2018-09-01

K-12 Blended Teaching Competencies

Emily Bateman Pulham
Brigham Young University

K-12 Blended Teaching Competencies

Emily Bateman Pulham

A dissertation submitted to the faculty of
Brigham Young University
in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

Charles R. Graham, Chair
Ross Allen Andrew Larsen
Jered Borup
Heather Miriam Leary
Randall Davies

Department of Instructional Psychology and Technology

Brigham Young University

ABSTRACT

K-12 Blended Teaching Competencies

Emily Bateman Pulham
Department of Instructional Psychology and Technology, BYU
Doctor of Philosophy

This dissertation centers on competencies for K-12 online and blended teaching. Article 1, published in *Distance Education,* is the literature review, which compares K-12 online and blended teaching competencies. We found that online and blended teaching share personalization as the most salient competency, but that blended teaching competencies emphasize pedagogical skill sets and online teaching competencies emphasize managing the online course. Article 2, published in the *Journal of Online Learning Research*, is an analysis of selected literature from Article 1, which analyzes the modality in which competencies occur (online or digital context, face-to-face context, generic, or blended). Over half of the competencies analyzed were deemed generic, or not specific enough to denote which modality in which they occur, and 30% of competencies were for an online or digital context, and a very few competencies were specifically for face-to-face modality, and blended competencies made up Article 3 is a description of the validation of a Blended Teaching Assessment of five competency areas associated with blended teaching: (a) technology skills, dispositions, and digital citizenship, (b) technology-mediated interactions, (c) blending online and in-person learning, (d) personalization, and (e) real-time data practices. While the confirmatory factor analysis showed minimal evidence of validity, we believe this is an important first step to building an objective assessment of blended teaching skills, and the assessment should be refined and further analyzed if it is to be used for summative purposes.

Keywords: blended learning, blended teaching, technology integration, teacher education, literature review

ACKNOWLEDGEMENTS

I would like to thank my husband, Ryan, for his dedication and hard work to make it possible for me to complete my PhD. I would also like to thank my committee members: Randy, Ross, Jered and Heather for their helpful guidance through the process, and my committee chair, Dr. Graham, who never let me off easy, but always pushed me to do my very best and develop a scholarly mind.

TABLE OF CONTENTS

LIST OF TABLES

ARTICLE 1 TABLES

ARTICLE 2 TABLES

ARTICLE 3 TABLES

LIST OF FIGURES

ARTICLE 1 FIGURES

ARTICLE 2 FIGURES

ARTICLE 3 FIGURES

DESCRIPTION OF THE RESEARCH AGENDA AND STRUCTURE OF THE DISSERTATION

The focus of this dissertation is K-12 blended teaching competencies: what they are, how they compare with K-12 online teaching competencies, the nature of the modality in which competencies are carried out (i.e., which competencies are used online and which are used face-to-face), and how we can assess the competencies for preservice teachers. Blended teaching has been shown to be effective (Means, Toyoma, Murphy, Bakia, & Jones 2010). There are many K-12 school districts moving toward blended learning models, but most of the guiding principles available to them are school-level administrative guidelines, rather than course-level pedagogical strategies for teachers (Graham, 2006). Below I will describe the substance of three articles in more detail.

Article 1 is a literature review of K-12 specific documents about online and blended teacher competencies. Due to the overlapping nature of skillsets between online and blended teaching, we chose to compare competencies mentioned in literature from both places. Dr. Graham and I co-authored a literature review. We gathered 18 documents and using a modified (Attride-Stirling, 2001) method of content analysis (Merriam & Tisdell, 2016) discovered the most salient themes contained within the literature in order to help us prioritize blended teaching skills and determine what was unique to a blended teaching environment. These K-12 blended teaching competencies were also compared with K-12 online teaching competencies. This review was published by *Distance Education* in May 2018.

In Article 2, we conducted an analysis of selected competency documents from the literature, an analysis that focused on whether each specific competency was unique to an online environment, to an in-person environment, to a blended (online with in-person) environment, or

if the competency was generic. This additional analysis was published by the *Journal of Online Learning Research* (JOLR) in March 2018.

The research in Article 3 documents the efforts to establish the validity of a blended teaching assessment through the use of confirmatory factor analysis (CFA). In addition to factor analysis, we ran item correlations with several participant-level characteristics, such as years of teaching experience. This assessment was built to address the state mandate that preservice teachers have coursework that helps them learn "to facilitate student use of software for personalized learning" and "teach effectively in traditional, online-only, and blended classrooms" (Utah Administrative Code R277-504-4.C.3.c-f, n.d.). The assessment was not validated through our CFA, so further work is needed to establish its psychometric properties. However, a second iteration of the assessment, which was edited based on test results and a previous pilot study, was published online through *The Learning Accelerator* (Pulham, 2018) as a tool for teachers to formatively assess their understanding of real-time data practices, technology-mediated interactions, and managing a personalized and blended classroom.

Article 1

Comparing K-12 online and blended teaching competencies: A literature review

Emily Bateman Pulham

Charles R. Graham

Brigham Young University

Citation: Pulham, E., & Graham, C. R. (2018). Comparing K-12 online and blended teaching competencies: A literature review. *Distance Education*, *4*(1), 1–22.

https://doi.org/10.1080/01587919.2018.1476840

Abstract

This paper presents a synthesis of reports and research on K-12 blended teaching competencies compared with K-12 online teaching competencies. The skills needed to teach in online and blended environments are distinct from traditional teaching, but teacher education programs often do not equip preservice teachers for the new modes of instruction. Additionally, there is a dearth of research on blended teaching competencies. This review synthesizes 8 blended teaching documents and 10 online teaching documents. Seven global themes identified in both competency domains are: (a) pedagogy, (b) management, (c) assessment, (d) technology, (e) instructional design, (f) dispositions, and (e) improvement. The top 20 blended teaching skills include: flexibility and personalization, mastery-based learning, data usage and interpretation, learning management system usage, online discussion facilitation, and software management. We recommend that researchers collect more methodologically transparent data about blended teaching, and that teacher education programs include the identified skills in curriculum.

Keywords: blended learning, online learning, literature review, teacher education

Introduction

Combining online learning (OL) with face-to-face instruction, or blended learning (BL) (Graham, 2013), is expanding at the K-12 level, with administrators, students, and parents demanding additional BL curriculums (Parks, Oliver, & Carson, 2016). The Blended Learning Universe (n.d.) school directory lists 307 blended schools in the United States. The National Education Policy Center (NEPC) reported a 40% increase in student enrollments at full-time BL schools from 2014 to 2015, from 10,490 to 36,605 (Molnar et al., 2017). These numbers do not include the millions of traditional students who enroll in supplemental OL courses, which are often considered BL (Gemin, Pape, Vashaw, & Watson, 2015). Additionally, there is evidence that many district and state OL programs are in reality BL programs because they involve onsite face-to-face instruction in addition to OL components (Barbour & Hill, 2011; Freidhoff, Borup, Stimson, & DeBruler, 2015; Means et al., 2010, 2013; Taylor et al., 2016; Watson, Murin, Vashaw, Gemin, & Rapp, 2011). With increased numbers of technological tools at teachers' disposal, teaching with OL components is becoming the "new normal" (Norberg, Dzubian, & Moskul, 2011, p. 4).

Though the demand for BL schools and teachers increases, our understanding of effective BL teaching practice has lagged behind implementation, including ways preservice teachers prepare for the new normal (Norberg et al., 2011). The NEPC has noted that during the past two years very little progress has been made in legislation, policy, or implementation to ensure quality training for OL teachers; it makes no mention of quality BL teacher training (Molnar et al., 2017). The International Society for Technology in Education (ISTE) offers OL courses instructing educators how to effectively integrate technology into their teaching, and several recent studies have examined professional development for in-service teachers to sharpen BL

teaching skills (Lewis & Garrett Dikkers, 2016; Parks, Oliver, & Carson, 2016; Riel, Lawless & Brown, 2016). However, if BL teacher training is only conducted for in-service teachers, valuable time and energy have been wasted training preservice teachers on old methods. Archambault, DeBruler, and Friedhoff (2014) discussed the importance of infusing BL teaching pedagogies and field experiences into preservice teacher curriculum, but they noted that far from doing this, many preservice teacher programs continue to instruct teachers as they have in past decades. Teacher education programs need to address the skills of BL teaching. The U.S. Department of Education's Office of Educational Technology stated, "No new teacher exiting a preparation program should require remediation by his or her hiring school or district" (p. 35-36)

Identifying BL teaching competencies is antecedent to including them in teacher education curricula. Online teaching competencies have attracted much attention in scholarly literature (Bailie, 2011; Baran, Correia, & Thompson, 2011; Darabi, Sikorski, & Harvey, 2006; Ferdig, Cavanaugh, DiPietro, Black, & Dawson, 2009; Klein, Spector, Grabowski, & de la Teja, 2004). Ferdig et al. (2009) conducted a systematic review of OL teacher competency documents and advocated for further research in this area. But BL has been less researched in K-12 and could benefit from more (Halverson, Graham, Spring, & Drysdale, 2012). As early as 2004 Cavanaugh et al. advocated for improving teacher preparation for both OL and BL contexts. Many articles in the literature lump blended and OL teaching competencies into the same category (Archambault, DeBruler, & Freidhoff, 2014), but one might question whether they are the same skill set. Oliver and Stallings' (2014) effective literature review of both higher education and K-12 blended teaching practices provided several broad suggestions. This literature review summarizes, compares, and contrasts K-12 blended teaching competencies with K-12 OL teaching competencies from existing literature.

To bring transparency to the discussion, we also chose to investigate methodology for creating OL and BL teaching competencies because businesses and research groups that publish about BL typically target a non-scholarly audience that may not hold them to the academically rigorous standards of reporting research methods typically required by peer-reviewed research articles.

Review questions

1. What skills are most often mentioned in K-12 BL teaching competency literature? And K-12 OL teaching competency literature?
2. Do BL and OL teaching require the same competencies? If not, what is unique to each?
3. What methodologies have authors of previous OL and BL competency documents used in identifying competencies?

Definitions and Context for Blended Learning

At a basic level, BL integrates in-person and OL instruction (Graham, 2013). In the K-12 sector, the most commonly used definition of BL describes students as learning "at least in part through online learning, with some element of student control over time, place, path and/or pace" (Horn & Staker, 2014, p. 34).

In the *Handbook of Blended Learning* Graham (2006) identified various ways to blend instruction: at the activity level, at the course level, at the program level, and at the institution level. Most research in higher education has centered on course-level blending (Halverson et al., 2012); however, the literature on K-12 BL is concerned with institution-level blending for administrators trying to set up a BL school (Graham, Henrie, & Halverson, 2015; Horn & Staker, 2014). This literature review focuses on pedagogical (class-level) BL teaching competencies, for

the purposes of improving teacher education, which we believe is not keeping up with demand for BL and OL teaching needs in schools.

Blended Teaching Matrix

Figure 1 represents four categories of learning interactions: (a) technology-mediated human interaction, (b) technology-mediated content interaction, (c) in-person human interaction, and (d) physical content interaction (Graham, Borup, Pulham, & Larsen, 2017). Table 1 defines the four quadrants of the matrix. The bottom half of the matrix represents traditional teaching interactions without digital technologies, and the top half represents a new class of interactions with and mediated by digital technologies. The left- and right-hand sides of the matrix represent learner interactions with content and with human agents such as teachers and peers (Moore, 1989). Table 2 shows how traditional in-person teaching (sometimes using technology), OL teaching, and BL teaching all use skills from various quadrants for different purposes.

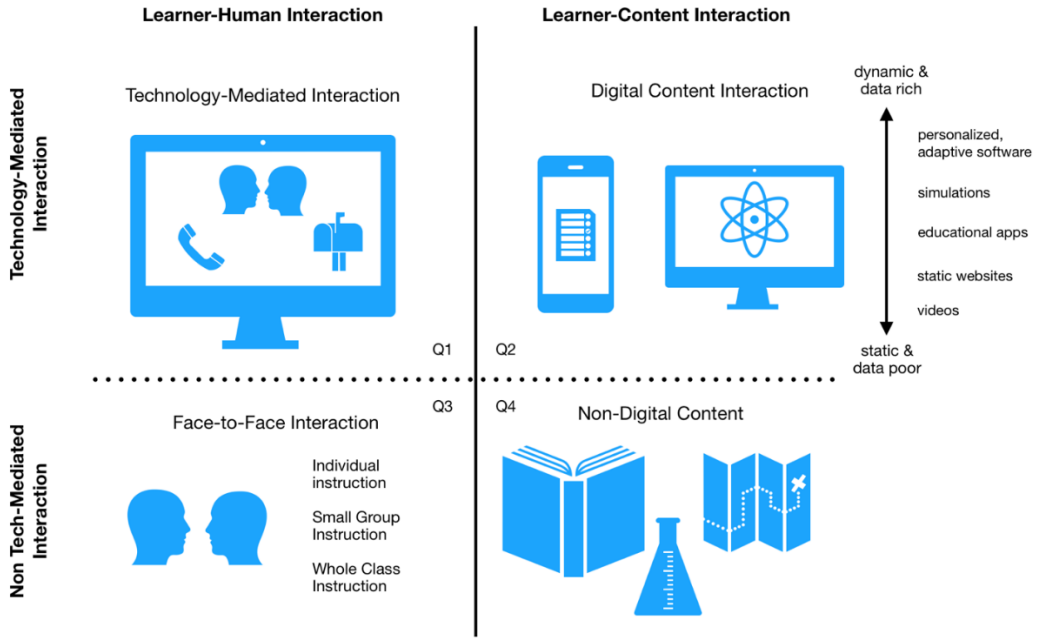


Figure 1. Blended teaching matrix identifying the four categories of interactions involved in blended learning (Graham, et al., 2017, p. 5).

Table 1

Description of Interaction in Four Quadrants (Graham, et al., 2017, p. 5).

Quadrant	Description of Skills in Each Quadrant
Q1	This quadrant requires the skills for participating in online teacher-student interaction and facilitating meaningful online student-student interaction. Interactions in this space can happen either asynchronously or synchronously and at low or high fidelity (e.g., text-based vs video).
Q2	This quadrant requires skills in working with digital tools and content. Increasingly digital content is dynamic and data rich. Teachers working in this quadrant need to have skills related to working with real-time data generated by adaptive or personalized learning software.
Q3	This quadrant requires the skills for in-person teacher-student interactions as well as student-student interactions in whole class and small group settings.
Q4	This quadrant requires the ability to use and manage traditional classroom-based materials.

Table 2

Description of the General Teaching Skills Needed for Teaching in Three Modalities (Graham et al., 2017, p. 6)

Teaching modality	Quadrant skills	Description
Traditional teaching (w/ technology)	Q3+Q4+(Q2)	Traditional teaching has typically involved Q3+Q4. As classroom-based technologies have become more prevalent, tools for engaging with digital content (Q2) have become more prevalent.
Online teaching	Q1+Q2+(Q4)	Online teaching primarily involves Q1+Q2. However, non-digital content (physical textbooks, science kits, etc.) are still often used in an online teaching context.
Blended teaching	Q1+Q2+Q3+Q4	Blended teaching requires teachers to have skill sets in all four quadrants.

The Clayton Christensen Institute has categorized different types of K-12 BL models based on hundreds of school observations (Staker & Horn, 2014). Figure 2 shows how those

blends fit on the K-12 BL spectrum. This does not include the "a la carte" model of blending because it is a program-level blend.

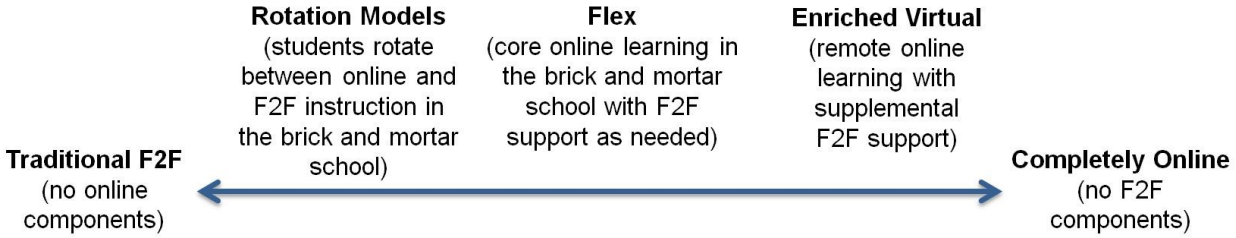


Figure 2. Spectrum of models of blended learning in K-12 education (adapted from Graham et al., 2017).

Rotation blends, which Horn and Staker (2014) have identified as sustaining rather than disruptive innovations, appear similar to traditional teaching with technology (see Table 2) with very little Q1 (OL human interaction). A recent summary of K-12 BL programs by Broderson and Melluzzo (2017) found that "all communications between teachers and students were face to face (there was no online interaction)" (p. 5). The integration happened between Q2 (digital content interaction) and Q3 (face-to-face interaction) as teachers received reports of student progress from OL software that they then used to inform their face-to-face instruction. The flex and enriched virtual BL models have OL at their core and therefore more emphasis on integration that takes place between Q1 (OL human interaction) and Q3 (face-to-face interaction).

Dynamic nature of digital materials. The true value in digital materials in a BL context is not increased with access alone. Digital materials bring added value when they are connected to databases that can keep track of a student's progress and learner characteristics, enabling mastery-based progression through content (Johnson, 2014). These kinds of dynamic digital materials are often referred to as interactive, adaptive, or personalized learning software and often provide a customized path through the content based on student performance. Another

dimension of dynamic digital materials used in BL contexts is when the materials provide rich performance and activity data that can be used by teachers and students to better focus the learning experience. Dynamic digital materials of this kind enable data-driven decision making including adjustments to the face-to-face instruction using the data from the digital content.

Methods

In this section, we address how sources were identified for the literature review and present the sources in two tables: one for the OL teaching competency sources, and another for BL teaching competency sources. We then discuss the analysis procedure used to identify and code competencies from these sources.

Source Identification

The search for literature began as a broad search for K-12 OL and BL teaching competencies in the Educational Resources Information Center (ERIC) and Google Scholar. Search terms were subsets of two different ideas: (a) teacher competencies and (b) OL/BL instruction. This search yielded several relevant articles for K-12 OL teaching but only a few articles about BL teaching. As BL is a relatively new research domain, it was not so surprising to find a limited number of peer-reviewed articles in the literature around BL teaching competencies. (This is evidence of the need for increased research efforts in this domain.) To widen our search we examined bibliographies of relevant articles and expanded our criteria to include non-peer-reviewed items such as white papers, books, and even a training website. Following these procedures we identified 10 documents relevant to K-12 OL competencies (see Table 3) and eight documents relevant to K-12 BL teaching competencies (see Table 4).

K-12 online teaching competencies. Table 3 displays all K-12 OL teaching competency documents included in our analysis.

