrid instructional model combining web-based and classroom components	Computers & Education
29	73	14.60	El Mansour and Mupinga (2007)	Students' positive and negative experiences in hybrid and online classes	College Student Journal
29	73	8.11	Boyle, Bradley, Chalk, Jones, & Pickard (2003)	Using blended learning to improve student success rates in learning to program	Journal of Educational Media
31	72	10.29	Glogoff (2005)	Instructional blogging: Promoting interactivity, student-centered learning, and peer input	Innovate: Journal of Online Education
31	72	9.00	Woods, Baker, and Hopper (2004)	Hybrid structures: Faculty use & perception of web-based courseware as a supplement to face-to-face instruction	The Internet and Higher Education
33	69	7.44	Utts et al. (2003)	A study comparing traditional and hybrid internet-based instruction in introductory statistics classes	Journal of Statistics Education
34	68	13.60	Condie and Livingston (2007)	Blending online learning with traditional approaches: changing practices	British Journal of Educational Technology
35	67	9.57	DeRouin, Fritzsche, & Salas (2005)	E-learning in organizations	Journal of Management
35	67	8.38	Cox, Carr, & Hall (2004)	Evaluating the use of synchronous communication in two blended courses	Journal of Computer Assisted Learning
37	66	8.25	Aspden and Helm (2004)	Making the connection in a blended learning environment	Educational Media International
37	66	8.25	Kirkley and Kirkley (2004)	Creating next generation blended learning environments using mixed reality, video games and simulations	TechTrends
39	65	10.50	Mortera-Gutiérrez (2006)	Faculty best practices using blended learning in e-learning and face-to-face instruction	International Journal of E-Learning
40	64	10.67	Smart and Cappel (2006)	Students' perceptions of online learning: A comparative study	Journal of Information Technology Education
40	64	8.00	Lynch and Dembo (2004)	The relationship between self-regulation and online learning in a blended learning context	The International Review of Research in Open and Distance Learning
42	62	5.56	Marsh, McFadden, & Price (2003)	Blended instruction: Adapting conventional instruction for large classes	Online Journal of Distance Learning Administration
43	59	11.80	Hall and Davison (2007)	Social software as support in hybrid learning environments: The value of the blog as a tool for reflective learning and peer support	Library & Information Science Research
44	57	5.70	Leh (2002)	Action research on hybrid courses and their online communities	Educational Media International
45	56	5.60	Bonk, Olson, Wisher, and Orvis (2002)	Learning from focus groups: An examination of blended learning	Journal of Distance Education
46	54	10.80	Laurillard (2007)		Higher Education
47	52	8.33	Motteram (2006)	"Blended" education and the transformation of teachers: A long-term case study in postgraduate UK higher education	British Journal of Educational Technology
47	52	8.33	Olapiriyakul and Scher (2006)	A guide to establishing hybrid learning courses: Employing information technology to create a new learning experience, and a case study	The Internet and Higher Education
49	51	17.00	Hoic-Bozic et al. (2009)	A blended learning approach to course design and implementation	IEEE Transactions on Education
49	51	7.29	Unwin (2005)	Towards a framework for the use of ICT in teacher training in Africa	Open Learning

Appendix B

Top ranked articles as measured by total citations, 2009–2011 (Halverson et al., 2012, pp. 387–388)

#	Total cites	Ave. cites/yr	Authors	Title	Source
2009					
1	74	24.67	Bernard, Abrami, Borokhovski, Wade, Tamim, Surkes, & Bethel	A meta-analysis of three types of interaction treatments in distance education	Review of Educational Research
2	51	17.00	Hoic-Bozic, Mornar, & Boticki	A blended learning approach to course design & implementation	IEEE Transactions on Education
3	48	16.00	Arbaugh, Godfrey, Johnson, Pollack, Niendorf, & Wresch	Research in online & blended learning in the business disciplines: Key findings & possible future directions	The Internet and Higher Education
4	38	12.67	Ozkan & Koseler	Multi-dimensional students' evaluation of e-learning systems in the higher education context	Computers & Education
5	33	11.00	Wang, Shen, Novak, & Pan	The impact of mobile learning on students' learning behaviors & performance: Report from a large blended classroom	British Journal of Educational Technology
2010					
1	22	11.00	Wu, Tennyson, & Hsia	A study of student satisfaction in a blended e-learning system environment	Computers & Education
2	19	9.50	Chen, Lambert, & Guidry	Engaging online learners: The impact of Web-based learning technology on college student engagement	Computers & Education
3	16	8.00	Bliuc, Ellis, Goodyear, & Piggot	Learning through face-to-face & online discussions: Associations between students' conceptions, approaches & academic…	British Journal of Educational Technology
4	14	7.00	Clayton, Blumberg, & Auld	The relationship between motivation, learning strategies & choice of environment whether traditional or including an online component	British Journal of Educational Technology
4	14	7.00	Cooner	Creating opportunities for students in large cohorts to reflect in & on practice: Lessons learnt from a formative evaluation of students' experiences of a technology-enhanced blended learning design	British Journal of Educational Technology
2011					
1	9	9.00	Akyol & Garrison	Understanding cognitive presence in an online & blended community of inquiry: Assessing outcomes & processes…	British Journal of Educational Technology
2	6	6.00	Ocak	Why are faculty members not teaching blended courses? Insights from faculty members	Computers & Education