Table 3

Online Teaching Competency Documents Used in Analysis

Document	Description	Methods of compilation
Standards for Quality Online Teaching (SREB, 2006)	Teaching standards put together by experts from the SREB, with competency categories: (a) academic preparation, (b) content knowledge, skills and temperament for instructional technology, and (c) online teaching and learning methodology, management, knowledge, skills and delivery.	Expert opinion collaboration
Guide to Teaching Online Courses (NEA, 2006)	A collaboration between ISTE, NEA, NACOL (now iNACOL), National Commission for Teaching and America's Future, and Virtual High School. This shares application tips for administrators as well as for online teachers. Section IV, "Skills of Online Teachers," lists 19 skills.	Expert opinion collaboration (no research cited)
Best Practices in teaching K-12 Online: Lessons Learned from Michigan Virtual School (DiPietro et al., 2008)	A research study from 16 virtual school teachers at Michigan Virtual School. There are 37 best practices identified from the interviews with teachers, under four categories: (a) general characteristics, (b) classroom management, (c) pedagogical strategies, and (d) technology.	Qualitative research (interviews) Data coding Constant comparative method Theoretical sampling Data synthesis
Virtual Schooling Standards and Best Practices for Teacher Education (Ferdig, Cavanaugh, DiPetro, Black, & Dawson, 2009)	A review synthesizing standards and best practices for online teaching published by 13 organizations and aligning research studies backing up the competency standards.	Synthesis of existing best practice documents, no further methods for analysis and synthesis disclosed
Going Virtual! The Status of Professional Development and Unique Needs of K-12 Online Teachers (Dawley, Rice, & Hinck, 2010)	An article describing results from a survey of online K-12 teachers, including their desired professional development needs. The survey contains competencies of an online teacher under these domains: (a) foundational knowledge, (b) facilitation strategies, (c) technology tools, (d) online lesson design and development, (e) digital etiquette, behavior, and assessment	Items based on a previous survey[a], with changes not clearly defined
Teacher Education from E-Learner to E-Teacher: Master Curriculum (Bjeki et al., 2010)	Article listing several roles of an e-teacher and guiding a preservice teacher through curriculum for becoming an e-teacher. It contains 17 statements of competency for developing online teachers.	No methodology provided
National Standards for Quality Online Teaching (iNACOL, 2011)	The second iteration of national quality standards from iNACOL (previously NACOL). It contains 11 standards, with instructional design as an optional standard.	Expert opinion collaboration, feedback from professional development researchers

Design and Development of Field experiences in K-12 Online Learning Environments (Kennedy & Archambault, 2012)	A cross reference of iNACOL (2011), NEA (2006), and SREB (2006) standards organized into 11 overarching categories for the purpose of sharing accepted online teaching standards with those who design field experiences for online teachers.	Previous frameworks used to discuss topics that should be included in a field experience for a K-12 online teacher
Virtually Unprepared: Examining the Preparation of K-12 Online Teachers (Barbour et al., 2013)	A book chapter examining online teaching: differences from face-to-face teaching and some desirable skills of an online teacher (taken from existing preservice and in-service teacher training). No comprehensive competency list was compiled.	No methodology provided
K-12 Online and Blended Teacher Licensure: Striking a Balance Between Policy and Preparedness (Archambault et al., 2014)	Recommendations for licensing online teachers, compiled from previous literature on online teaching competencies along with interviews of three program directors from K-12 online school programs. Cites ISTE (2008), SREB (2006), iNACOL (2011), Quality Matters (2010), and NEA (2006) standards.	Uses previous frameworks, does not make a unique contribution, provides no rationale for inclusion

Note. [a]The 2008 *Going Virtual!* Document states, "the survey items…were mapped to these synthesized standards [of NEA (2006), NACOL (2008), SREB (2006), and ISTE (2008)]" (Rice, Dawley, Gasell, & Flores, p. 7)

K-12 blended teaching competencies. Table 4 displays all eight documents analyzed for BL teaching competencies.

Table 4

Blended Teaching Competency Documents Used in Analysis

Document	Description	Methods of compilation
Implementing Online Learning Labs (Bakia, Anderson, Keating, & Mislevy, 2011)	Report of Miami-Dade County's use of online learning labs after one year of implementation. They produced guidelines for online lab facilitators.	Feedback from online learning lab facilitators
The Rise of K-12 Blended Learning (Staker, 2011)	Report compiling 40, K-12 blended learning case studies across the US, including type of blended institutional model, cost effectiveness, and a few descriptions of teacher skills.	Case study observations of 40 schools (no specific methodology listed)
Blended Learning in Grades 4-12: Leveraging the Power of Technology to Create Student-Centered Classrooms (Tucker, 2012)	Practical advice and details from a teacher to other teachers implementing blended learning in their own classroom. The major focus is on facilitating online discussions.	Personal blended teaching experience

Preparing Teachers for Blended Environments (Oliver & Stallings, 2014)	Literature review compiling research-based evidence of effective blended learning practices, stating that blended teachers must consider: (a) class context, (b) pedagogical strategies, and (c) technology.	Literature review of "published research, position papers, book chapters" (p. 59) from peer-reviewed articles
iNACOL Blended Learning Teacher Competency Framework (Powell, Rabbitt, & Kennedy, 2014)	Framework organizing 12 competencies under four main categories: (a) mindsets, (b) qualities, (c) adaptive skills, and (d) technical skills.	Compilation of 50 blended teaching job descriptions, with some research references cited.
Oliver's Framework for Blended Instruction (Oliver, 2014)	Framework with domains including (a) professional responsibility, (b) instruction, (c) design, (d) technology, (e) preparation, and (f) curriculum.	Some items derived from ISTE (2008) and iNACOL (2011)—no unique rationale for competency inclusion[a]
Go Blended! A Handbook for Blending Technology in Schools (Arney, 2015)	Handbook containing a three-fold blended teaching readiness rubric: (a) instructional elements, (b) behavioral elements, and (c) data.	Personal administrative experience starting "Aspire Schools"
Learning Accelerator Website (The Learning Accelerator, n.d.)	Framework including 67 strategies organized into these six practices: (a) face-to-face learning, (b) technology, (c) integration, (d) real-time data, (e) personalized learning, and (f) mastery-based progression.	Derived from interviews with over 40 school and district teams and visits to hundreds of classrooms at about 30 education organizations (http://practices.learningaccelerator.org/about-this-project)

Note: [a] Parks, Oliver, and Carson (2016) has a brief treatment of each of the competency domains and shows data from the validation of the Blended Practice Profile instrument which is based on Oliver's Framework.

Many articles are white papers or reports (Bakia et al., 2011; Oliver, 2014; Powell et al., 2014; Staker, 2011). Some are books (Tucker, 2012; Arney, 2015). One is a published literature review (Oliver & Stallings, 2014). The least traditional document analyzed was Learning Accelerator's website (n.d.), which included many web pages of teaching strategies and artifacts from a variety of schools. Due to the emerging nature of BL teaching competencies, we included this in our analysis for more robust data.

Analysis Procedure

Constant comparative coding analysis (Merriam & Tisdell, 2016) was used to review the literature. We coded documents in Nvivo qualitative analysis software (version 10, 2012) and

labeled competencies according to organizing themes – some containing sub-themes. Subsequently, global themes were used to categorize the organizing themes. If an organizing theme concept reached a critical mass, as did *assessment*, it became a global theme with organizing themes beneath it. This procedure resembles Attride-Stirling's (2001) thematic process: building from basic codes to coding categories, then to global themes. In a full thematic network analysis, the basic codes, organizing codes, and global themes are organized into a web-like structure (see Figure 3). This paper does not display an image of an entire thematic network analysis but offers a simplified visual of global and organizing themes.

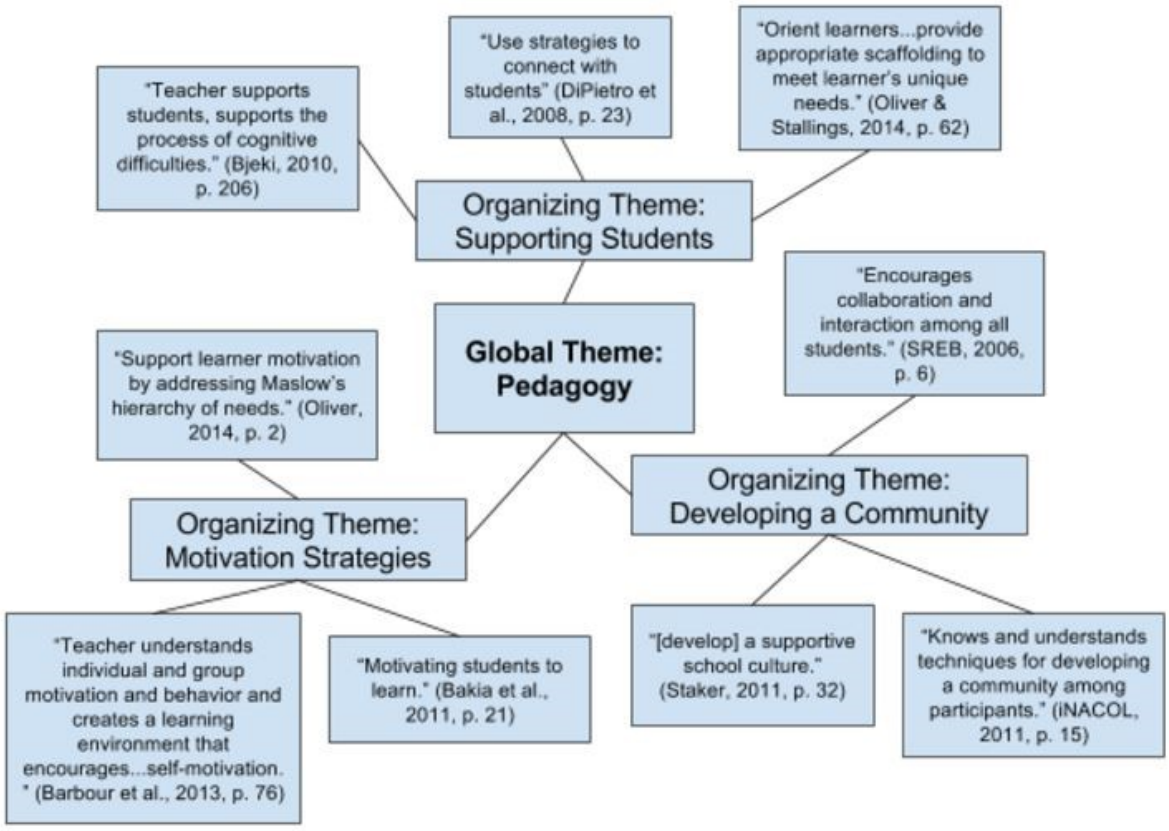


Figure 3. An application of the Attride-Stirling (2001) thematic network analysis, using data from the current study. The citations in boxes represent basic codes that are under an organizing theme umbrella. All organizing themes combine under the global theme of pedagogy.

To increase the trustworthiness of the coding structure, we used peer debriefing to come to consensus about code meanings and develop the code book. (See Appendix for examples from the code book.) The full code book contains definitions for ideas at each global and organizing theme level, with citations from the text to provide greater context and to correlate the authors' ideas explicitly with the text from the literature. Efforts have been made to provide clear definitions and reliable constructs that reflect the nature of competencies. Ambiguous terms frequently used in the literature have been altered to convey more meaning: for example, "pathway of instruction" has been clarified as "personalized curriculum work."

Findings

Findings of the literature review research questions are discussed here in the order of research questions: (a) What skills are mentioned most often in BL and OL teacher competency literature? (b) What similarities and differences are there between BL and OL teaching competency emphases?, and (c) What methods were used to compile the teaching competencies?

Prevalent K-12 Online and Blended Teaching Competencies

Salient themes that emerged from the literature are discussed here with accompanying tables and figures. The seven global themes were (a) pedagogy, (b) management, (c) assessment, (d) technology, (e) instructional design, (f) dispositions, and (g) improvement. These global themes are somewhat correlated with the global themes from McAllister and Graham's (2016) research of OL teaching endorsement curriculum objectives: (a) technical skills, (b) instructional design, (c) OL pedagogy, (d) ethics, (e) OL/BL general knowledge, and (f) OL practical experience. Figure 4 shows a mind map of the BL teaching competencies, and Figure 5 shows a mind map of OL teaching competencies. These figures are organized with global themes in the blue bubbles and organizing themes in the smaller sections from each bubble. The global theme

that contained the highest number of codes in the literature (BL or OL) was moved to "first place", which creates the numbering structure you see here. The category of *other* is not a theme but a way to group less significant organizing themes that were not aligned with the seven identified global themes.

Figure 4. Concept map of all codes from documents on blended teaching competencies, with global themes ordered by rank. The number in parenthesis after the organizing theme is the number of references (or basic codes) on the topic of that theme.

Figure 5. Concept map of all codes from documents on online teaching competencies, with global themes ordered by rank. The number in parenthesis after the organizing theme is the number of references (or basic codes) on the topic of that theme.

Comparing and Contrasting K-12 Online and Blended Teaching Competencies

Figure 6 compares the global themes in OL and BL teaching literature. At the global level, OL competencies emphasize management skills and instructional design less prominent in

BL teaching. Blended teaching competencies center more in *pedagogy*, the global category which accounts for 40% of all BL teaching competencies analyzed in this literature review. As stated previously, the *other* category is not a global theme, rather this figure shows the percentage of remaining organizing codes that did not easily fall under the seven main global themes.

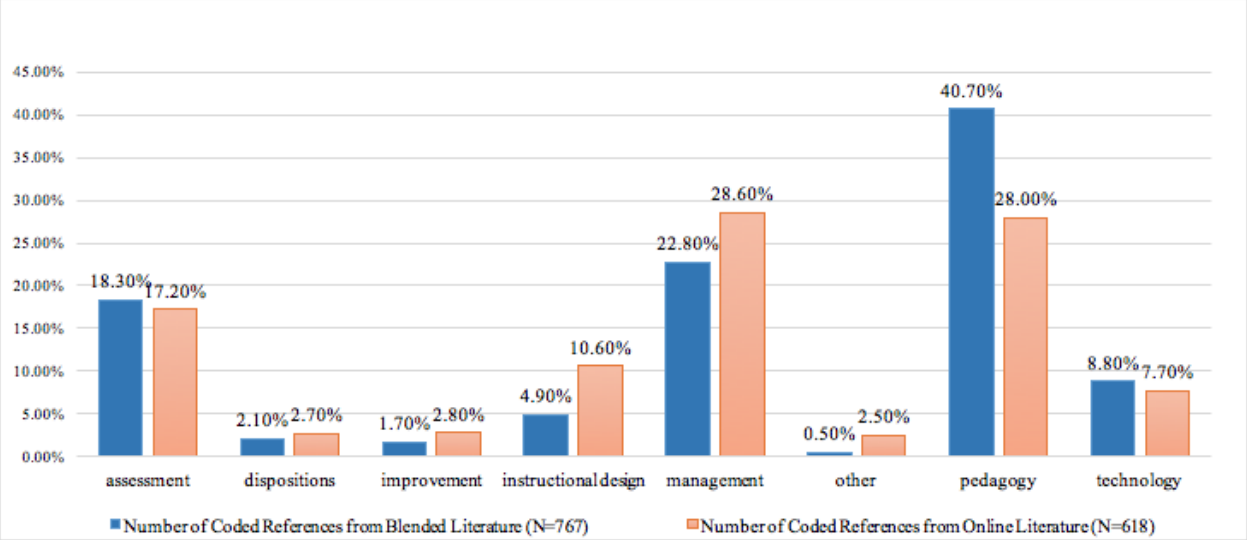


Figure 6. A comparison between online and blended teaching competency global categories. The percentage of references shows how often that global theme was mentioned throughout the literature.

Table 5 ranks the organizing codes with the most basic codes supporting them from BL literature. It provides a ranking and comparison of competency concepts which distinguishes between BL and OL contexts. Several top BL teaching competencies are emphasized just as much in the OL literature (*flexibility and personalization, establishing expectations, classroom management, general assessment,* and *online discussion facilitation).* These correlations and differences will be explored in greater detail in the discussion section.

Table 5

Top Organizing Themes, Ranked in Order of Blended Coding Frequency Percentage

Rank			Percent of total codes	
Blended	Online	Organizing theme (global theme)	Blended (n=767)	Online (n=618)
1	1	Flexibility & personalization (pedagogy)	9.65%	6.96%
2	44	Mastery-based learning (pedagogy)	4.69%	0.49%
3	14	Data usage and interpretation (assessment)	4.56%	2.43%
4	5	Expectations established (management)	4.43%	4.53%
5	36	Student progress review (assessment)	4.17%	0.97%
6	8	Classroom management (management)	4.04%	3.88%
7	36	Learning management system (technology)	3.52%	0.97%
8	22	Student-centered learning (pedagogy)	3.39%	1.62%
8	0	Integration of face-to-face and online class elements (management)	3.39%	0.00%
10	48	Student grouping (pedagogy)	2.87%	0.32%
11	7	General assessment (assessment)	2.74%	4.05%
12	28	Community development (pedagogy)	2.61%	1.29%
12	36	Software management (technology)	2.61%	0.97%
14	15	Online discussion facilitation (pedagogy)	2.48%	2.27%
15	28	Parental involvement (management)	2.22%	1.29%
15	44	Formative assessment (assessment)	2.22%	0.49%
15	44	Instructional intervention (pedagogy)	2.22%	0.49%

Methods Used in Existing K-12 BL/OL Competency Construction

Several OL competency lists have been compiled through collaboration of expert opinions (SREB, 2006; NEA, 2006; iNACOL, 2011), some provided no methodology (Barbour, 2013; Bjeki, 2010), and others were created using previously created frameworks and competencies (Ferdig et al., 2009; Dawley et al., 2010; Kennedy & Archambault, 2012; Archambault et al., 2014). One document in this table is unique: DiPietro et al. (2008) based their Michigan Virtual School OL teaching competency list on interviews with 16 teachers using constant comparative coding analysis to develop the themes from the data. This is the most transparent of the articles in terms of methodology.

While Staker (2011), Bakia et al. (2011), and Learning Accelerator (n.d.) compiled teacher competencies based on specific BL school contexts, Tucker (2012) and Arney (2015) gathered competencies from personal experience. Oliver and Stallings (2014) cite specific, contextual research in BL from both higher education and K-12 research, though they point out that the majority of research cited comes from higher education. Oliver (2014) cites research articles as the basis for her BL competencies, as does Powell et al. (2014), however Powell et al. also state in a footnote, "over 50 descriptions for BL teaching positions were reviewed to identify common competencies and themes" (p. 20).

Discussion

In this section, we discuss the global and organizing themes in more detail that emerged from the findings. Codes that were used in the analysis are italicized for ease of reading and connection to previous tables and figures.

Pedagogy

In lists of both BL and OL competencies, the concept of a *flexible and personalized pedagogy* emerged as the top organizing code, with sub-categories of *pacing*, *curriculum choice*, *scheduling*, and *diverse learning styles* (even though some neuroscientists have recently published a statement debunking learning styles as a myth, encouraging education professionals and researchers to desist researching this specific phenomenon; Hood et al., 2017). The second most frequently item among BL teaching competencies is *mastery-based learning*, which enables students to learn in a personalized, self-paced environment. *Student-centered learning* is another concept that entails personalization, based on students becoming independent learners with ownership over their studies and assessments. The BL teacher releases control of some aspects of instruction, leaving some responsibility in student hands. *Student grouping* also emerged from the BL literature as a pedagogical tool, often to differentiate instruction in the face-to-face aspect of BL teaching. Whether students are grouped for projects, discussions, or short-term activities, the groups are dynamic; they can be homogeneous or heterogeneous depending on the needs of the moment (The Learning Accelerator, n.d.).

Online discussion facilitation is a specific pedagogical skill for both OL and BL environments. The rationale for using OL rather than face-to-face discussion in a BL classroom is that it provides teachers with an additional way to assess learning: they are aware of the depth of students' responses and can make all students accountable for participation (Tucker, 2012). These discussions also provide opportunities to teach OL etiquette to students. This competency was not addressed by The Learning Accelerator but was included in all other BL competency lists. The affordances of OL discussion are discussed more robustly in higher education BL

literature (Vaughan, Cleveland-Innes, & Garrison, 2013; Graham, 2006; Garrison & Vaughan, 2008, Garrison & Kanuka, 2001).

Management

While many management skills are equally important in BL and OL contexts, integration of OL and face-to-face aspects is unique to BL teachers. Seamless *integration between the OL curriculum and face-to-face activities* requires a teacher to know what students are learning in the digital space and to build on their skills and newly acquired knowledge in class. For example, Tucker (2012) mentions the importance of drawing from OL discussions in class so that the OL discussion is directly related to other class content and activities.

Assessment

Data usage and interpretation have expedited effectiveness in personalization and mastery-based learning. The data often comes from "multiple sources, including data systems" and helps teachers "adjust individual student instruction" (Powell et al., 2014, p. 11). Data about student mastery may enable the teacher to give summative assessments earlier than usual to fast-paced learners. Some data can be interpreted for use in adjusting student groups.

If students are regularly being formatively assessed on their work, a BL teacher must *review student progress* frequently enough to adjust a student's schedule, curriculum work, or other variables. *Formative assessment* with feedback and corrective instruction also enables the self-pacing and allows the teacher to conduct instructional interventions at the right time for the student (Oliver & Stallings, 2014).

Technology

Learning management system usage is the top technology skill for a BL teacher. Some LMSs use data dashboards that give teachers an overview of student progress. Many learning

management systems have customizable content page options or playlist creation software that a teacher must use to make curricular content and assessments available for students, or customize the curriculum as needed (iNACOL, 2011).