Appendix C

Top 25 ranked edited book chapters as measured by total citations (Halverson et al., 2012, pp. 410–412)

#	Total cites	Ave. cites/yr	Author	Chapter title	Source
1	407	67.83	Graham (2006)	Blended learning systems	The handbook of blended learning
2	235	33.57	Dziuban, Moskal, & Hartman (2005)	Higher education, blended learning, & the generations: Knowledge is power: No more	Elements of quality online education: Engaging communities
3	107	17.83	Bonk, Kim, and Zeng (2006)	Future directions of blended learning in higher education & workplace learning settings	The handbook of blended learning
4	70	7.00	Masie (2002)	Blended learning: The magic is in the mix	The ASTD e-learning handbook
5	66	11.00	Nicol & Milligan (2006)	Rethinking technology-supported assessment practices in relation to the seven principles of good feedback practice	Innovative assessment in higher education
6	51	8.50	Dziuban, Hartman, Juge, Moskal, & Sorg (2006)	Blended learning enters the mainstream	The handbook of blended learning
7	39	5.57	Graham, Allen, and Ure (2005)	Benefits and challenges of blended learning environments	Encyclopedia of information science and technology
8	34	4.86	Alvarez (2005)	Blended learning solutions	Encyclopedia of educational technology
9	33	5.50	Jones (2006)	E-College Wales, a case study of blended learning	The handbook of blended learning
10	29	4.83	Owston, Garrison, & Cook (2006)	Blended learning at Canadian universities: Issues & practices	The handbook of blended learning
11	27	4.50	Oliver, Herrington, & Reeves (2006)	Creating authentic learning environments through blended learning approaches	The handbook of blended learning
12	25	4.17	Wagner (2006)	On designing interaction experiences for the next generation of blended learning	The handbook of blended learning
13	24	4.00	Jung and Suzuki (2006)	Blended learning in Japan & its application in liberal arts education	The handbook of blended learning
14	23	2.56	Swenson & Evans (2003)	Hybrid courses as learning communities	Electronic learning communities
15	20	3.33	Milne (2006)	Designing blended learning space to the student experience	Learning spaces
16	19	3.17	Hofmann (2006)	Why blended learning hasn't (yet) fulfilled its promises: Answers to those questions that keep you up at night	The handbook of blended learning
17	17	2.83	Masie (2006)	The blended learning imperative	The handbook of blended learning
18	16	3.20	Edirisingha, Salmon, & Fothergill (2007)	Profcasting: A pilot study & guidelines for integrating podcasts in a blended learning environment	Research on competence development in online distance education & e-learning
18	16	2.67	Huang & Zhou (2006)	Designing blended learning focused on knowledge category & learning activities	The handbook of blended learning
18	16	2.67	Lewis and Orton (2006)	Blending learning for business impact: IBM's case for learning success	The handbook of blended learning
21	15	3.00	Graham & Robison (2007)	Realizing the transformational potential of blended learning: Comparing cases of transforming blends and enhancing blends in higher education	Blended learning: Research perspectives
21	15	3.0	Kaleta et al. (2007)	Discovering, designing, & delivering hybrid courses	Blended learning: Research perspectives
21	15	1.50	Douglis (2002)	Blended learning: Choosing the right blend	The encyclopedia of educational technology
24	14	2.33	Wenger and Ferguson (2006)	A learning ecology model for blended learning from Sun Microsystems	The handbook of blended learning
25	13	2.17	Hanson & Clem (2006)	To blend or not to blend: A look at community development via blended learning strategies	The handbook of blended learning

Appendix D

Gold star publications: Those that combined model/theory development with empirical research.

Citation	Model name or description	Empirical validation
Akyol and Garrison (2011)	Practical inquiry model (from the community of inquiry conceptual model) operationalized cognitive presence in terms of triggering event, exploration, integration, and resolution	Used transcript analysis, learning outcomes, perceived learning, satisfaction, and interviews to assess learning processes and outcomes (i.e., cognitive presence)
Bliuc et al. (2010)	Applied presage-process-product (3P) model of student learning (see Biggs, 1979; Entwistle & Ramsden, 1983; Prosser & Trigwell, 1999), which suggests that the key related aspects of student learning in HE are student characteristics, institution context, student perceptions of the learning context, student approaches to learning, and learning outcomes	Used closed-ended questionnaires to gather data on students' conceptions and approaches; used final mark to measure academic performance; revealed "strong associations between what students thought their learning is about, the way they approached their learning, and academic performance in both face-to-face and online contexts" (p. 512)
Derntl and Motschnig-Pitrik (2005)	Proposed blended learning systems structure (BLESS) model as "a reusable framework for decomposing complex blended learning processes into smaller, more tangible and reusable units" (p. 113); suggested five "layers," presenting "blended learning patterns"	Applied "project-based learning pattern" (blended learning pattern layer in the BLESS model) to Web engineering course; obtained quantitative data by electronic survey & online reaction sheets; used paired t-tests to determine whether the blended course style contributed to an increase in motivation (p. 125)
Jung and Suzuki (2006)	Identified & gave strategies for four instructional approaches to blended learning: open interaction, knowledge creation, efficient management, or information dissemination (p. 273)	Presented case study of blending at the International Christian University (ICU) in Tokyo, Japan; applied four separate approaches to this case
Kaleta et al. (2007)	Applied Rogers' (1995) innovation-decision process five-stage model—knowledge, persuasion, decision, implementation, & confirmation; employed Berge's (1995) framework of pedagogical, social, managerial, and technological roles to investigate faculty experiences in the *implementation* phase	Conducted in-depth semi-structured interviews about the hybrid teaching experiences of 10 faculty from three universities; analyzed data using an inductive analytic process
Lewis and Orton (2006)	Used a blended 4-tier learning model incorporating 4 instructional approaches or "tiers": learning labs, collaborative learning, interactive learning (simulation), and performance support and best practice reference	Conducted student questionnaires and in-depth interviews to gauge satisfaction; gave student perception surveys at the end of every learning lab; measured content mastery through tests; assessed alumni 8–9 months after training to determine behavior change dimensions; measured ROI as cost avoidance and savings and as results enhancement
Martyn (2003)	Created a "matrix for the seven principles of good practice" by overlaying own "hybrid online model" (proposed mix of online and face-to-face instruction) upon Chickering & Gamson's (1987) "seven principles for good practice in undergraduate education" (student–faculty contact, student–student collaboration, active learning, prompt feedback, emphasis on time on task, high expectations, and respect for diverse talent)	Gathered descriptive and qualitative data on perceptions through student and faculty surveys; applied findings to the components of the "hybrid online model" as well as Chickering & Gamson's seven principles
Ozkan and Koseler (2009)	Proposed six dimensions for LMS evaluation through the hexagonal e-learning assessment model (HELAM): supportive factors, learner perspective, instructor attitudes, system quality, information (content) quality, and service quality (p. 1285)	Developed survey instrument based on HELAM and tested it for content validity, reliability, and criterion-based predictive validity; performed an explanatory factor analysis showing "that each of the six dimensions of the proposed model had a significant effect on the learners' perceived satisfaction" (p. 1285); also collected descriptive and qualitative data
Tuckman (2002)	Researched the ADAPT (active discovery And participation through technology) hybrid instructional model, an attempt to combine direct instruction with problem-based, manipulative or active learning in the form of computer-mediated performances (p. 262)	Ran an analysis of covariance on quarter grade point average (dependent variable) with prior cumulative grade point average as the covariate; used the between-subjects factor as instructional condition with three levels (ADAPT hybrid, conventional, or control-no instruction)
Vaughan and Garrison (2005)	Operationalized practical inquiry model (from the community of inquiry conceptual model); operationalized cognitive presence in terms of triggering event, exploration, integration, and resolution	Collected qualitative data from the transcripts of online discussion forums, audio recordings of face-to-face sessions, and a post-study interview with each participant; coded transcripts for cognitive presence (pp. 4–5)
Wu et al. (2010)	Proposed a blended e-learning system (BELS) research model drawing on social cognitive theory; posited that three factors—learners' cognitive beliefs (self-efficacy & performance expectations), technological environment (system functionality & content feature), and social environment (interaction & learning climate)—would most impact student learning satisfaction	Performed confirmatory factor analysis (CFA) to test the reliability and validity of a student questionnaire; used the partial least squares (PLS) method to validate the measurement and hypotheses; concluded, "The empirical findings indicate that computer self-efficacy, performance expectations, system functionality, content feature, interaction, and learning climate are the primary determinants of student learning satisfaction with BELS" (p. 155)

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