Software management is the second most frequently cited technology skill for BL teachers. Confidence in learning software programs is key in the changing environment (Arney, 2015). Often third-party content software packages, such as Khan Academy (https://www.khanacademy.org/), provide curricular content. Understanding how these software platforms operate and integrate with in-class curriculum is crucial to providing sequential integrated curriculum and helping students through materials.

Instructional Design

One disparity between OL and BL competencies is in *instructional design*, referenced twice as often in OL literature as in BL literature. As many BL teachers use third-party software and may not be responsible for digital content creation, disproportionate mention of instructional design between discussion of OL and BL teaching is not surprising. Online teachers are bound by the OL medium; therefore, their instructional design skills for OL spaces are crucial if they have any responsibility in designing their own OL curriculum. If an OL teacher does not have that responsibility, then this competency may be a lesser one. In a BL environment, a BL teacher with a lot of latitude may get creative to find the best mix of OL and in-person learning activities for the students they teach, which is an instructional design activity (Oliver & Stallings, 2014).

Dispositions

Both OL and BL literature had some mention of *dispositions* including *respect, growth-mindset,* and *commitment to school opportunities*. These qualities are not unique to OL or BL but are useful for any teacher in any environment. The iNACOL BL framework urges BL teachers to

have an "entrepreneurial spirit" (Powell et al., 2014, p. 10), but this was not in OL teaching literature. An *entrepreneurial spirit* may be particularly useful in new BL schools to have teachers who are excited to experiment with technology and to innovate in the classroom.

Improvement

Although *improvement* was not among the top 20 BL competencies, concepts of improving, *evaluating*, and *reflecting* on teaching practice were repeatedly and evenly mentioned throughout all the literature. Especially in the era of fast-changing technologies, teachers who have skills to adapt to change and improve their classes will be at an advantage. However, it should be noted that these competencies are not unique to BL or OL teaching.

Other

Some miscellaneous competencies came up in the literature that deserves brief mention. Many discussions of OL teaching competencies included the teacher having been an OL student prior to teaching (see 8.2 in Figure 5; SREB, 2006; Dawley et al., 2010; iNACOL, 2011; McAllister & Graham, 2016). iNACOL's BL framework mentioned using OL student experience as a tool in preparing to teach a BL class (Powell et al., 2014). Both BL and OL teachers benefit from personal experience OL as a student.

Implications

This literature review of the emerging K-12 literature for OL and BL teachers raises some questions about the subject matter preservice teachers receive in their course of teacher education. At least a few questions that we should ask about preservice teacher education:

1. Do preservice teachers learn how to work with a class of students who are working at varying paces?

2. Can teachers interpret data from the software they use to make educational interventions impactful?
3. Do teachers have experience or exposure to an alternative grading system that is based on mastery, not traditional grading practices?
4. What kind of experience do teachers have with facilitating OL discussions?
5. Can teachers navigate easily through LMS and other software programs with minimal training?

Yet another question that arises from this study is about the dearth of peer-reviewed, rigorous, and methodologically transparent research in K-12 BL competencies. Most of the literature regarding OL and BL teaching competencies has been built on expert opinion, with less relying on survey data, interviews, and/or personal experience. Future research studies should be stricter about the methods used for identifying and including teaching competencies, providing clear delineation between skills specific to OL and BL environments. For example, a research study by Darabi, Sikorski, and Harvey (2006) used The International Board of Standards for Training, Performance and Instruction (IBSTPI) competency development model–(a) identify foundational research, (b) draft competencies, and (c) validate (Klein et al., 2004)–in building specific OL teacher competencies. Online instructors (n=148) from four countries used a Likert-scale measurement to rank IBSTPI competency tasks by importance and by amount of time spent doing the activity. This model of competency development provides a promising pattern that researchers may follow in validating K-12 BL teaching competencies.

Many articles published about BL in K-12 do not get published in peer-reviewed outlets and there is a general lack of research in K-12 BL (Halverson et al., 2012; Pulham & Mohammed, 2018). This also highlights the need for practitioner-research partnerships between

schools and universities; this will make research, educational improvement, and publication a more collaborative, and hopefully more research-based process for all involved in blended learning initiatives (Coburn & Penuel, 2016). All this notwithstanding, there are several dedicated researchers and organizations who have provided useful frameworks and who are currently publishing high-quality research in K-12 BL and OL (Borup, Hastler Waters & Beck, 2016; DeWitt, 2017).

We likewise applaud the recent work of Foulger, Graziano, Schmidt-Crawford and Slykhuis (2017) in developing a set of Teacher Educator Technology Competencies which provides guidelines for teacher educators in how to prepare preservice teachers for their new environments, including modeling OL and BL teaching environments. The competencies were developed using a Delphi method and is disclosed in depth in their article. It makes clear that technology in teaching must be modeled by all teachers, not just those that teach an educational technology course. This is a great step in the direction of including BL skills in the curriculum for preservice teachers.

Conclusion

This analysis of the literature concerning OL and BL teaching competencies was undertaken to (a) find which BL teaching competencies are most salient in the literature, (b) compare and contrast OL and BL competencies, and (c) examine the methodology used in all of the competency compilations.

Results showed personalized learning as the most frequently referenced competency in BL *and* OL teaching, confirming the study of effective personalized learning practices as a meaningful research topic for scholars. The four sub-domains under personalized teaching competencies are pacing, curriculum, scheduling, and learning styles. While catering to

individual learning styles has been debunked as an effective tool for increased student achievement (Hood et al., 2017), pacing, curriculum and scheduling are potentially areas of research interest that could be studied by educators to further understanding into effective practices of personalization. While many of these concepts are extensively treated, personalization in OL and BL contexts involves challenges and competencies different from those of traditional teaching, warranting emphasis in teacher education curricula.

Results demonstrated that BL and OL teaching share many competencies, but have nuanced differences, such as emphasis on instructional design for OL teaching vs. integration of face-to-face and OL curriculum for BL teaching. Placing the top 20 BL teaching competencies beside rankings for OL teaching competencies (Table 5) reveals differences between the two competency sets. As BL teaching comes more fully into the mainstream in the future, we hope the skills outlined in this paper will not be relegated to a special certification, but can become an integral part of the preservice teacher curriculum at colleges nationwide. Though this study is a step in understanding BL teaching competencies, it cannot be the last. As other researchers have concluded, more research of OL and BL teaching at the teacher or school level is needed to validate existing competencies (Barbour et al., 2012). Researchers must continue to examine BL teaching competencies that require integrative ability (Gerbic, 2011). At this point in the emerging field of BL teaching, early adopting BL teachers and schools provide examples to inform future efforts in preservice teacher education. Aligning K-12 teaching standards and competencies with the foundational research in BL will ensure that preservice training of K-12 teachers includes the skills needed for teachers to thrive with 21st century abilities.

References

Archambault, L., DeBruler, K., & Freidhoff, J. (2014). K-12 online and blended teacher licensure: Striking a balance between policy and preparedness. *Journal of Technology and Teacher Education*, *22*(1), 83–106. Retrieved from http://www.editlib.org/p/112361/share

Arney, L. (2015). *Go blended!: A handbook for blending technology in schools.* San Francisco, CA: Jossey-Bass.

Attride-Stirling, J. (2001). Thematic networks: An analytic tool for qualitative research. *Qualitative Research, 1*(3), 385–405. Retrieved from http://doi.org/10.1177/1468794107085301

Bakia, M., Anderson, K., Heying, E., Keating, K., & Mislevy, J. (2011). *Implementing online learning labs in schools and districts: Lessons from Miami-Dade's first year*. Menlo Park, CA: SRI International.

Barbour, M. K. (2012). *State of the nation study: K-12 online learning in Canada.* Victoria, BC: Open School BC/Vienna, VA: International Council for K-12 Online Learning. Retrieved from http://k12sotn.ca/wp-content/uploads/2016/09/StateOfTheNation2012.pdf

Barbour, M. K., & Hill, J. R. (2011). What are they doing and how are they doing it? Rural student experiences in virtual schooling. *Journal of Distance Education, 25*(1). Retrieved from http://www.jofde.ca/index.php/jde/article/view/725

Barbour, M. K., Siko, J., Gross, E., & Waddell, K. (2013). Virtually unprepared: Examining the preparation of K-12 online teachers. In R. Hartshorne, T. Heafner, & T. Petty (Eds.), *Teacher education programs and online learning tools: Innovations in teacher*

preparation (pp. 60-81). Hershey, PA: IGI Global. Doi:10.4018/978-1-4666-1906-7.ch004

Bjeki, D., Krneta, R., & Milo, D. (2010). Teacher education from E-Learner to E-Teacher: Master curriculum. *The Turkish Online Journal of Educational Technology*, *9*(1), 202–212.

Blended Learning Universe. (n.d.). Retrieved from http://blendedlearning.org

Blended Practice (n.d.). Retrieved from http://blendedpractice.com/

Borup, J., Hasler Waters, L. & Beck, D. (2016). Special issue on supporting students in K-12 online and blended learning environments. *Journal of Online Learning Research*, *2*(4), 327-331. Retrieved from http://www.learntechlib.org/p/174324

Brodersen, R. M., & Melluzzo, D. (2017). *Summary of research on online and blended learning programs that offer differentiated learning options (REL 2017–228).* Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Central. Retrieved from http://ies.ed.gov/ncee/edlabs

Cavanaugh, C., Gillan, K. J., Kromrey, J., Hess, M., & Blomeyer, R. (2004). *The effects of distance education on K-12 student outcomes: A meta-analysis.* Naperville, IL: Learning Point Associates. Retrieved from https://files.eric.ed.gov/fulltext/ED489533.pdf

Coburn, C. E., & Penuel, W. R. (2016). Research–Practice Partnerships in Education: Outcomes, Dynamics, and Open Questions. *Educational Researcher*, *45*(1), 48–54. http://doi.org/10.3102/0013189X16631750

Darabi, A. A., Sikorski, E. G., & Harvey, R. B. (2006). Validated competencies for distance teaching. *Distance Education*, *27*, 105–122. http://doi.org/10.1080/01587910600654809

Dawley, L., Rice, K., & Hinck, G. (2010). *Going virtual! The status of professional development and unique meeds of K-12 online teachers*. Boise, ID: Boise State University. Retrieved from http://edtech.boisestate.edu/goingvirtual/goingvirtual3.pdf

DeWitt, J. (2017). *District-level blended learning implementation: Readiness points and challenges.* Lansing, MI: Michigan Virtual University. Retrieved from https://mvlri.org/research/publications/district-level-blended-learning-implementation/

DiPietro, M., Ferdig, R. E., Black, E. W., & Preston, M. (2008). Best practices in teaching K-12 online: Lessons learned from Michigan Virtual School teachers. *Journal of Interactive Online Learning*, *7*(1), 10–35. Retrieved from https://www.ncolr.org/jiol/issues/pdf/7.1.2.pdf

Ferdig, R. E., Cavanaugh, C., DiPietro, M., Black, E., & Dawson, K. (2009). Virtual schooling standards and best practices for teacher education. *Journal of Technology and Teacher Education*, *17*(4), 479–503.

Freidhoff, J. R., Borup, J., Stimson, R., & DeBruler, K. (2015) Documenting and sharing the work of successful on-site mentors. *Journal of Online Learning Research, 1*(1), 107-128.

Garrison, D. R., & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *The Internet and Higher Education, 7*(2), 95–105. http://doi.org/10.1016/j.iheduc.2004.02.001

Garrison, R. D., & Vaughan, N. D. (2008). *Blended learning in higher education: Framework, principles, and guidelines.* San Francisco, CA: Jossey-Bass.

Gemin, B., Pape, L., Vashaw, L. & Watson, J. (2015). *Keeping pace with K-12 digital learning: An annual review of policy and practice.* Retrieved from https://www.evergreenedgroup.com/keeping-pace-reports/

Gerbic, P. (2011). Teaching using a blended approach–what does the literature tell us? *Educational Media International*, *48*(3), 221–234. http://doi.org/10.1080/09523987.2011.615159

Graham, C. R. (2006). *Blended learning systems: Definition, current trends, and future directions.* In C. J. Bonk & C. R. Graham (Eds.), Handbook of blended learning: Global perspectives, local designs (pp. 3–21). San Francisco, CA: Pfeiffer Publishing.

Graham, C. R. (2013). Emerging practice and research in blended learning. In M. G. Moore (Ed.), *Handbook of distance education* (3rd ed., pp. 333–350). New York, NY: Routledge.

Graham, C. R., Borup, J., Pulham, E., & Larsen, R. (2017). *K-12 Blended Teaching Readiness: Phase 1- Instrument Development.* Lansing, MI: Michigan Virtual University. Retrieved from https://mvlri.org/research/publications/k-12-blended-teaching-readiness-instrument-development/

Graham, C. R., Henrie, C. R., & Halverson, L. R. (2015). Blended: Using disruptive innovation to improve schools. [Review of the book *Blended: Using disruptive innovation to improve schools,* by M. B. Horn & H. Staker.] *Teachers College Record.* Retrieved from http://tcrecord.org/content.asp?contentid=18121

Halverson, L. R., Graham, C. R., Spring, K. J., & Drysdale, J. S. (2012). An analysis of high impact scholarship and publication trends in blended learning. *Distance Education, 33*(3), 381-413. http://dx.doi.org/10.1080/01587919.2012.723166

Hood, B., Howard-Jones, P., Laurillard, D., Bishop, D., Coffield, F., Frith, U., . . . & Foulsham, T. (2017, March 12). No evidence to back idea of learning styles. *The Guardian.* Retrieved from https://www.theguardian.com/education/2017/mar/12/no-evidence-to-back-idea-of-learning-styles

Horn, M. B., & Staker, H. (2014). *Blended: Using disruptive innovation to improve schools.* San Francisco, CA: Jossey-Bass.

International Association for K-12 Online Learning (iNACOL). (2008). *National standards for quality online teaching.* Vienna, VA: International Association for K-12 Online Learning.

International Association for K-12 Online Learning. (2011). *National standards for quality online teaching* (Version 2). Vienna, VA: International Association for K-12 Online Learning. Retrieved from https://www.inacol.org/wp-content/uploads/2015/02/national-standards-for-quality-online-teaching-v2.pdf

International Society for Technology in Education (ISTE). (2008). *National educational technology standards for teachers.* Retrieved from http://www.iste.org/

Johnson, J. [Jen Johnson]. (2014, January 20). *Blended learning and technology integration* [Video file]. Retrieved from https://www.youtube.com/watch?v=KD8AufGsCKg&t=77s

Kennedy, K., & Archambault, L. (2012). Design and development of field experiences in K-12 online learning environments. *The Journal of Applied Instructional Design*, *2*(1), 35–49. Retrieved from https://docs.wixstatic.com/ugd/c9b0ce_b4639acd1e744252beef9737a26613a1.pdf

Klein, J. D., Spector, J. M., Grabowski, B., & Teja, I. de la. (2004). The IBSTPI instructor competencies. In *Instructor competencies: Standards for face-to-face, online, and blended settings* (pp. 13-21). City, ST: Information Age Publishing.

Lewis, S., & Garrett Dikkers, A. (2016). Professional development supports for the blended, co-taught classroom. *Journal of Online Learning Research, 2*(2), 103-121.

Means, B., Toyama, Y., Murphy, R. F., & Baki, M. (2013). The effectiveness of online and blended learning: A meta-analysis of the empirical literature. *Teachers College Record*, *115*(3), 1–47.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010*). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies.* U.S. Department of Education. Retrieved from http://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf

Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative Research: A Guide to Design and Implementation.* San Francisco, CA: Jossey-Bass.

Molnar, A., Miron, G., Gulosino, C., Shank, C., Davidson, C., Barbour, M.K., . . . & Nitkin, D. (2017). *Virtual Schools Report 2017.* Boulder, CO: National Education Policy Center. Retrieved from http://nepc.colorado.edu/publication/virtual-schools-annual-2017

Moore, M. G. (1989) Three types of interaction. [Editorial]. *American Journal of Distance Education 3*(2), 1-7.

National Education Association. (2006). *Guide to teaching online courses*. Washington, D.C. Retrieved from http://www.nea.org/assets/docs/onlineteachguide.pdf

Norberg, A., Dzuiban, C. & Moskal, P.D. (2011). A time-based blended learning model. *On the Horizon*, *19*(3), 207-216. http://dx.doi.org/10.1108/10748121111163913

Nvivo qualitative data analysis software; QSR International Pty Ltd. Version 10, 2012.

Oliver, W. L. (2014). *Oliver's framework for blended instruction.* Retrieved from http://blendedpractice.com/wp-content/uploads/2015/11/Olivers-Blended-Framework-for-Instruction.pdf

Oliver, K. M., & Stallings, D. (2014). Preparing teachers for emerging blended learning environments. *Journal of Technology and Teacher Education*, *22*(1), 57–81.

Parks, R. A., Oliver, W., & Carson, E. (2016). The status of middle and high school instruction: Examining professional development, social desirability, and teacher readiness for blended pedagogy in the southeastern United States. *Journal of Online Learning Research, 2*(2), 79-101.

Powell, A., Rabbitt, B., Kennedy, K., International Association for K-12 Online, L., & The Learning, A. (2014). *iNACOL blended learning teacher competency framework.* Retrieved from https://www.inacol.org/wp-content/uploads/2014/10/iNACOL-Blended-Learning-Teacher-Competency-Framework.pdf

Pulham, E. B. & Mohammed, S. (2018, January 29). *Publish or (the field will) perish: Blended learning needs more peer-reviewed publications* [Blog post]. Retrieved from https://www.brookings.edu/blog/brown-center-chalkboard/2018/01/29/publish-or-the-field-will-perish-blended-learning-needs-more-peer-reviewed-publications/

Rabbit, C. E. (2013). *Human capital in blended learning schools: Developing an early-stage talent strategy for touchstone education* (Unpublished doctoral dissertation). Harvard University, Cambridge, MA.

Rice, K., Dawley, L., Gasell, C., & Flores, C. (2008). *Going virtual! Unique needs and challenges of K-12 online teachers*. Boise State University. Retrieved from http://edtech.boisestate.edu/goingvirtual/goingvirtual2.pdf

Riel, J., Lawless, K.A., & Brown, S.W. (2016). Listening to the teachers: Using weekly online teacher logs for ROPD to identify teachers' persistent challenges when implementing a blended learning curriculum. *Journal of Online Learning Research, 2*(2), 169-200.

Southern Regional Education Board. (2006). *Standards for quality online teaching, SREB's educational technology cooperative 1–12.* Atlanta, GA: Southern Regional Education Board. Retrieved from http://publications.sreb.org/2006/06T02_Standards_Online_Teaching.pdf

Staker, H. (2011). *The rise of K-12 blended learning: Profiles of emerging models*. Retrieved from https://www.christenseninstitute.org/wp-content/uploads/2013/04/The-rise-of-K-12-blended-learning.emerging-models.pdf

Staker, H., & Horn, M. B. (2014). Blended learning in the K-12 education sector. In A. G Picciano, C. D. Dziuban, & C. R. Graham (Eds.), *Blended learning: Research perspective* (Vol 2, pp. 285-303). New York, NY: Routledge.

The Learning Accelerator (n.d.). *Practices at work.* Retrieved from http://practices.learningaccelerator.org/

Tucker, C. R. (2012). *Blended learning in grades 4-12: Leveraging the power of technology to create student-centered classrooms.* Thousand Oaks, CA: Corwin Press.

Twigg, C. A. (2003). Improving learning and reducing costs: New models for online learning. *Educause Review, 38*(5), 28–38.

U.S. Department of Education, Office of Educational Technology, (2017). *Reimagining the Role of Technology in Education: 2017 National Education Technology Plan Update, Washington, D.C.* Retrieved from https://tech.ed.gov/files/2017/01/NETP17.pdf

Vaughan, N. D., Cleveland-Innes, M., & Garrison, R. D. (2013). *Teaching in blended learning environments: Creating and sustaining communities of inquiry.* Edmondon, AB: Athabasca University Press. Retrieved from

http://www.aupress.ca/books/120229/ebook/99Z_Vaughan_et_al_2013-Teaching_in_Blended_Learning_Environments.pdf

Watson, J., Murin, A., Vashaw, L., Gemin, B., & Rapp, C. (2011). *Keeping pace with K-12 online learning: An annual review of policy and practice.* Evergreen Education Group. Retrieved from https://www.evergreenedgroup.com/s/KeepingPace-2011.pdf

Appendix

Code Book for Selected Pedagogy Organizing Themes

Code	Definition	Examples from online and blended literature
Flexibility and personalization	Ability to allow for personalization in pace, curriculum work, scheduling, and learning styles in accordance with student preference and ability	"Create learning environments that are flexible and personalized, dependent on real-time data, direct observation, and interaction with and feedback from students" (Powell et al., 2014, p. 10). "The online teacher is able to address learning styles, needs for accommodations, and create multiple paths to address diverse learning styles and abilities" (iNACOL, 2011, p. 10).
Student collaboration	Ability to create projects and assignments requiring student collaboration in multiple modes: online and face to face	"[Begin] virtual collaboration by assigning group projects in class" (Staker, 2011, p. 73). "Foster student-to-student collaboration through the use of online discussions, group projects, team activities, and instructional style" (NEA, 2006, p. 17).
Online discussion	Ability to facilitate student discussion in an online environment	"Post questions to drive higher-order thinking and engage students in dynamic discussions" (Tucker, 2012, p. 38). "Demonstrate skill at facilitating discussions, and be reliable guides to student learning" (NEA, 2006, p. 17).
Mastery-based learning	Skills to manage students in moving on only once a skill has been mastered	"Allows Learners to move faster than suggested pace, so long as they are mastering content" (The Learning Accelerator, n.d.). "Allow for . . . advancement based on demonstrating competency rather than on completing a certain number of hours of coursework" (Staker, 2011, p. 14).
Student-centered learning	Ability to encourage student independence and ownership in learning rather than a maintaining a teacher-centric approach	"Instead of solely relying on the teacher for answers, students are empowered to push through challenges on their own to build confidence, resilience, and in turn autonomy" (The Learning Accelerator, n.d.). "Shift from teacher-led instruction to student-centered learning for the purposes of meeting individual needs and fostering engagement and motivation" (Powell et al., 2014, p. 10).
Community development	Disposition and ability to create a culture of respect, caring, and mutual support among students	"The online teacher knows and understands the techniques for developing a community among the participants" (iNACOL, 2011, p. 6). "Creates a class culture where students are expected to support each other" (The Learning Accelerator, n.d.).

Content knowledge	Disposition and ability to remain knowledgeable and current about the particular subject area being taught	"Address the common misconceptions centered on a particular topic within the content they are teaching" (Archambault et al., 2014, p. 86). "Candidates who are certified experts in the content subject area being taught" (Barbour et al., 2012, p. 63).
Supporting students	Disposition and sensitivity to support students throughout the learning process by caring about them and assisting during times of learning difficulty	"The instructor establishes and maintains a positive and caring rapport with learners" (Oliver, 2014, p. 3). "Teacher supports students, supports the process of cognitive difficulties resolving, directs the learners to use specific knowledge and skills" (Bjeki et al., 2010).
Student grouping	Ability to group students based on their abilities and needs	"Provide resources for students to learn content and enable them to work independently and/or in cooperative groups" (Powell et al., 2014, p. 11). "Groups students based on need and potential for support" (The Learning Accelerator, n.d.).
General pedagogy	Ability to understand and implement best practices for blended and online learning	"The instructor demonstrates the use of a variety of methodologies consistent with best practices for blended learning" (Oliver, 2014, p. 3). "Knowledge of best practices in online learning" (Bakia et al., 2011, p. 21).
Project-based learning	Ability to incorporate projects as a component of curriculum	"Leads online instruction groups that are goal-oriented, focused, project-based and inquiry-oriented" (SREB, 2006, p. 4) "The instructor engages learners in methodologies supported by current research in best practices for blended instruction, such as simulations, discussions, project-based learning etc." (Oliver, 2014, p. 4).
Small group instruction	Ability to create small groups and instruct on a small group level	"Socratic discussions and small-group experiences" (Staker, 2011, p. 16). "Develop effective strategies to use small group activities in their courses" (NEA, 2006, p. 6).
Whole class instruction	Ability to teach to the whole class, recognizing when whole class or direct instruction is needed	"Using daily whole class instruction to address common needs" (The Learning Accelerator, n.d.). "Rotates the students through some direct instruction" (Staker, 2011, p. 32).

Article 2

Generic vs. Modality-Specific Competencies for K-12 Online and Blended Teaching

Emily B. Pulham

Charles R. Graham

Cecil R. Short

Brigham Young University

Accepted by *Journal of Online Learning Research* (JOLR)

Citation: Pulham, E. B., Graham, C. R., & Short, C. R. (2018). Generic vs. Modality-Specific Competencies for K-12 Online and Blended Teaching. *Journal of Online Learning Research*, *4*(1), 33–52. Retrieved from https://files.eric.ed.gov/fulltext/EJ1174455.pdf

Abstract

Although research has explored teacher competencies in K-12 blended and online learning, it has not specified which competencies are appropriate to an online or digital medium, which refer to blending in-person with online experiences, or which are generic—applicable in any teaching modality. This article explores selected K-12 online and blended teaching competency documents to determine which specific modalities (online, in-person, blended, or generic) the competencies address. Many competencies are still categorized as generic, and not specific enough to denote a particular context. We give recommendations for preservice teacher education and indicate needs for further research in K-12 online and blended teaching.

Keywords: blended learning, online learning, teacher education, teaching competencies

Introduction

The number of full-time students enrolled in blended or online schools is increasing: between 2014 and 2015 blended school enrollment rose by 40%, and full-time virtual school enrollment increased by 6.5% (Molnar et al., 2017). Preparing teachers for these environments is of concern to many (Foulger, Graziano, Schmidt-Crawford, & Slykhuis, 2017; Pulham & Graham, 2018).

Our research interests leading to this study began several years ago when the Utah State Board of Education updated teacher licensure requirements to include coursework preparing candidates "to teach effectively in traditional, online-only, and blended classrooms" and "to facilitate student use of software for personalized learning" (Utah Administrative Code R277-504-4.C.3.c-f, n.d.). We were allotted limited space in our university's already loaded educator preparation curriculum to address this new requirement. Thus, we conducted a systematic review of the literature endeavoring to identify the core teaching competencies and found only limited research (Pulham & Graham, 2018). Aware of the development trends of blended and online learning in K-12 contexts (Dzubian, Graham, Moskal, & Norberg, 2018; McAllister & Graham, 2016; Molnar et al., 2017), we realized that with the increase in blended and online teaching, many teacher preparation programs, school districts, and schools would need to establish courses and professional development to prepare their teachers for such contexts.

Researchers in blended and online learning continue to affirm that the skills appropriate to each are unique (Barbour, Siko, Gross, & Waddell, 2013; Davis & Niederhauser, 2007; Pulham & Graham, 2018). Several have expressed concern that research on teacher competencies does not distinguish between those unique to online environments (e.g., facilitating online asynchronous discussion) and those applicable to any teaching environment (e.g.,

providing useful feedback on assignments; Barbour et al., 2013; Molnar et al., 2017). Barbour et al. (2013) discussed three difficulties with implementing K-12 online teaching competencies:

1. Identifying essential online teaching skills
2. Validating skills through empirical research
3. Translating skills into a preservice teacher curriculum

Similar issues apply to blended teaching competencies, particularly problematic because blended teaching is becoming "the new normal" in education (Norberg, Dzubian, & Moskul, 2011). Teacher educators must understand what distinguishes competencies specific to blended and online learning from those useful in any environment?

Research Questions

This study is intended to analyze selected K-12 blended and online teaching competency documents to discover (a) which competencies are specific to an online/digital context, (b) which are specific to blending online and in-person learning, (c) which are specific to an in-person context, and (d) which are generic (applicable in any modality). More specifically, we addressed five primary questions:

1. What proportion of competencies in the documents are applicable for
    a. teaching in an online or digital context,
    b. blending online and in-person learning,
    c. teaching in an in-person context, or
    d. teaching in any context?
2. Which competencies in the documents apply specifically to teaching in an online or digital context?

3. Which competencies in the documents apply specifically to blending online and in-person instruction?
4. Which competencies in the documents are specific to in-person teaching?
5. Which competencies in the documents are generic enough to apply across teaching modalities?

Background

The included background information in this section based on our previous work provides continuity for the conceptual framework of this study (Graham et al., 2017; Pulham & Graham, 2018). Figure 1 and Tables 1-2 represent four categories of learning interactions that help clarify the distinctions between *online teaching*, *blended teaching*, and *technology integration*. Learner-human interaction (e.g., communication between teachers and students or between students and other students) and learner-content interaction (e.g., reading a book or interacting with online content) are represented on the left and right sides of the matrix, respectively (Anderson, 2008; Moore, 1989). The bottom half of the Figure 1 matrix represents interactions without digital technologies, commonly used in a traditional in-person only classroom. The top half represents a new class of interactions involving digital technologies. Blended teaching skills integrate interactions represented in all four quadrants, whereas in-person instruction does not require digital interaction, and online instruction does not require non-digital interaction.

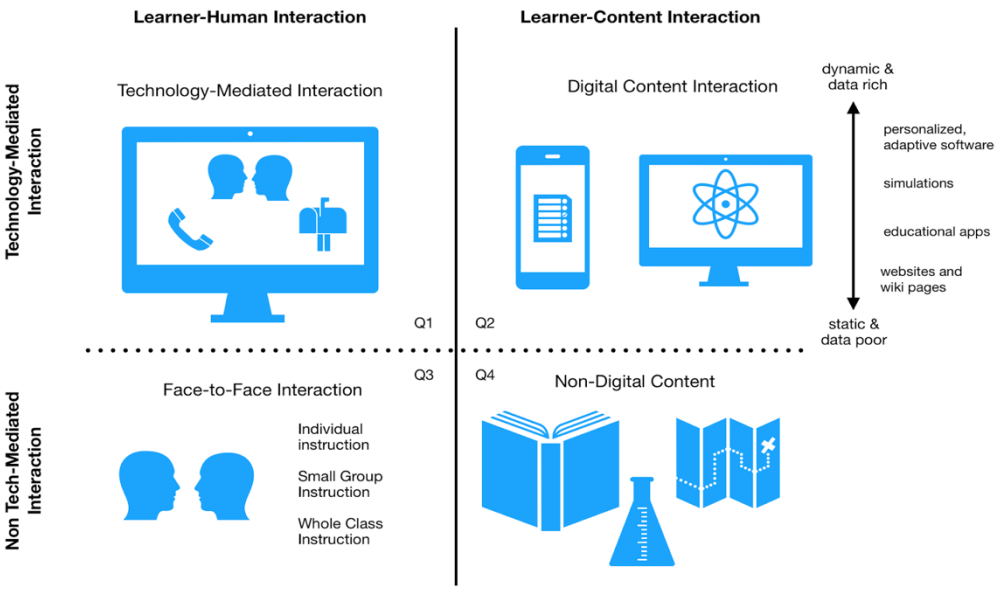


Figure 1. Blended teaching matrix identifying the four categories of interactions involved in blended learning (Graham et al,, 2017, p. 5).

Table 1

Description of Interaction in Four Quadrants

Quadrant	Description of skills in each quadrant
Q1	This quadrant requires the skills for teachers to conduct online interaction with a student or facilitate meaningful online interactions between students. Interactions in this space can happen either asynchronously or synchronously and at low or high fidelity (e.g., text-based vs video).
Q2	This quadrant requires skills of working with digital tools and content. Digital content is increasingly dynamic and data rich, which requires increasing skills related to working with real-time data generated by adaptive or personalized learning software.
Q3	This quadrant requires skills for participating in in-person teacher-student interactions and for facilitating student-student interactions in whole class and small group contexts.
Q4	This quadrant requires the ability to use and manage traditional classroom-based materials.

Note: See Figure 1; see Graham et al., 2017

Table 2

Description of the General Teaching Skills Needed for Teaching in Three Modalities

Teaching modality	Quadrant skills	Definition/ description
In-person teaching	Q3 + Q4	In-person teaching has traditionally involved Q3 + Q4.
Technology integrated teaching	Q2 + Q3 + Q4	Technology integrated environments add some digital content and resources (Q2) to the in-person teaching context.
Online teaching	Q1 + Q2 + (Q4)	Online teaching primary involves Q1+Q2. However, occasionally non-digital content (Q4) (physical textbooks, science kits, etc.) are still used in an online teaching context.
Blended teaching	Q1 + Q2 + Q3 + Q4	Blended teaching requires teachers to have skill sets in all four quadrants. Blending requires a combination of in-person and online teaching skills.

Note: See Figure 1, adapted from Graham et al., 2017.

Literature Review

In general, the literature agrees that online, blended, and in-person teaching are different, but few research articles hone in on specific differences. Milrad, Spector, and Davidsen (2003) stated that "instructional technology changes what teachers and learners do and can do" (p. 13). Teaching practice changes with the introduction of technology, but how technology is incorporated and to what extent will determine the way teaching practices change.

Often online and blended teaching are treated as being the same, but they are not (Pulham & Graham, 2018). Many "online" programs are actually blended because they incorporate some in-person teaching elements (Freidhoff, Borup, Stimson, & DeBruler, 2015; Means et al., 2010, 2013; Watson, Murin, Vashaw, Gemin, & Rapp, 2011). Barbour et al. (2013) indicated that the existing overlap of skills for online and in-person teaching is mostly surface level, that in-depth examination shows differences in many of the skills required to use each modality effectively.

Our literature review (Pulham & Graham, 2018) found different emphases in the skills identified as being necessary for online and blended teaching. While both emphasize personalized learning, literature on blended teaching competency mentions mastery-based

learning far more than literature on online teaching competency, and online teaching competencies emphasize instructional design much more than blended teaching. For example, Horn and Staker's (2014) definition of the blended context includes characteristics of mastery-based learning such as "some element of student control over time, place, path, and/or pace" (p. 34). These features are not necessarily guaranteed or desirable in an online learning context; as mastery-based learning was among the least-mentioned concepts in online teaching competency literature (Pulham & Graham, 2018). Brodersen and Melluzzo's (2017) analysis of 17 studies found that online and blended teachers communicated with students differently: online teachers used phone or email, while blended teachers communicated only in person, despite having access to online student achievement data. Online and blended programs were also found to provide varying levels and types of student differentiation options.

Very little literature explicitly states differences between competencies specific to online and blended environments versus competencies generic enough to be good for a teacher in any environment. The International Board of Standards for Training, Practice and Instruction (IBSTPI) says that teacher competencies are similar enough for online, blended, and in-person environments that all of their competencies are generic (Klein, Spector, Grabowski & de la Teja, 2004). Barbour et al. (2013) would argue differently; until strong empirical research is available to support online teaching principles, some "teacher preparation programs may do more harm than good by teaching pre-service teachers faulty methods for teaching courses online" (p. 63). This would indicate the importance of distinguishing competencies that are specific to online settings rather than lumping all good teaching competencies into one group or assuming that a desirable competency for an in-person class is also desirable for an online class.

Our literature review searched ERIC, Google Scholar, and the internet to find online and blended teaching competency documents for K-12 teachers. They identified white papers and reports (Bakia, 2011; Dawley, Rice, & Hinck, 2010; National Education Association, 2006; Oliver, 2014; Powell, Rabbitt, & Kennedy, 2014; Southern Regional Education Board, 2006; Staker, 2011), books and book chapters (Arney, 2015; Barbour et al., 2013; Tucker, 2012), a website (The Learning Accelerator, n.d.), and published research articles (Archambault, DeBruler, & Friedhoff, 2014; Bjieki et al., 2010; diPietro et al., 2008; Ferdig et al., 2009; Kennedy & Archambault, 2012; Oliver & Stallings, 2014). A compilation of the majority of the research and findings showed two trends: (a) most research on blended teaching competencies does not explain how the competencies are developed, and (b) much more research has been published in peer-reviewed journals for online teaching than for blended teaching competencies. This literature review was limited because it sought research only for K-12 teachers; higher education and corporate training are much more prevalent in the blended teaching literature (Halverson, Graham, Spring, & Drysdale, 2012). Oliver and Stallings (2014) included higher education teaching practices in their research article concerning K-12 teachers due to the lack of research on teaching in K-12 blended environments.

In summary, the literature suggests that online, blended, and in-person teaching methods require different competencies, but little has been done to differentiate them. Some sources combine online and blended competencies as if they require the same skill sets (Archambault et al., 2014). Our prior literature review (Pulham & Graham, 2018) discovered that online and blended teaching competencies have distinct emphases. The differences distinguishing modalities need to be identified if teacher training and development are to center on competencies. Identifying such differences is the purpose of this study.

Methods

With two exceptions, the documents in this analysis came from our review of K-12 online and blended teaching competencies (Pulham & Graham, 2018). Eight documents were chosen based on the comprehensiveness of competencies and diversity of ideas discussed in each. We consulted four prominent researchers in the field of K-12 online and blended learning concerning the documents we had included, to ensure that we had not missed any important competency documents they recommended. We selected four documents on blended teaching competency for analysis: (a) iNACOL's Blended Learning Teacher Competency Framework (Powell et al., 2014), (b) Oliver's Framework for Blended Instruction (Oliver, 2014), (c) The Learning Accelerator Practices (The Learning Accelerator, n.d.), and (d) Preparing Teachers for Blended Environments (Oliver & Stallings, 2014). We also selected four documents focused on online teaching competencies: (a) Going Virtual! Report (Dawley et al., 2010), (b) iNACOL's National Standards for Quality Online Teaching (iNACOL, 2011), (c) Best Practices in Teaching K-12 Online: Lessons Learned from Michigan Virtual School Teachers (DiPietro et al., 2008), and (d) Virtual Schooling Standards and Best Practices for Teacher Education (Ferdig et al., 2009).

We analyzed two additional documents: the 2017 and 2008 versions of the International Society for Technology in Education (ISTE) Teacher Standards. Although these documents use neither *blended* nor *online* as a specific modality designation, both contain standards that are widely used and shared in teacher education and professional development related to technology integration and thus were relevant to our analysis.

Analysis Procedure

Table 3 displays descriptions for the four mutually exclusive codes we created to analyze the context of the identified competencies, which relate to the four modalities (a) online/digital teaching, (b) in-person teaching, (c) blended teaching, and (c) generic teaching.

Table 3

Codes and Definitions for Blended and Online Teaching Competencies

Code	Definition
Generic	Competencies in this category could apply to teaching in any modality: online, in-person, or blended (e.g., motivate students, ensure student collaboration, accommodate diverse student learning styles, provide appropriate academic credentials)
OL/digital	These competencies are specific to an online environment or a purely digital skill (e.g., facilitate online discussion, establish expectations for timely online responses from students, or create playlists of learning activities), whether a web-based program or local software.
In-person	These competencies are is specific to an in-person environment (e.g., manage classroom equipment, prepare students to use digital resources in the classroom)
Blended	This category includes competencies that integrate in-person and online components (e.g., use wikis and discussion boards in online modes to foster collaboration along with group work in in-person modes)

Initially two researchers coded each competency statement in the ten source documents (N=578) into one of the four categories. The principal researcher coded them in context as they were written in the body of the documents. A second researcher coded statements out of context as phrases or sentences not connected to the documents. Initially the coders had 81% interrater agreement. All codes that disagreed in the initial coding were revisited and discussed until 100% agreement was reached, which we believe represents a good-faith effort to make findings more trustworthy.

If competencies used language such as “the online teacher will” (iNACOL, 2011), we considered whether the word clearly designated a skill that an in-person teacher would not need.

If this analysis identified a context-specific skill, we approached the competency in the online/digital category; however, if the skill would be applicable to online or in-person teaching, we considered it to be generic. For example, providing "online feedback" is not sufficiently different from providing in-person feedback to warrant being specified as an online competency. Yet fostering "online discussion" does require a different skill set than fostering "in-person discussion," therefore warranting classification as an online competency.

As with the online competencies, we considered whether use of the word *blended*, such as "the blended teacher will" or "in a blended environment," significantly changed the skill from a generic category applicable to either an online or in-person competency to an exclusively blended competency. If the word *blended* did indicate specific application, such as a "blended classroom" being inherently different than a "in-person classroom," we classified the competency as *blended*.

Limitations

This analysis is not without limitations. Variances in language and perceived meaning of competencies can be difficult when the coding scheme was built to be mutually exclusive. For example, a few competencies targeting data usage and interpretation required judgment calls to code items as an *online* or *in-person* competency, while others were deemed applicable to either setting. For example, we decided to use the word *data* as a generic term, and the phrase *real-time data* as a term specifying data provided through a digital program.

Another limitation to be acknowledged is the scope of the literature analyzed. The literature review (Pulham & Graham, 2018) specifically documented insufficient research on K-12 blended teaching competencies and generally deficient research on blended learning at the K-12 level—as has

been noted by other researchers (Halverson et al., 2012). We hope that this analysis provides some insights that will be useful to future efforts in blended teaching research and practice.

Findings

Table 4 reports the final count of the mutually exclusive codes. The top four rows show the blended documents with their code break down, the second two rows contain ISTE competencies from 2008 and 2017, and the bottom four rows show online teaching documents with their code breakdown. Table 5 describes the coding breakdown across document type.

Table 4

Analysis of Blended and Online Teaching Competency Documents for Skills Specific to Online, In-Person, and Blended Teaching

	Generic 330 (57%)	OL/digital 172 (30%)	In-Person 29 (5%)	Blended 47 (8%)
Blended teaching competency documents				
iNACOL Framework for Blended Learning Teacher Competencies (Powell et al., 2014)	29 (71%)	5 (12%)	0	7 (17%)
Oliver's Framework for Blended Instruction (Oliver, 2014)	35 (71%)	8 (16%)	0	6 (12%)
Preparing Teachers for Blended Environments (Oliver & Stallings, 2014)	17 (47%)	8 (22%)	1 (3%)	10 (28%)
Learning Accelerator (n.d.)	99 (59%)	26 (15%)	28 (17%)	16 (9%)
ISTE (technology integration) documents				
ISTE 2017 Standards	11 (44%)	13 (52%)	0	1 (4%)
ISTE 2008 Standards	9 (35%)	13 (50%)	0	4 (15%)
Online teaching competency documents				
iNACOL Online Teaching Competencies (iNACOL, 2011)	71 (59%)	50 (41%)	N/A	1 (<1%)
Virtual Schooling Standards and Best Practices for Teacher Education (Ferdig et al., 2009)	27 (82%)	6 (18%)	N/A	0
Going Virtual! (Dawley et al., 2010)	14 (35%)	26 (65%)	N/A	0
Best Practices in Teaching K-12 Online: Lessons learned from Michigan Virtual School Teachers(DiPietro, 2008)	18 (49%)	17 (46%)	N/A	2 (5%)

Note. Blended learning integrates online and in-person instruction.

Table 5

Breakdown of Coding Between ISTE Documents, Blended Competency Documents, and Online Competency Documents

	Generic	OL/Digital	F2F	Blended
ISTE	20 (39%)	26 (51%)	0	5 (10%)
Blended	180 (61%)	47 (16%)	29 (10%)	39 (13%)
Online	130 (56%)	99 (43%)	n/a	2 (<1%)

The following section includes four tables (Tables 6-9) with representative examples of competencies from the various documents included in the analysis. These samples were chosen as clear, concise, and representative of the code.

Table 6

Examples of Online or Digital-Specific Competencies

Source	Online or digital competency examples
Learning Accelerator (n.d.)	• "Inputs and reviews behavioral data through [an online tracking system]" (Common Behavior Management Techniques, para. 4) • "[Using] content tools: IXL, ReadingPlus, Write to Learn, Lexia, Duolingo, SRI" (Lindsay High School Software Suite, para. 1) • "Posts mastery videos in resource bank for other students to use" (Mastery Videos, para. 3) • "Create[s] playlists of content from a variety of digital sources" (ReNEW DTA Software Suite, para.1)
Oliver's Framework (Oliver, 2014)	• "Promotes a secure and engaging digital learning environment" (p. 2) • "Models consistent use of organizational policy and procedure as they relate to digital media" (p. 4) • "Tools or other resources required for viewing course content are provided along with instructions for how to use and install them" (p. 10)
Preparing Teachers for Blended Environments (Oliver & Stallings, 2014)	• "Using the online medium to connect students not only to the teacher and to each other but also to groups or businesses outside of the classroom" (p. 67) • "Providing forums in which students can pose questions for the instructor or peers to answer" (p. 68) • "How to structure and facilitate online discussions to promote cognitive processing" (p. 69)
Going Virtual! (Dawley et al., 2010)	• "Psychology of online learning" (p. 24) • "Effective asynchronous discussion" (p. 25) • "Effective synchronous facilitation" (p. 25) • "Managing groups and collaboration in the online classroom" (p. 25) • "Digital etiquette and responsible behavior" (p. 28)
Best practices in Teaching K-12 Online: Lessons Learned from Michigan Virtual School Teachers (DiPietro et al., 2008)	• "Teachers are interested in and enjoy exploring new technologies that have potential value for virtual school environments" (p. 17) • "Use strategies to address inappropriate or abusive behavior of students in public forums of the course" (p. 19) • "Interact with students using multiple channels of communication (telephone, IM, etc.)" (p. 25)

Table 7

Examples of Blended Teaching Competencies from the Literature

Source	Blended competency examples
iNACOL Blended Learning Teacher Competency Framework (Powell et al., 2014)	• "Apply lessons and takeaways about their own experiences as learners, both online and offline, to their work with students" (p. 11) • "Establish and maintain open communication channels, online and in person, with students, educators, and other stakeholders to support student learning" (p. 11) • "Understand and manage the face-to-face and online components of lesson planning and organization within a blended course" (p. 12) • "Develop, practice, model, and embody respectful behaviors in both face-to-face and online learning environments" (p. 12) • "Use learning management system and/or other online collaborative tools to organize and manage the blended learning environment" (p. 12)
Oliver's Framework (Oliver, 2014)	• "The instructor combines strategies from both the digital and traditional environments to motivate learners" (p. 5) • "The instructor plans the integration of technical resources and digital content into the curriculum in order to achieve specific learning goals and outcomes" (p. 7) • "The instructor takes into account the needs of the learners as an audience when designing curriculum by providing consistency through an organized classroom in order to minimize extraneous confusion that may exist in a blended environment as a result of multiple simultaneous activities" (p. 9)
Preparing Teachers for Blended Environments (Oliver & Stallings, 2014)	• Consider whether blended elements (online and face to face) can help learners meet goals and objectives (p. 61) • Use online collaborative tools (forums, wikis, discussion boards) that mirror in-class collaborative groups (p. 68, mentioned twice) • Inform students about purposes of online *and* F2F discussion (p. 69) • Ensure that online and F2F modes and resources are merged and related to each other, not separate elements (p. 70)*
ISTE 2017 Standards for Educators (International Society for Technology in Education, 2017)	• "Manage the use of technology and student learning strategies in digital platforms, virtual environments, hands-on makerspaces or in the field" (Facilitator, para. 6)

*Items for this section are not directly quoted because of the length and complexity of sentences in the source

Table 8

Examples of In-Person Teaching Competencies from the Literature.

Source	In-person competency examples
The Learning Accelerator (The Learning Accelerator, n.d.)	● "Ensures the classroom has multiple types of furniture to meet student needs" (Strategy: Creative Furnishings and Spaces, para. 2) ● "Allows students to choose their best work environment" (Strategy: Creative Furnishings and Spaces, para. 2) ● "Adjusts student schedules based on new student information" (Additional Personalized Learning Time, para. 2)
Preparing Teachers for Emerging Blended Learning Environments (Oliver & Stallings, 2014)	● "Traditional direct instruction in the forms of a strong teacher presence" (p. 69)

Table 9

Examples of Generic Teaching Competencies from the Literature.

Source	Generic competency examples
Virtual Schooling Standards and Best Practices for Teacher Education (Ferdig et al., 2009)	● "Meet federal standards for licensing" (p. 488) ● "Participate in pre-service and in-service professional development" (p. 488) ● "Is reflective of practice" (p. 488) ● "Shares student progress with stakeholders" (p. 489) ● "Has content and pedagogy knowledge" (p. 490)
iNACOL Blended Learning Teacher Competency Framework (Powell et al., 2014)	● "Embrace change and model this for others" (p.10) ● "Openly and frequently share successes, failures, and challenges" (p. 10) ● "Proactively seek to learn from and with other experts in the field" (p. 10) ● "Engage in problem solving through continuous planning, designing, testing, evaluation, and recalibration of teaching methods" (p. 11) ● "Provide resources for students to learn content and enable them to work independently and/or in cooperative groups" (p. 11)
Going Virtual! (Dawley et al., 2010)	● "Promoting student reflection and self-evaluation" (p. 25) ● "Active listening" (p. 25) ● "Design of syllabi" (p. 27)

Discussion

Online or Digital Context-Specific Competencies

Online/digital specific competencies made up 30% of all competencies analyzed (see Table 4); these tend to focus on technology logistics such as facilitating logins and managing software, organizing online materials, and facilitating online interactions including synchronous and asynchronous discussions (see Table 6). Mention of inputting and reviewing data also occurred a number of times, especially in blended documents that focus on mastery-based learning, which is often best facilitated with data dashboards containing information from a variety of programs.

Among the competency documents, *Going Virtual!* (Dawley et al., 2010) contained the most online/digital specific competencies, while the *Virtual Schooling Standards* (Ferdig et al., 2009), despite being labeled as a resource for online teacher competencies, had the lowest percentage of online or digital competencies among the online documents (18%).

Blended Competencies

Blended competencies, which integrate online/digital and in-person elements, are exemplified in Table 7 by quotes from the source documents. Preparing Teachers for Blended Environments (Oliver & Stallings, 2014) was the document with the greatest emphasis on these competencies (28%; see Table 4). Blended competencies are necessary skills that might require working with multiple stakeholders to effectively integrate in-person and online elements of teaching. Accounting for only 8% of the total competencies analyzed in the documents, this is a narrow subset focusing on critical abilities, such as using online collaboration to mirror in-person group work (Oliver & Stallings, 2014). Perhaps the most important aspect is insuring that online

activity relates to and informs in-class instruction, a connection which confuses some groups in differentiating between technology integration and blended learning (Fisher et al., 2017).

In-Person Competencies

The in-person category accounted for only 5% of the competencies analyzed (see Table 4)—those not found in the online teaching competency documents. In-person competencies identified in a blended context involved managing the students on site, scheduling activities in the learning space, and managing technology devices (see Table 8). These competencies are not shared with online teaching but might be present in various in-person learning environments. The highest percentage of in-person competencies (17%) were included in Learning Accelerator, possibly due to their links with specific school examples in classroom spaces.

Generic Competencies

Overall, the competencies in the documents were mostly generic: 57% of all included competencies in the analysis (see Table 4), exemplified within Table 9. While these competencies do not specify online or digital modalities, they emphasize collaboration, stress openness to change, and help students work independently, which are important components of blended and online learning and teaching. These practices are generally important in facilitating student learning and growth and do not require a teacher to use a computer-based system. Virtual Schooling Standards and Best Practices for Teacher Education (Ferdig et al., 2009) contained the highest percentage of generic competencies (82%; see Table 4). The ISTE 2008 Standards for Teachers and Going Virtual! (Dawley et al., 2010) tied for the lowest number of generic competencies (35%).

As we coded statements from the documents out of context, we noticed that many of the best practices, even crucial practices, for online teachers were written so they would be

applicable to any environment. For example, competencies related to communicating through varied mediums, providing prompt responses to students, or practicing email etiquette are appropriate for any teacher under any circumstance, but these are crucial to the success of an online teacher because all communication is through a distance medium, with no in-person follow up as would be available in traditional or blended settings.

More Specific Blended and Online Teaching Competencies

While we had anticipated strengths and limitations to having more generic or modality-independent teaching competencies, the generic competencies did not provide us specific enough guidance for designing professional development for blended teaching. The primary findings of this study suggest that competencies more specific to the unique teaching needs of online and blended contexts must be developed. This would include competencies possibly specific to various blended learning models, such as the station rotation, flex, or enriched virtual models. Competencies also may vary slightly by the age group of the students. Older or otherwise more autonomous learners may be responsible for completing more online activities as they mature.

A challenge in creating and organizing competencies is to determine the level of granularity or specificity needed for the skills to be useful in a blended or online context. The more general and abstract the competency, the more broadly it can be applied, but also the more effort is required for the user to interpret it within a specific context. Many teaching practices are generally applicable across modalities, but others require unique skills. For example, the skills needed to facilitate whole class discussion in an in-person environment are substantial, but they are different from the skills for facilitating online asynchronous discussion or the skills for weaving asynchronous discussion with in-person discussion.

The challenge with more generic competencies is that their presentation does not provide the level of detail needed to support a professional development curriculum. In our efforts to develop a blended teaching readiness instrument (Graham et al., 2017; Pulham & Graham, 2018), we found that using generic competencies could give participants the impression that they were prepared for blended teaching, when in fact they had only developed skills needed for teaching in an in-person classroom context. Those designing and organizing teacher preparation programs and in-service professional development must realize that while generic competencies may be important, specific standards and competencies that target skills unique to online and blended contexts will provide teachers and education leaders with the more specific direction they need for building curriculum required for these environments.

Conclusions

This review of teaching competencies presented in blended, online, and technology integration documents indicates that a majority of recognized teaching competencies remain generic. Generic competencies that can be applied by any teacher in any environment are more difficult to interpret and apply in the variety of tech-mediated systems that are now available. The language used to discuss online and blended teaching competencies needs to include explicit directions for using such skills: For example, the difference between communicating with students in an online format vs. an in-person format or between planning an online lesson vs. planning an in-person lesson must be specified. Without such instruction, there is less of a chance that teachers or educators will be able to effectively teach or model these skills for their preservice teachers. The competency language should be precise and explicit if these practices are to be valuable guidelines presented in teacher education programs. We suggest that future competency descriptions include some indication of the environment in which they are to be

used or contain enough specificity to give teachers and administrators a clear indication of how the skill is different than skills a teacher has acquired through traditional teacher education or professional development.

The increasing demand for online and blended teaching in K-12 schools should increase the focus on research-based, empirically grounded practices that are needed to transform education. Rigorous studies based on real classroom observations and interviews with technology professionals at school districts that are implementing blended learning will aid in this process. Additionally, developing competencies and valid measurement processes for them could facilitate professional development focused on identifying gaps in teacher skills and personalizing instruction to teachers' needs rather than providing a non-differentiated curriculum. Developing such competencies also has important resource implications, as programs and schools have limited time and resources for professional development.

We recommend that teacher education programs endeavoring to improve outcomes for online or blended teaching examine competencies for the contexts in which they are appropriate and include more blended and online competencies in mainstream teacher education for all preservice teachers. We also recommend future nuanced study of online and blended teaching competencies, as they eventually become mainstream rather than outside the norm for preservice teacher education.

References

Anderson, T. (2008). Toward a theory of online learning. In T. Anderson (Ed.), *The theory and practice of online learning* (2nd ed., pp. 33–60). Edmonton, Canada: Athabasca University Press.

Archambault, L., DeBruler, K., & Freidhoff, J. (2014). K-12 online and blended teacher licensure: Striking a balance between policy and preparedness. *Journal of Technology and Teacher Education, 22*(1), 83–106. Retrieved from http://www.editlib.org/p/112361/share

Arney, L. (2015). *Go blended!: A handbook for blending technology in schools.* San Francisco, CA: Jossey-Bass.

Bakia, M., Anderson, K., Heying, E., Keating, K., & Mislevy, J. (2011). *Implementing online learning labs in schools and districts: Lessons from Miami-Dade's first year*. Menlo Park, CA: SRI International.

Barbour, M. K., Siko, J., Gross, E., & Waddell, K. (2013). Virtually unprepared: Examining the preparation of K-12 online teachers. In R. Hartshorne, T. Heafner, & T. Petty (Eds.), *Teacher education programs and online learning tools: Innovations in teacher preparation* (pp. 60-81). Hershey, PA: IGI Global. doi:10.4018/978-1-4666-1906-7.ch004

Bigatel, P. M., Ragan, L. C., Kennan, S., May, J., & Redmond, B. F. (2012). The identification of competencies for online teaching success. *Journal of Asynchronous Learning Networks, 16*(1), 59-77.

Bjeki, D., Krneta, R., & Milo, D. (2010). Teacher education from e-learner to e-teacher: Master curriculum. *The Turkish Online Journal of Educational Technology, 9*(1), 202–212.

Brodersen, R. M., & Melluzzo, D. (2017). *Summary of research on online and blended learning programs that offer differentiated learning options (REL 2017–228), Washington, D.C.* Retrieved from http://ies.ed.gov/ncee/edlabs

Davidson Smith, R. (2009). Virtual voices: Online teachers' perceptions of online teaching standards. *Journal of Technology and Teacher Education*, *17*(4), 547–571.

Davis, N. E., & Niederhauser, D. S. (2007). Virtual schooling. *Learning and Leading with Technology, 34*(7), 10–15.

Dawley, L., Rice, K., & Hinck, G. (2010). *Going virtual! The status of professional development and unique needs of K-12 online teachers*. Boise, ID: Boise State University. Retrieved from http://edtech.boisestate.edu/goingvirtual/goingvirtual3.pdf

DiPietro, M., Ferdig, R. E., Black, E. W., & Preston, M. (2008). Best practices in teaching K-12 online: Lessons learned from Michigan Virtual School teachers. *Journal of Interactive Online Learning*, *7*(1), 10–35. Retrieved from www.ncolr.org/jiol

Dziuban, C., Graham, C. R., Moskal, P., Norberg, A., & Sicilia, N. (2018). Blended learning: The new normal and emerging technologies. *International Journal of Educational Technology in Higher Education*, *15*(3). Retrieved from http://doi.org/10.1186/s41239-017-0087-5

Ferdig, R. E., Cavanaugh, C., DiPietro, M., Black, E., & Dawson, K. (2009). Virtual schooling standards and best practices for teacher education. *Journal of Technology and Teacher Education*, *17*(4), 479–503.

Fisher, J., Bushko, K., & White, J. (2017). *Blended beyond borders: A scan of blended learning obstacles and opportunities in Brazil, Malaysia, & South Africa* [White paper]. World

Innovation Summit for Education & Christensen Institute. Retrieved from https://www.christenseninstitute.org/publications/beyondborders/

Foulger, T. S., Graziano, K. J., Schmidt-Crawford, D. & Slykhuis, D. A. (2017). Teacher educator technology competencies. *Journal of Technology and Teacher Education, 25*(4), 413-448. Waynesville, NC: Society for Information Technology & Teacher Education. Retrieved February 14, 2018 from https://www.learntechlib.org/p/181966/

Freidhoff, J. R., Borup, J., Stimson, R., & DeBruler, K. (2015). Documenting and sharing the work of successful on-site mentors. *Journal of Online Learning Research, 1*(1), 107-128.

Gemin, B., Pape, L., Vashaw, L. & Watson, J. (2015). *Keeping pace with K-12 digital learning: An annual review of policy and practice.* Retrieved from https://www.evergreenedgroup.com/keeping-pace-reports/

Graham, C. R., Borup, J., Pulham, E., & Larsen, R. (2017). *K-12 blended teaching readiness: Phase 1- Instrument development.* Lansing, MI: Michigan Virtual University. Retrieved from https://mvlri.org/research/publications/k-12-blended-teaching-readiness-instrument-development/

Halverson, L. R., Graham, C. R., Spring, K. J., & Drysdale, J. S. (2012). An analysis of high impact scholarship and publication trends in blended learning. *Distance Education, 33*(3), 381-413. http://dx.doi.org/10.1080/01587919.2012.723166

Horn, M. B., & Staker, H. (2014). *Blended: Using disruptive innovation to improve schools.* San Francisco, CA: Jossey-Bass.

International Society for Technology in Education (ISTE). (2008). *National educational technology standards for teachers.* Retrieved from http://www.iste.org/

International Society for Technology in Education. (2017). *ISTE standards for educators.* Retrieved from https://www.iste.org/standards/for-educators

Kennedy, K., & Archambault, L. (2012). Design and development of field experiences in K-12 online learning environments. *The Journal of Applied Instructional Design, 2*(1), 35–49. Retrieved from https://www.jaid.pub/vol-2-issue-1-2012

Klein, J. D., Spector, J. M., Grabowski, B., & Teja, I. de la. (2004). The IBSTPI instructor competencies. In *Instructor competencies: Standards for face-to-face, online, and blended settings* (pp. 13-21). Charlotte, NC: Information Age Publishing.

McAllister, L., & Graham, C. R. (2016). An analysis of the curriculum requirements for K-12 online teaching endorsements in the U.S. *Journal of Online Learning Research*, *2*(3), 247–282.

Means, B., Toyama, Y., Murphy, R. F., & Bakia, M. (2013). The effectiveness of online and blended learning: A meta-analysis of the empirical literature. *Teachers College Record, 115*(3), 1–47.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies. U.S. Department of Education. Retrieved from https://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf

Milrad, M., Spector, J. M., & Davidsen, P. I. (2003). Model facilitated learning. Unpublished manuscript. 13-27. Retrieved from https://pdfs.semanticscholar.org/d8aa/ec075710141e9f042432328bd3da8bac3d5c.pdf

Molnar, A., Miron, G., Gulosino, C., Shank, C., Davidson, C., Barbour, . . . & Nitkin, D. (2017). *Virtual Schools Report 2017.* Boulder, CO: National Education Policy Center. Retrieved from http://nepc.colorado.edu/publication/virtual-schools-annual-2017

Moore, M. G. (1989). Three types of interaction [Editorial]. *The American Journal of Distance Education*, *3*(2), 1–6.

National Education Association. (2006). *Guide to teaching online courses.* Washington, D.C. Retrieved from http://www.nea.org/assets/docs/onlineteachguide.pdf

Norberg, A., Dzuiban, C. & Moskal, P. D. (2011). A time-based blended learning model. *On the Horizon*, *19*(3), 207-216. http://dx.doi.org/10.1108/10748121111163913

Oliver, K. M., & Stallings, D. (2014). Preparing teachers for emerging blended learning environments. *Journal of Technology and Teacher Education*, *22*(1), 57–81.

Oliver, W. L. (2014). *Oliver's framework for blended instruction.* Retrieved from http://blendedpractice.com/wp-content/uploads/2015/11/Olivers-Blended-Framework-for-Instruction.pdf

Parks, R. A., Oliver, W., & Carson, E. (2016). The status of middle and high school instruction: Examining professional development, social desirability, and teacher readiness for blended pedagogy in the southeastern United States. *Journal of Online Learning Research*, *2*(2), 79–101.

Powell, A., Rabbitt, B., Kennedy, K., International Association for K-12 Online Learning, & The Learning Accelerator. (2014). *iNACOL blended learning teacher competency framework.* Retrieved from https://www.inacol.org/wp-content/uploads/2014/10/iNACOL-Blended-Learning-Teacher-Competency-Framework.pdf

Pulham, E. B., & Graham, C. R. (2018). Comparing K-12 online and blended teaching competencies: A literature review. *Distance Education*. DOI: 10.1080/01587919.2018.1476840

Southern Regional Education Board. (2006). *Standards for quality online teaching, SREB's educational technology cooperative 1–12.* Atlanta, GA: Southern Regional Education Board. Retrieved from http://www.sreb.org/

Staker, H. (2011). *The rise of K-12 blended learning: Profiles of emerging models*. Retrieved from https://www.christenseninstitute.org/wp-content/uploads/2013/04/The-rise-of-K-12-blended-learning.emerging-models.pdf

The Learning Accelerator (n.d.). *Practices at work.* Retrieved from http://practices.learningaccelerator.org/

Tucker, C. R. (2012). *Blended learning in grades 4-12: Leveraging the power of technology to create student-centered classrooms.* Thousand Oaks, CA: Corwin Press.

Utah Administrative Code (n.d.) R277-504-4.C.3.c-f

Watson, J., Murin, A., Vashaw, L., Gemin, B., & Rapp, C. (2011). *Keeping pace with K-12 online learning: An annual review of policy and practice.* Evergreen Education Group. Retrieved from https://www.evergreenedgroup.com/s/KeepingPace-2011.pdf

Article 3

Test Validation of Blended Teaching Competencies Assessment

Emily Bateman Pulham

Charles R. Graham

Ross Larsen

Brigham Young University

Abstract

In the last few years K-12 blended schools have grown around 40% in the United States (Molnar et al., 2017), which prompts a question about the preparation of teachers to work effectively in these settings. Several blended teaching readiness and online teaching readiness instruments exist; however, most are self-report in nature. This article outlines the creation and validation of an objectively scored test instrument of blended teaching skills in four areas: *Blending Online and In-Person learning*, *Technology-Mediated Interactions*, *Personalization*, and *Real-Time Data Practices*. The test also has a section for self-evaluation of technology skills, digital citizenship, and dispositions toward using technology for teaching. Confirmatory and Exploratory Factor Analyses are used to evaluate the loading of question items on the latent constructs presented. This research also the questions: What is the relation between the scores and items of this assessment and (a) total years teaching, (b) years teaching in a blended setting, (c) years teaching in an online setting, and (d) blended teaching self-efficacy? We found that very few test items had a significant, linear relationship with these measures and that the test items did not load equally on the latent constructs proposed. More refinement of the test instrument is proposed for future use as an indicator of blended teaching readiness or competency.

Introduction

The number of students enrolled in full-time blended schools grew by 40% from 2014 to 2015 (Molnar et al., 2017). Across the country, technology is being integrated into classrooms, with many schools adopting their own approaches to teaching by mixing of online and in-person learning methods. Some groups are calling going so far as to call blended learning the "new normal" (Norberg, Dzubian, & Moskul, 2011, p. 4). Preparing preservice teachers for these environments is an important and difficult task. While many states are now requiring preservice teachers to take credits that are technology-focused, most future teachers will have very little experience teaching in a blended classroom environment, especially classrooms that are built like a K-12 blended environment (Archambault, DeBruler, & Friedhoff, 2014). Despite this, many states offer a K-12 online teaching endorsement (McAllister & Graham, 2016).

Currently, there is adequate awareness of necessary skill sets to develop an objectively-referenced assessment of blended teaching knowledge, skills, and understanding rather than needing to rely solely on self-assessment tests for blended teacher readiness. This is important because there currently are no tests in existence that measure the blended teaching practices being implemented by school districts or those practices being promoted by various organizations. While some school districts and organizations provide structured professional development for in-service teachers, we need a way to assess the skills that blended teaching demands before the teachers set foot in a classroom. There currently are very few measures, other than self-evaluation, to assess what teachers do and do not know about their own competencies in blended teaching. In this article, we describe the literature on blended learning and blended teaching competency instruments and share the development process of a test instrument built to assess unique blended teaching skills and understanding. We also describe the

methods for completing validation of the test instrument and discuss implications of the statistical analyses.

Recently the Utah State Board of Education added a requirement for teacher candidates "to teach effectively in traditional, online-only, and blended classrooms" and "to facilitate student use of software for personalized learning" (Utah Administrative Code, n.d.). In response to this, Brigham Young University sought to create a course that addresses blended and online teaching skills, and to build a common assessment to be used across every school that is involved in the Educator Preparation Program (EPP). The first attempt to write a common assessment for the EPP is the subject of this article. The test needs to be capable of being issued to students in a variety of disciplines across BYU campus, and validly certify an individual student's ability with and understanding of blended teaching concepts and skill requirements before graduating. Ideally, the test should be written in a way that will make it scalable larger group, including being auto-graded by a computer.

Literature Review

Blended learning is the combination of online and face-to-face learning. It is in use in many age groups and has been shown to improve achievement outcomes (Bernard, Borokhovski, Schmid, Tamim, 2014; Means, Toyoma, Murphy, Bakia, Jones, 2010). A common definition of blended learning in K-12 is an educational setting that occurs "at least in part through online learning, with some element of student control over time, place, path and/or pace" (Horn & Staker, 2014, p. 34). In preparation for building an objectively scored assessment, we gathered literature on blended teaching competencies, existing instruments that measure blended teaching competence or readiness, literature on test writing and types of assessments, and test validation strategies.

Blended Teaching Competencies

In our literature review (Pulham & Graham, 2018), 8 documents on blended teaching competencies and 10 documents on online teaching competencies were reviewed and coded to determine the most prevalent skills needed and to compare and contrast blended with online teaching skills (see Table 1). Table 2 shows the skills most often mentioned in blended competency documents. To write the question items for the assessment tool, we used the basic codes from this measurement project, the same codes that formed the organizing codes in Table 4.

Table 1

Blended Teaching Competency Documents Used in Analysis (adapted from Pulham & Graham, 2018)

Document	Description
Implementing Online Learning Labs (Bakia, Anderson, Heying, Keating, Mislevy, 2011)	Report of Miami-Dade County's use of online learning labs after one year of implementation. They produced guidelines for online lab facilitators.
The Rise of K-12 Blended Learning (Staker, 2011)	Report compiling 40 K-12 blended learning case studies across the US, including type of blended institutional model, cost effectiveness, and a few descriptions of teacher skills.
Blended Learning in Grades 4-12: Leveraging the Power of Technology to Create Student-Centered Classrooms (Tucker, 2012)	Practical advice and details from a teacher to other teachers implementing blended learning in their own classroom. The major focus is on facilitating online discussions.
Preparing Teachers for Blended Environments (Oliver & Stallings, 2014)	Literature review compiling research-based evidence of effective blended learning practices, stating that blended teachers must consider: (a) class context, (b) pedagogical strategies, and (c) technology.
iNACOL Blended Learning Teacher Competency Framework (Powell, Rabbitt, & Kennedy, 2014)	Framework organizing 12 competencies under four main categories: (a) mindsets, (b) qualities, (c) adaptive skills, and (d) technical skills.
Oliver's Framework for Blended Instruction (Oliver, 2014)	Framework with domains including (a) professional responsibility, (b) instruction, (c) design, (d) technology, (e) preparation, and (f) curriculum.
Go Blended! A Handbook for Blending Technology in Schools (Arney, 2015)	Handbook containing a three-fold blended teaching readiness rubric: (a) instructional elements, (b) behavioral elements, and (c) data.
Learning Accelerator Website (The Learning Accelerator, n.d.)	Framework including 67 strategies organized into these six practices: (a) face-to-face learning, (b) technology, (c) integration, (d) real-time data, (e) personalized learning, and (f) mastery-based progression.

Note: [a]Parks, Oliver, and Carson (2016) has a brief treatment of each of the competency domains and shows data from the validation of the Blended Practice Profile instrument which is based on Oliver's Framework.

Table 2

Top Blended Organizing Themes, Ranked in Order of Coding Frequency Percentage (adapted from Pulham & Graham, 2018)

Rank	Organizing theme (global theme)	Percent of total codes (n=767)
1	Flexibility & personalization (pedagogy)	9.65%
2	Mastery-based learning (pedagogy)	4.69%
3	Data usage and interpretation (assessment)	4.56%
4	Expectations established (management)	4.43%
5	Student progress review (assessment)	4.17%
6	Classroom management (management)	4.04%
7	Learning management system (technology)	3.52%
8	Student-centered learning (pedagogy)	3.39%
8	Integration of face-to-face and online class elements (management)	3.39%
10	Student grouping (pedagogy)	2.87%
11	General assessment (assessment)	2.74%
12	Community development (pedagogy)	2.61%
12	Software management (technology)	2.61%
14	Online discussion facilitation (pedagogy)	2.48%
15	Parental involvement (management)	2.22%
15	Formative assessment (assessment)	2.22%
15	Instructional intervention (pedagogy)	2.22%

Existing Assessments for Blended Teaching Competence

There are several companies who already have a blended teaching competence inventory, self-assessment, or standard for teachers. The Learning Accelerator (TLA) in partnership with iNACOL built a simple self-assessment for teachers that includes a rubric to gauge whether they are strong, developing, or need major improvement with the main competencies (The Learning

Accelerator, n.d.). Thrivist has also created a proprietary self-assessment tool for teachers (Parks, Oliver & Carson, 2016). While this survey is still being validated, one of its major drawbacks is the lack of access we have to the survey. One performance rubric built by The New Teacher Project (TNTP) for administrators has a talent scorecard with 32 indicators that allow administrators to assess potential blended teachers at their schools (TNTP, 2014). However, like the other tools, this scorecard has not been validated through research. Several other self-report surveys of blended teaching readiness focus on district-wide readiness rather than individual teacher competency (The District Reform Support Network, 2015; The Highlander Institute, 2017).

One blended teaching competency survey instrument we developed (Graham et al., 2017), has been validated by a confirmatory factor analysis (CFA). It uses a Likert-scale type self-evaluation for 55 items and focuses on several factors: technical literacy, digital citizenship, dispositions, planning blended activities, planning blended assessments, personalizing instruction, facilitating interactions, implementing blended assessments, and evaluating and reflecting.

Types of Assessments

There are chiefly three types of assessments: (a) performance assessments, (b) cognitive assessments, and c) affective assessments. Cognitive assessments have the greatest prevalence in academics, and assess prior knowledge, understanding and application, and are many times administered to many students at once. Performance assessments are more typical for assessing actual competence in a skill or talent, such as music, dance, nursing, and other areas requiring action. Performance assessments are often accompanied by rubrics that guide a rater's grading of the activity. Performance assessments can also occur in the form of observation, such as

classroom observation. Affective assessments are measures of individual affective traits, measured by scales. Self-report surveys are a type of affective assessment that can also assess opinion.

Writing Test Items

Miller, Gronlund, and Linn (2013) state that before constructing assessment items, these three steps should be followed:

1. The purpose of the test or assessment should be determined,
2. A set of specifications should be developed, and
3. The most appropriate types of test items and tasks should be selected.

Without a purpose to the test, test items will be written that have no clear purpose guiding the language of the questions. The test specifications allow for strategic planning of which kinds of questions will be included in the test, and to which instructional objectives they relate. Lastly, selecting appropriate test items will be important for executing the purpose of the test. Objective test items have right or wrong answers, while performance assessments usually require rubrics for grading essays and open-ended questions.

To guide the appropriate test item selection, clear statements of instructional objectives should be written as actions, beginning with a verb, such as "Describes the principle in own words" (Gronlund & Brookhart, 2009).

Validation of Assessments

While many test instruments exist, it is not often that they are validated by a Confirmatory Factor Analysis (CFA), which analyzes relations among latent constructs and is commonly used in psychological research (Jackson, Gillaspy, & Purc-Stephenson, 2009). To be considered valid measures for high-stakes purposes (such as the ACT, GRE, or other

standardized tests), tests should provide evidence that their psychometric properties are aligned to real world constructs. This can be done through a CFA or other measure. The American Educational Research Association states that researchers should provide proof of internal validity of test instruments (AERA, 2014; Lewis, 2017). It is also recommended that 250-500 responses are recorded for a CFA to have sufficient statistical power (Lewis, 2017). If the test instrument is eventually to become a measure for high-stakes purposes, it should be built with and tested for validity.

Research Questions

Our aims in performing this research were: (a) complete a validation procedure for a new objectively-scored assessment instrument in order to establish its psychometric properties, and (b) analyze relationship between demographic variables and scores on the test. Thus, our research questions include:

1. Does the CFA show unidimensionality in the domains being tested (i.e., integrating online and in-person learning, technology-mediated interactions, personalization, and real-time data practices)?
2. What is the relation between the test scores and:
    1. total years of teaching experience,
    2. years of online teaching experience,
    3. years of blended teaching experience,
    4. perceived preparedness for teaching in a blended environment (self-efficacy)?

Methods

Instrument Development

The graded items on the final assessment instrument are located in Appendix A. We based our test items off of the basic codes from our previous literature review (Pulham & Graham, 2018). While this section only provides a summary of the instrument development, a more detailed development process and initial testing of the instrument can be found in an unpublished PhD measurement project report (Pulham, 2018). The competencies deemed to be important for a blended teaching environment were put into three categories that TLA uses: (a) personalization, (b) data practices, (c) in-person and online integration, along with two additional categories: (d) technology-mediated interaction, and (e) dispositions. We have created the fourth category (technology-mediated interactions) to address blended teaching skills not directly addressed by TLA but that we feel are important to blended teaching. The fifth category contains ideas about basic skills and dispositions that are foundational to success in a technology-rich pedagogical approach, whether blended, online, or technology integration focused.

Informal conversations with three school leaders from three local partnership school districts helped to further inform the competencies desired for newly-hired teachers. They were asked, “What are the technology competencies you would want newly hired teachers to have?” In addition, teachers and leaders from around the country were also asked to provide their desired skills at the iNACOL conference in Orlando, Florida during an informal research meeting discussion. These ideas were written down and brought to discussions of the teaching competencies by the primary researcher with other researchers collaborating on test development.

Four of the five areas of competency were addressed by writing Specified Learning Objectives (SLOs) and the General Instructional Outcomes (GIOs) associated with each (Gronlund & Brookhart, 2009). In Table 3, the areas are categorized by their GIOs, and the SLOs for each area of competency are provided. The SLOs provided us with a guide map for developing assessment items that correlate to just one SLO and are not measuring more than one construct.

Table 3

General Instructional Outcomes and Specified Learning Objectives for the Pilot Test

Competency Area and General Instructional Outcome	Specified Learning Objectives
Personalization: Understands how to allow for student flexibility in pace and learning activities in accordance with student preference and ability.	P1. Understands how to help students set reasonable goals (1 item) P2. Understands how to effectively group students homogeneously (1 item) P3. Understands how to effectively group students heterogeneously (1 item) P4. Understands how to personalize instruction based on student interests (1 item) P5. Knows how to increase student ownership by letting students select a way to demonstrate mastery (1 item) P6. Understands how to manage a class where students are working at varied paces (1 item) P7. Understands importance of mastery-based grading in aiding personalization (1 item)
Real-Time Data Practices: Understands how to interpret data from multiple sources (software, face-to-face interaction, discussions, etc.) to modify instruction and assess students	RTD1. Understands how to select assessment items that produce valid, objective-referenced, real-time data (1 item) RTD2. Interprets dashboards for the purposes of changing instruction for students (2 items) RTD3. Interprets dashboards for purposes of modifying future courses / curriculum (1 item) RTD4. Recognizes student achievement trends in data (2 items) RTD5. Recognizes student activity trends in data (1 item) RTD6. Understands the need to check data consistently, frequently (1 item)
Blending in-person and online learning: Understands how to effectively combine in-person and online learning activities	B1. Understands when to use technology for learning activities (1 item) B2. Understands how to effectively transform in-person activities into blended ones (1 item) B3. Evaluates the effective use of technology activities (1 item) B4. Knows how to build on online experiences in class, vice versa (1 item) B5. Understands models of blending in the school space (4 items) B6. Knows techniques for transitioning students in class from technology to f2f activities, and vice versa (1 item)
Technology-Mediated Interactions: Understands how to effectively communicate and facilitate interactions using technology	T1. Understand effective facilitation of an online asynchronous discussion (3 items) T2. Identifies basic benefits of synchronous / asynchronous / in-person communication (1 item) T3. Creates an asynchronous discussion prompt for deeper level thinking (1 item)

Test items. We wrote and edited test items, and then administered the test using Qualtrics. Rather than create new items for basic technology and dispositions, we used 15 self-evaluation items from the blended teaching readiness survey developed previously (Graham et

al., 2017). Since dispositions are harder to measure in an objective way, we included these 15 items at the beginning of the test to evaluate basic technology skills, dispositions and digital citizenship. The rest of the test items were written by the researchers and went through a think-aloud process with former and preservice teachers (two elementary education, one secondary education). The think-aloud participants read question items aloud with the researcher or assistants present, and described whether they felt the question was clear enough for them to make an appropriate answer choice. Their comments were written down by the researcher and helped to refine the language and purpose of the items.

Pilot testing. Pilot testing took place during the final exam period for students in an undergraduate/preservice teacher class entitled "Teaching K-12 Online/Blended Learning." Originally, we had intended the pilot test to be taken by a variety of individuals from different backgrounds but developing test items took more time than we had thought, and this group of 14 students was a convenient sample for piloting the test and receiving feedback on the instrument. Beneath each question was an open-ended question box, which we required them to use, asking for suggestions, feedback, and if anything was difficult about the question items. We found that it took an average of 40 minutes for the pilot group to take the assessment, and this included them providing required feedback for most questions. The feedback was open-ended, and asked, "Please provide feedback (i.e., questions, concerns, suggestions) on the previous test item(s)? How could we improve this item? Provide any feedback you have below." The students took the test as their final for the class and received full credit for doing it regardless of their score, which was the incentive for participating in the pilot exam.

Based on the pilot testing, we made changes to some of the test items (editorial changes to the wording of questions or editing item options). We heavily edited one item within

Personalization, specifically the item related to the SLO, "Understands how to help students set reasonable goals," which was changed to, "Understands how to help students set mastery goals." The other item we edited was from *Technology-Mediated Interactions*, specifically the SLO that states "Identifies effective facilitation of an online asynchronous discussion," which was changed to, "Understands effective facilitation strategies of an online asynchronous discussion." The single item addressing this SLO became three items. The final test became 44 questions long rather than 42 questions in the pilot test. Two of the teachers we previously consulted to help refine the pilot test, were shown the rewritten test questions to determine the clarity of the new questions and to improve them for the final test. The test's final specifications are detailed in Table 4. A table of item numbers and the specified learning outcomes is in Table 5.

Table 4

Table of Specifications for Final Blended Teaching Assessment

Content	Question Type					Total
	Self Eval	Knowledge	Understanding	Interpretation	Application & Evaluation	
Personalization	0	1	6	0	0	7
Real-Time Data Skills	0	0	2	6	0	8
Tech-Mediated Interactions	0	1	4	0	1	6
Blending	0	2	6	0	1	8
Basic Technology	15	0	0	0	0	15
Total	15	4	18	6	2	44

Table 5

Table of Question Item Numbers and Specified Learning Outcomes (SLO)

Item	SLO
B1.1	Understands models of blending in the school space
B1.2	Understands models of blending in the school space
B1.3	Understands models of blending in the school space
B1.4	Understands models of blending in the school space
B2	Knows how to effectively build on online experiences in class
B3.2	Knows techniques for transitioning students in class from technology to face to face activities
B4.3	Evaluates the effective use of technology activities
T1	Identifies basic characteristics of synchronous, asynchronous and in-person communication
T2.2	Creates an asynchronous discussion prompt for deeper level thinking
T2.3	Identifies effective facilitation strategies of an online asynchronous discussion
T2.4	Identifies effective facilitation strategies of an online asynchronous discussion
T2.5	Understands effective facilitation strategies of an online asynchronous discussion
P1.1	Understands how to effectively group students homogeneously
P1.2	Understands how to effectively group students heterogeneously
P2.2	Understands how to manage a class where students are working at varying paces
P2.3	Understands how to personalize instruction based on student interests
P2.4	Understands importance of mastery-based grading in aiding personalization
P2.5	Understands how to help students set mastery goals
RTD1.1	Understands need to check data consistently, frequently
RTD1.2	Understands how to select assessments or assessment items that produce valid objective-referenced real-time data
RTD1.3	Recognizes trends in student achievement data
RTD1.4	Recognizes trends in student achievement data
RTD1.5	Recognizes student activity trends in data
RTD2.1	Interprets dashboards for purposes of changing instruction for students
RTD2.2	Interprets dashboards for purposes of changing instruction
RTD2.3	Interprets dashboards for purposes of modifying future courses/curriculum

Data Collection and Sampling

Data were collected using Qualtrics, and the test was distributed to participants via e-mail. Consent for research participation was obtained on the first page of the assessment (see Appendix B).

For purposes of validation, we decided to recruit a variety of individuals from expert blended teachers to individuals with little or no teaching experience at all. To reach expert blended teachers, we distributed the survey through third parties such as The Learning Accelerator (learningaccelerator.org), and The Alliance for Catholic Education (https://ace.nd.edu/). One local school district also participated with a group of teachers who are using devices in their classrooms. Non-experts were recruited from BYU, along with some willing individuals from within the researchers' circle of influence. Other non-experts include BYU students taking a course titled, "Online and Blended Teaching in K-12." 108 participants (53%) had 0 years of any K-12 teaching experience, 72 participants (36%) had between 1 and 21+ years of blended teaching experience, and 10 participants (5%) had between 1 and 11 years of fully online teaching experience. Over 40% of participants selected elementary education as their area of teaching expertise, and 20% of participants selected special education as their area of expertise (see table 6). We had a total of 189 test takers with at least one valid question item answered, but some participants did not complete the test, so for some questions, our sample size is as small as 146 responses.

Table 6

Participants by Preferred Teaching Subject Area Expertise

Subject Area	Frequency	Percentage
Elementary Education	82	40.6%
Special Education	45	22.3%
Secondary Education: English Language Arts	21	10.4%
Secondary Education: Social Studies/ History	10	5.0%
Secondary Education: Math	3	1.5%
Secondary Education: Visual Arts	2	1.0%
Secondary Education: Physical Education	1	0.5%
Secondary Education: Science	18	8.9%
Secondary Education: Performing Arts	2	1.0%
Secondary Education: World Language	18	8.9%

The test pilot took 35-45 minutes and knowing that some test takers would not complete the entire test, we opted to use a Qualtrics function which randomized the order in which the final three sections of the test were presented (*Technology-Mediated Interactions*, *Personalization*, and *Real-Time Data Practices*). The first two sections of the test were the self-evaluation and the *Blending Online and In-Person Learning* section. These sections have the most responses from participants as a result of being first in the sequence.

Data Analysis Procedures

Using the Mplus software (version 8.0), we conducted a confirmatory factor analysis (CFA) to establish whether the four sections of the test that are objective have factor loadings on the same construct. According to some scholars in the measurement field, for a CFA to be considered accurate, it needs a sample size of at least 250 (Lewis, 2017). As part of our data analysis strategy, we determined to conduct Exploratory Factor Analyses (EFAs) in the event

that the CFAs failed due to low sample size, so as to potentially discover the constructs that the variables on the test measure or learn which items work best together.

The first section of the test that is a disposition self-evaluation has been previously evaluated with a CFA (see Graham et al., 2017). A structural model of the entire assessment is represented in Figure 1.

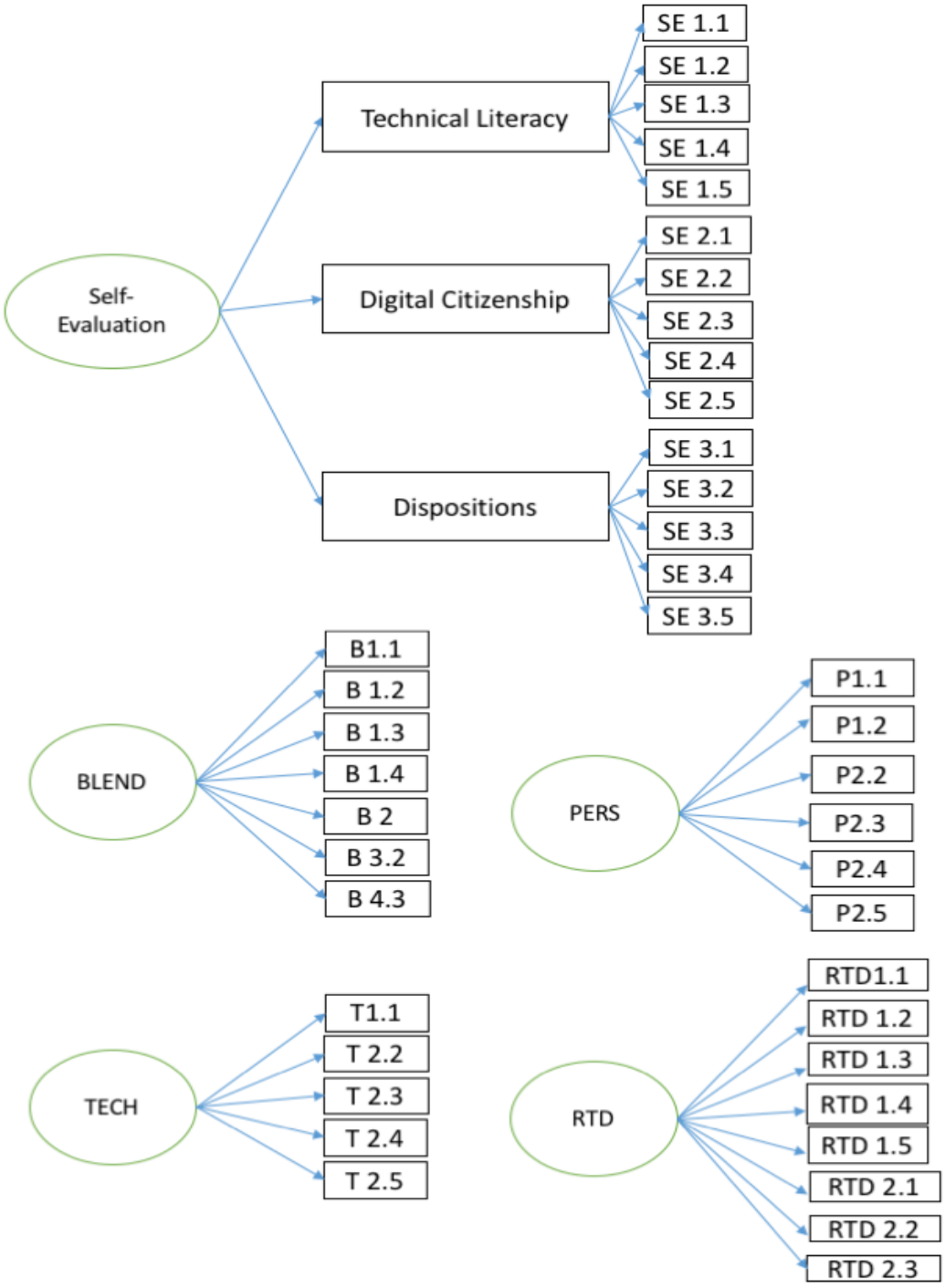


Figure 1. Proposed structural model for assessment variables. BLEND = *Blending online and in-person learning,* TECH = *Technology-Mediated Interactions*, PERS=*Personalization*, RTD= *Real-Time Data Practices.* (The item numbers represent individual question numbers from the assessment found in Appendix A.)

After obtaining data over the course of several months, data were downloaded from Qualtrics into the SPSS software, and the missing data (unanswered/unseen questions) were accounted for before being exported into Mplus for analysis. Missing data were retained and coded as -999 as prescribed in protocols by Wang and Wang (2012).

Findings

The questions this research set out to answer were (a) Does the CFA show unidimensionality of the hypothesized constructs being tested?, and (b) What are the relationships between the score on items of the test and the following participant-level characteristics:

- total years of teaching experience,
- years of online teaching experience,
- years of blended teaching experience,
- perceived preparedness for teaching in a blended environment (self-efficacy)?

The findings indicate there is minimal evidence for unidimensionality on the four constructs from the objectively scored sections of the test. Two constructs, *Technology-Mediated Interactions* and *Personalization*, showed no evidence of unidimensionality, either upon first CFA or even with a reduced CFA. There was more evidence of unidimensionality present in the constructs of *Blending Online and In-Person Learning,* and *Real-Time Data Practices*, but only once the sections had been reduced by several items. Many *Personalization* and *Real-Time Data Practices* question items required individuals to interpret charts of imaginary student data to make informed decisions about a student's next steps.

The test item correlations showed few significant correlations between scoring well on a test item and an individual's experience in (a) blended teaching, (b) online teaching, (c) general K-12 experience, or (d) perceived preparedness for blended teaching.

The findings of our data analyses are explained in three parts of this section: (a) descriptive statistics, (b) CFA results, and (c), item-by-item correlation analyses against the participant level characteristics mentioned above. These findings will be discussed in greater detail in the discussion section, along with theoretical concerns about items.

Descriptive Statistics

Table 7 shows the descriptive statistics of the items on the test: the number of valid responders for each item, number of missing responses, the mean score, standard deviation, and the minimum and maximum score by respondents.

Table 7

Descriptive Statistics Per Item

	N					
	Valid	Missing	Mean	Std. Deviation	Minimum	Maximum
[a]B 1.1	189	13	.4074	.49266	.00	1.00
[a]B 1.2	189	13	.3333	.47266	.00	1.00
[a]B 1.3	189	13	.7566	.43027	.00	1.00
[a]B 1.4	189	13	.6402	.48121	.00	1.00
B 2	189	13	.6667	.47266	.00	1.00
[b]B 3.2	180	22	1.7444	.85301	1.00	4.00
[b]B 4.3	165	37	2.4606	.60922	.75	3.00
T 1	156	46	9.8141	2.80047	2.00	14.00
[b]T 2.2	155	47	2.9613	1.50706	1.00	7.00
T 2.3	153	49	.1895	.39323	.00	1.00
T 2.4	153	49	2.2092	.90796	.00	4.00

T 2.5	153	49	4.3464	1.43417	1.00	7.00
[c]P 1.1	153	49	.5490	.49923	.00	1.00
[c]P 1.2	153	49	.1634	.37094	.00	1.00
[c]P 2.2	150	52	5.5067	1.07283	2.00	7.00
[c]P 2.3	150	52	.7267	.44716	.00	1.00
[c]P 2.4	150	52	.1200	.32605	.00	1.00
[c]P 2.5	146	56	3.6027	1.45023	1.00	6.00
RTD 1.1	150	52	1.0667	.67224	.00	4.00
[c]RTD 1.2	152	50	.3684	.48397	.00	1.00
[c]RTD 1.3	152	50	.1776	.38347	.00	1.00
[c]RTD 1.4	152	50	.1382	.34621	.00	1.00
[c]RTD 1.5	152	50	.4671	.50057	.00	1.00
[c]RTD 2.1	152	50	.3553	.48018	.00	1.00
[c]RTD 2.2	152	50	.3750	.48572	.00	1.00
[c]RTD 2.3	152	50	.2303	.42239	.00	1.00

[a]Knowledge items, about blended learning models.
[b]Self-evaluation items, where the test taker evaluates their performance on a previously answered open-ended item.
[c]Interpretive items, requiring the test taker to select answers on fictitious student data.

Most of the items on the test were scored categorically, usually right or wrong, however several items were continuous, such as T1, in which the participant could receive between 0 and 16 points depending on their answers (see Appendix A for complete item). Many of these items, and whether they should be edited for future iterations of the assessment, are discussed in depth in the discussion section.

Confirmatory Factor Analysis Results

We ran individual CFAs on the four latent constructs in question: (a) *Blending Online and In-Person Learning* (BLEND), (b) *Technology-Mediated Interactions* (TECH), (c) *Personalization* (PERS), and (d) *Real-Time Data Practices* (RTD). As a point of reference, good model fit is indicated by a comparative fit index (CFI) and a Tucker-Lewis index (TLI) greater than 0.9, and root mean square error of approximation (RMSEA) and weighted root mean square

residual (WRMR) of less than .08 (Wang & Wang, 2012). All initial CFAs were conducted with a weighted least squares approach (WLSMV) estimator because of the presence of both categorical and continuous test items in the assessment. Table 8 presents the CFA fit statistics per full latent construct, where the initial CFA did not fail to converge. When full latent construct CFAs failed, we ran an EFA to determine which items were most problematic. We also reduced the construct accordingly. Such was the case with latent constructs of BLEND and PERS. Due to some overlap in constructs, PERS and RTD (many assessment items included interpreting data tables), those items were combined into a single CFA. In instances where the reduced CFA did not yield unidimensionality, another EFA was conducted using the reduced CFA items to produce a further reduced CFA. Full item factor loadings for each CFA in Table 8 are in Appendix C.

Table 8

Fit Statistics for Confirmatory Factor Analyses

Latent Construct	**Items Included**	**CFI (good fit > .9)**	**TLI (good fit > .9)**	**RMSEA (good fit < .08)**	**WRMR (good fit < .08)**
BLEND	All blend items	Did not converge			
BLEND reduced**	B1.1, 1.2, 1.3, 1.4, 2. 3.2	1.000 Good	1.048 Good	0.000 Good	0.571 Poor
BLEND further reduced***	B1.2, 1.3, 1.4, 2	1.000 Good	1.171 Good	0.000 Good	0.442 Poor
TECH	T1.1, 2.2, 2.3, 2.4, 2.5	1.000 Good	1.000 Good	0.000 Good	.220 Poor
PERS	All PERS items	Did not converge			
PERS reduced**	P1.1, 1.2, 2.2, 2.5	1.000 Good	1.000 Good	0.000 Good	0.188 Poor
RTD	RTD 1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3	.499 Poor	.298 Poor	.055 Good	.860 Poor
RTD reduced**	RTD 1.3, 1.4, 1.5	1.000 Good	1.755 Good	0.000 Good	0.575 Poor
PERS & RTD combined (interpretive table items)	P 1.1, 1.2, 2.2, 2.3, 2.4 & 2.5 RTD 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3	0.944 Good	0.930 Good	0.017 Good	0.781 Poor
PERS & RTD combined, reduced****	P 1.1, 2.5 RTD 1.3, 1.4, 1.5, 2.3	0.691 Poor	0.587 Poor	0.055 Good	0.908 Poor

*NOTE: Although the fit statistics for many of the constructs yielded good results, the individual item factor loadings were not significant ($p<.05$) for most of the CFAs. Individual CFA factor loadings are in Appendix B.
**These reduced CFAs were run following an EFA, where we retained items that showed potential for unidimensionality.
***From *BLEND reduced* EFA
****From *PERS & RTD combined* EFA

Item Correlation Results

The only test items that have correlations are those which could be objectively scored, and therefore the self-evaluation section items are not included. Missing values were treated as

missing and not as 0. The test items were all scored positively, so positive correlations show where more teaching experience (general K-12, blended, or online) or perceived preparedness, yielded significantly better scores at the item level. Negative correlations show where more experience in teaching, or higher levels of perceived preparedness, were associated with scoring poorly on a particular item (see Table 9).

Table 9

Item Correlations with Participant-Level Characteristics.

Section	Item and SLO associated with item	K-12 Years Taught	Blended Teaching Years	Online Teaching Years	Perceived Preparedness to Blend (scale 1-6)
BLEND	B 1.1 (n=189) Understands models of blending in the school space	-.006	-.011	.009	.062
	B 1.2 (n=189) Understands models of blending in the school space	-.048	-.032	.026	-.018
	B 1.3 (n=189) Understands models of blending in the school space	.091	.002	-.062	.112
	B 1.4 (n=189) Understands models of blending in the school space	.015	.020	.034	.144*
	B 2 (n=189) Knows how to build on online experiences in class, vice versa	-.087	-.006	-.005	-.009
	B 3.2 (n=180) Knows techniques for transitioning students in class from technology to f2f activities, and vice versa (self-evaluation)	-.079	-.105	-.099	.032
	B 4.3 (n=165) Understands how to effectively transform in-person activities into blended ones	.028	-.043	-.047	.054
TECH	T1 (n=156) (Identifies basic benefits of synchronous / asynchronous / in-person communication)	-.236**	-.251**	-.019	-.169*

Section	Item and SLO associated with item	K-12 Years Taught	Blended Teaching Years	Online Teaching Years	Perceived Preparedness to Blend (scale 1-6)
	T2.2 (n=155) Creates an asynchronous discussion prompt for deeper level thinking (self-evaluation)	-.204*	-.108	-.092	.211**
	T2.3 (n=153) Understand effective facilitation of an online asynchronous discussion	-.175*	-.106	-.067	.047
	T 2.4 (n=153) Understand effective facilitation of an online asynchronous discussion	.057	.142	.128	.168*
	T2.5 (n=153) Understand effective facilitation of an online asynchronous discussion	-.149	-.163*	-.079	-.110
PERS	P1.1 (n=153) Understands how to effectively group students homogeneously	.109	.135	.065	-.101
	P1.2 (n=153) Understands how to effectively group students heterogeneously	-.021	.020	-.054	.064
	P2.2 (n=150) Understands how to manage a class where students are working at varying paces	-.190*	-.122	-.123	-.056
	P2.3 (n=150) Understands how to personalize instruction based on student interests	-.208*	-.230**	-.115	-.164*
	P2.4 (n=150) Understands importance of mastery-based grading in aiding personalization	.192*	.176*	.002	.137
	P2.5 (n=146) Understands how to help students set mastery goals	-.075	-.034	.064	-.034

Section	Item and SLO associated with item	K-12 Years Taught	Blended Teaching Years	Online Teaching Years	Perceived Preparedness to Blend (scale 1-6)
RTD	R1.1 (n=150) Understands need to check data consistently, frequently	-.009	-.102	.105	-.112
	RTD1.2 (n=152) Understands how to select assessments or assessment items that produce valid objective-referenced real-time data	.167*	.116	-.089	-.030
	RTD1.3 (n=152) Recognizes trends in student achievement data	.075	.185*	.210**	.149
	RTD1.4 (n=152) Recognizes trends in student achievement data	-.015	-.026	.178*	.009
	RTD1.5 (n=152) Recognizes student activity trends in data	-.053	-.088	.109	-.064
	RTD2.1 (n=152) Interprets dashboards for purposes of changing instruction for students	-.007	-.018	-.086	.099
	RTD2.2 (n=152) Interprets dashboards for purposes of changing instruction	-.057	-.127	-.074	-.105
	RTD2.3 (n=152) Interprets dashboards for purposes of modifying future courses/curriculum	-.033	-.021	.176*	-.067

*p<.05 **p<.01

Significant correlations from BLEND section. Participants with higher perceived preparedness to BLEND, positively correlated with an item that asked about knowledge of blended learning models (B1.4). This was the only significant correlation in this section.

Significant correlations from TECH section. Teachers with more blended teaching and more general K-12 teaching experience, as well as those who perceived high levels of preparedness for blended teaching correlated negatively with the item that asked them to identify basic benefits of different modes of discussion (T1). Teachers with more teaching experience in general also negatively correlated with the item that asked them to create and evaluate their own asynchronous discussion prompt, while individuals who perceived their preparedness to blend at higher levels positively correlated with this activity (T2.2). Three items in this section addressed understanding how to facilitate an asynchronous discussion: greater K-12 experience negatively correlated with one item (T2.3), greater blended teaching experience correlated negatively with another (T2.5), and higher perceived preparedness to blend correlated positively with the other (T2.4). This shows that there is not a consistent correlation pattern between increased perceived preparedness or more teaching experience with the understanding of facilitating asynchronous discussion.

Significant correlations from PERS section. Teachers with more K-12 teaching experience and teachers with more blended teaching experience had significantly high correlations with an item about mastery-based grading aid with a teacher's personalization efforts (P 2.4). However, greater levels of experience teaching and blended teaching showed negative correlations with understanding how to personalize instruction based on student interests (P 2.3). Teachers with more K-12 teaching experience also showed negative correlation

with the item about knowing how to manage a class where students move at varying paces (P2.2).

Significant correlations from RTD section. In general, those with more experience teaching online performed better on items in the *Real-Time Data Practices* section, and significant correlations were found on items addressing the ability to recognize trends in student achievement (RTD 1.3 and 1.4), and to interpret dashboards to modify future courses and curriculum (RTD 2.3). More general K-12 teaching experience was significantly correlated with selecting assessment items that produce valid, real-time data (RTD 1.2). There were no significant negative correlations from this section of the test.

Discussion and Limitations

Here we discuss the implications and limitations of the current data taken from the assessment. While we believe the effort has been an important one, there are many factors that can be examined more carefully to improve the assessment for future iterations.

Item Correlation Observations

K-12 blended or K-12 general teachers, although familiar with technology tools and resources, are not necessarily competent in designing or grading online asynchronous discussions or understanding the affordances of asynchronous, synchronous, or in-person discussion. Students who have zero years of teaching experience are likely enrolled at the university and might have experienced online discussions as a student and have a better feel for how to run or grade a discussion even though they haven't taught in the K-12 classroom. *Technology Mediated Interactions* was also an area that we see being ignored in many blended classrooms because teachers are used to interacting with students through in-person means (Broderson & Melluzzo, 2017).

High perceived preparedness to teach in a blended environment did not correlate with a high score on any of the areas, and this corroborates other studies which say that a self-evaluation of skill is often inflated and inaccurate, especially when people have very little experience in a domain (Lichtenstein, Fischhoff, & Phillips, 1982).

Item Performance

In general, there is little relationship between scoring well on the test and having more teaching experience, which may simply indicate the oft-mentioned need to improve preparation and training materials so every teacher can learn the skills needed for a blended and online teaching (Archambault et al., 2014). Based on these results, there are several specific items that we believe require extensive editing, or that should be thrown out of the test entirely to improve the test's validity.

In general, we found that the test does not overall discriminate between those test takers who have experience with blended teaching and those that do not. Table 10 contains a table of items and proposed changes in order to assist with clarity of the instrument and measuring latent constructs appropriately.

Table 10

Item Revision Suggestions for Future Test Iterations

Item	Current Question	Possible Revision(s)	Rationale for revising item
P1.1	(Based on 3 tracker images) Misty, Brock and Ash would best be homogeneously grouped to work on ___	• Include definition of "homogeneously" • Remove "best" term, might connote subjectivity	• Pilot student feedback
P1.2	(Based on 3 tracker images) Misty, Brock and Ash would best be heterogeneously grouped to work on ___	• Include definition of "heterogeneously" • Reduce number of trackers analyzed to 2 • Remove "best" term	• Pilot student feedback • Lack of variability on the item (too hard)
P 2.4	(Based on 3 tracker images) You have decided to focus more class time on 6.1 before progressing. The best plan for re-teaching 6.1 is to _____	• Reduce number of trackers • Remove "best" term, which might connote subjectivity.	• Lack of variability (too hard) • Pilot student feedback

T1.1	Identify the characteristics/ benefits listed below as belonging to asynchronous/synchronous/ in-person conversation	• Remove or edit characteristics that are more subjective in nature:
		  • ("allows group collaboration" could become "allows real-time group collaboration")
		  • Allows spontaneity in discussion structure (define spontaneity)
		  • Provides strict guidelines to facilitate discussion (remove)
		  • Prevents feelings of isolation (remove)
		• Separate the item into several separate multiple-choice items for better distinctions and granularity (perhaps into three items: asynchronous, synchronous, in-person)
			Expert opinion: some benefits in the list are subjective

T2.2	Evaluate your discussion prompt. Select any of the following details that you included in your discussion prompt	• Have students evaluate the same discussion prompt rather than self evaluate their own written prompt (objective, not self-evaluative) • Remove item asking for discussion prompt writing	Not an objectively scored or easy auto-scored item
B1.1-4	SLO: Understands models of blending in school space	• Remove items;	Items do not help differentiate skills and

Item	Current Question	Possible Revision(s)	Rationale for revising item
			abilities, rather they are knowledge focused.
B 4.3	Evaluate your rationale [for why you updated your lesson for blended in this way]. Select any 3 of the following benefits that you included in your rationale (maximum of 3).	• Remove item, since it is self-evaluative-- better used in an authentic context (badging, class activity, etc.) • Have test takers evaluate the same lesson plan that has been transformed into a blended one	Item caused initial BLEND CFA to fail
R2.1	(Based on 2 tracker images) In helping students achieve mastery on X and X standard, it would be best to suggest ___	Remove "best" or "suggest" language, do you pair lows/high students together or students close in ability? More detail needed.	Pilot student feedback
RTD 2.3	(Based on 2 tracker images) Your subject area coordinator asked all the teachers to look at the data from the end of the quarter to determine areas for improvement in teaching next year. If this mastery data is from the end of the quarter, then next year, we should revise how we teach _____	Be more specific: (for example, "Which standard should we focus on improving our teaching for next year, based on student data?")	Pilot student feedback

Here are some examples from the table above of the changes that we propose, with rationale for editing and improving items.

Item B4.3 caused the BLEND segment to fail to converge, so we believe this item requires extensive revision or should be removed from the test altogether. As it is a self-evaluation question, requiring the test taker to evaluate their own response, this item may be better suited for an activity that is graded by another individual, rather than the test taker self-evaluating their own performance. If access to natural language processing software became available, it might be another viable option in grading open-ended items, but that is not a viable option at this time. Examples of this kind of grading are done widely in standardized testing (Attali, Powers, Freedman, Harrison, & Obetz, 2008).

Items P 2.4 and RTD 2.1 both had negative factor loadings in the combined (PERS and RTD) CFAs, which was unexpected. Upon closer inspection of those items, both of them were perceived by our pilot test takers to be questions that were subjective in nature, and therefore, perhaps students did not consult the diagrams very closely before selecting their answers. While we attempted to edit the questions thoroughly after the pilot test was over, these questions should be revised further by incorporating better language that ensures a test taker knows there is a correct and an incorrect answer. Items T1 and P1.2, likewise, were items that negatively loaded onto the latent constructs, and our pilot test takers indicated that they wanted definitions for terms: asynchronous, synchronous, heterogeneous, and homogeneous. We revised item T1 after the pilot test to include definitions, however, we did not include the definitions for item P1.2 (heterogeneous and homogeneous). We can easily edit the item to include the definition and see if it improves understanding of the question and improves convergence on the latent construct. P 1.1, which is analogous to question P1.2, did not negatively load on the latent construct.

CFA Results Limitations

Ideally, a high score on this test would indicate a teacher's likelihood of implementing blended teaching practices in their own classroom, or at the very least their willingness to do so in the future. Nevertheless, this assumption is in doubt because of the poor psychometric properties observed from this instrument test results. We have several ideas as to why and how the item factors did not load equally onto the latent constructs in the CFAs.

Small sample size. We did not reach the lower limit of recommended sample size (n=250) that some measurement experts have indicated is satisfactory for running accurate CFAs (Lewis, 2017). This could be accomplished by sending the test out to targeted blended schools, having more preservice teachers take the test, inviting a wider range of non-experts to take the test, and allowing for the test to be refined according to the current analysis.

Construct complexity and item complexity. Blended learning and teaching are emerging fields, and therefore, some areas that we have tested do not have robust enough literature to verify competencies or guiding principles. For example, testing the concept of a teacher's ability to transition students between online and in-person activities (B 3.2) was difficult to determine due to the lack of literature on that specific subject. Further guidance from experts in the field could shed light on whether the assessment item addressing this construct effectively represents the general practices that are taking place in blended classrooms.

Another challenge for an emerging field is the lack of consensus on the most important skills and competencies. While our test targets competencies that overlap mostly with The Learning Accelerator, they are drawn from literature that is still evolving. Another potential area for future research is work that more efficiently captures blended teaching competencies. Evaluating some competencies in a real-school environment would likely require building a

separate, detailed rubric for evaluators and include different skills or objectives than are outlined in this study, though some may overlap.

The complexity of some of the items that we wrote for the test may also account for lack of acceptable factor loadings. For example, some items required the test taker to evaluate their own free-response. This is unlike most objectively-scored tests, in that the test does rely on the objectivity of the test taker to report their score. In future uses, perhaps the test will contain only items that are objectively scored rather than a mix of short answer, self-evaluation, and objectively-scored items in order to increase the similarities between items within a general construct.

Test length. Despite our pilot test takers (14 subjects) taking an average of 35-40 minutes for the test, the average duration for this test was much higher (around nine hours), due to individuals beginning the test, then coming back to it after long periods of inactivity. The median duration for test takers was 65 minutes, which may be a more accurate estimation of the length of time it takes to finish the test in a single sitting. The length of the test itself may also have created a high amount of cognitive load on test takers, which might have decreased test performance. Some competencies, though desirable skills, were ill-suited for an objectively-scored test, and in interest of keeping the test in a reasonable time frame, we concluded that we should pare down the number of SLOs addressed in the assessment to those we could clearly capture well within the framework of the evaluation instrument.

In the future it is plausible that, rather than an entire test comprised of four separate sections, that there would be separate, shorter assessments focusing on the latent constructs. Items from the PERS and RTD category in particular, could be combined into a single construct, refined, and then used as a tool to measure a teacher's ability to interpret student data.

Conclusion

When we began writing this test, it was with the understanding that blended teaching is ill-defined compared to other fields of study that have cognitive tests of ability. Therefore, this exploration and research of an objective, criterion referenced test is part of an emerging field and represents one of the first efforts of its kind. What has been learned from the process of test development and data analysis can be used to inform the future of the test itself and the field, as the skills K-12 teachers need in our technology-rich society continue to evolve and grow at a rapid pace. However, we believe further refinement of the assessment instrument is necessary to improve the test's accuracy.

We believe this is a good first attempt to objectively measure skills and understanding required by teachers in a blended environment. To effectively implement blended learning throughout the country, there would need to be a scalable way to relay the necessary skills blended teaching requires. The Learning Accelerator and The Highlander Institute are among several education groups that are attempting to see how we can effectively implement blended learning at scale. Scalable enterprises rely on data and some forms of automation, automation that often includes testing. As was mentioned in the introduction, this test eventually needs to be efficiently implemented across preservice educators at BYU as a valid measure of their ability to teach in a blended environment.

While writing an objectively measured and scored test of blended teaching competencies is not an easy endeavor, it is a worthwhile one for the future of blended teaching. Not only will it help us understand teacher competencies, but we will then be more able to deliver targeted materials for professional development. If the test itself can mimic the adaptive software used by many of the blended teachers (such as Khan Academy, Lexia Learning, etc.), then it has the

potential to model for teachers what they will be doing with their own students as part of using technology to personalize instruction in blended learning settings.

References

American Educational Research Association, American Psychological Association, & National Council on Measurement in Education. (2014). *Standards for educational and psychological testing.* Washington, DC: American Educational Research Association.

Archambault, L., DeBruler, K., & Freidhoff, J. (2014). K-12 online and blended teacher licensure: Striking a balance between policy and preparedness. *Journal of Technology and Teacher Education*, *22*(1), 83–106. Retrieved from http://www.editlib.org/p/112361/share

Arney, L. (2015). *Go blended! A handbook for blending technology in schools.* San Francisco, CA: Jossey-Bass.

Attali, Y., Powers, D. E., Freedman, M., Harrison, M., Obetz, S. A. (2008). *Automated scoring of short-answer open-ended GRE subject test items.* (Report # GREB-04-02, RR-08-20) Retrieved from ets.org: http://dx.doi.org/10.1002/j.2333-8504.2008.tb02106.x

Bakia, M., Anderson, K., Heying, E., Keating, K., & Mislevy, J. (2011). *Implementing online learning labs in schools and districts: Lessons from Miami-Dade's first year.* Menlo Park, CA: SRI International.

Bernard, R. M., Borokhovski, E., Schmid, R. F., Tamim, R. M., & Abrami, P. C. (2014). A meta-analysis of blended learning and technology use in higher education: From the general to the applied. *Journal of Computing in Higher Education*, *26*(1), 87-122.

Graham, C. R., Borup, J., Pulham, E., & Larsen, R. (2017). *K-12 blended teaching readiness: Phase 1- instrument development.* Lansing, MI: Michigan Virtual University. Retrieved from https://mvlri.org/research/publications/k-12-blended-teaching-readiness-instrument-development/

Gronlund, N. E., & Brookhart, S. M. (2009). *How to write and use instructional objectives* (8th ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Horn, M. B., & Staker, H. (2014). *Blended: Using disruptive innovation to improve schools.* San Francisco, CA: Jossey-Bass, A Wiley Brand.

Jackson, D. L., Gillaspy, J. A., & Purc-Stephenson, R. (2009). Reporting practices in confirmatory factor analysis: an overview and some recommendations. *Psychological Methods*, *14*(1), 6–23. http://doi.org/10.1037/a0014694

Lewis, T. F. (2017). Evidence regarding the internal structure: Confirmatory factor analysis. *Measurement and Evaluation in Counseling and Development, 50*(4), 239-247. doi: 10.1080/07481756.2017.1336929

Lichtenstein, S., Fischhoff, B., & Phillips, L.D. (1982). Calibration of probabilities: The state of the art to 1980. In D. Kahneman, P. Slovic, & A. Tversky (Eds.), *Judgment under uncertainty: Heuristics and biases* (pp. 306-334). Cambridge, UK: Cambridge University Press.

McAllister, L., & Graham, C. R. (2016). An analysis of the curriculum requirements for all online K-12 teaching endorsements in the U.S. *Journal of Online Learning Research, 2*(3), 247–282. Retrieved from https://www.learntechlib.org/primary/p/173220/

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010). *Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies.* U.S. Department of Education. Retrieved from http://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf

Miller, M. D., Gronlund, N., & Linn, R. L. (2013). *Measurement and assessment in teaching* (11th ed.). New York, NY: Pearson.

Molnar, A., Miron, G., Gulosino, C., Shank, C., Davidson, C., Barbour, M.K., . . . & Nitkin, D. (2017). *Virtual schools report 2017.* Boulder, CO: National Education Policy Center. Retrieved from http://nepc.colorado.edu/publication/virtual-schools-annual-2017

Norberg, A., Dziuban, C., & Moskal, P. D. (2011). A time-based blended learning model. *On the Horizon*, *19*(3), 207–216.

Oliver, K. M., & Stallings, D. (2014). Preparing teachers for emerging blended learning environments. *Journal of Technology and Teacher Education. 22*(1), 57–81. Retrieved from https://www.learntechlib.org/p/112374/

Oliver, W. L. (2014). *Oliver's framework for blended instruction.* Retrieved from http://blendedpractice.com/wp-content/uploads/2015/11/Olivers-Blended-Framework-for-Instruction.pdf

Parks, R. A., Oliver, W., & Carson, E. (2016). The status of middle and high school instruction: Examining professional development, social desirability, and teacher readiness for blended pedagogy in the southeastern United States. *Journal of Online Learning Research*, *2*(2), 79–101.

Pulham, E., & Graham, C. R. (2018). Comparing K12 online and blended teaching competencies: A review of the existing literature. *Distance Education*, *4*(1), 1–22. https://doi.org/10.1080/01587919.2018.1476840

Pulham, E.B. (2018). *Measurement project: blended teaching competency assessment.* Unpublished manuscript, Department of Instructional Psychology & Technology, Brigham Young University, Provo, Utah.

Staker, H. (2011). *The rise of K-12 blended learning: Profiles of emerging models.* Retrieved from https://www.christenseninstitute.org/wp-content/uploads/2013/04/The-rise-of-K-12-blended-learning.emerging-models.pdf

The District Reform Support Network. (2015). *Blended learning readiness and progress rubric*. Retrieved from https://rttd.grads360.org/#communities/pdc/documents/7209

The Highlander Institute. (2017). *Fuse RI district readiness survey.* Retrieved from https://highlanderinstitute.org/work/resources/

The Learning Accelerator (n.d.). *Practices at work.* Retrieved from http://practices.learningaccelerator.org/

The New Teacher Project (2014). *Recruitment and selection: Assessing your existing talent.* Retrieved from https://tntp.org/assets/documents/TNTP_BlendedLearning_TalentAssessment_2014.pdf

Tucker, C. R. (2012). *Blended learning in grades 4-12: Leveraging the power of technology to create student-centered classrooms.* Thousand Oaks, CA: Corwin Press.

Utah Administrative Code R277-504-4.C.3.c-f, n.d

Wang, J., & Wang, X. (2012). *Structural equation modeling: Applications using Mplus*. West Sussex, United Kingdom: John Wiley & Sons.

APPENDIX A

Graded Test Items

SE.1 TECHNICAL LITERACY

Rate your ability to do the following:

	1=Very Limited . . . 6=Very High					
	1	2	3	4	5	6
1. Master new online technologies on your own.	O	O	O	O	O	O
2. Successfully troubleshoot unfamiliar technological issues that you and students encounter.	O	O	O	O	O	O
3. Use the tools commonly found in a learning management system (e.g., grade book, announcements, content pages, quizzes, discussion boards).	O	O	O	O	O	O
4. Use content-specific educational software outside of the learning management system (e.g., math/literacy/science educational software, educational games).	O	O	O	O	O	O
5. Find quality online content resources relevant to student learning needs (e.g., media resources, lesson plans, etc.).	O	O	O	O	O	O

SE.2 DIGITAL CITIZENSHIP

Rate your ability to do the following:

	1=Very Limited . . . 6=Very High					
	1	2	3	4	5	6
1. Model the legal use of instructional materials (e.g. copyright, fair use, creative commons).	O	O	O	O	O	O
2. Ensure student online privacy (e.g., technology use agreements for sharing student data, protection of online data and identities).	O	O	O	O	O	O
3. Model online safety for students (e.g., ensure password protection, protect against cyberbullying, detect scams, use content filters and virus software, etc.).	O	O	O	O	O	O
4. Ensure academic honesty in an online learning environment (e.g., prevent cheating, check for plagiarism, etc.).	O	O	O	O	O	O
5. Ensure access to online learning activities for all students (e.g., low socioeconomic status, English language learners, special education, gifted, etc.).	O	O	O	O	O	O

SE.3 DISPOSITIONS

Rate your agreement with the following:

	1=Very Low . . . 6=Very High					
	1	2	3	4	5	6
1. I believe students perform better when they have some control over the pace of their learning.	O	O	O	O	O	O
2. I believe individual student access to devices in the classroom should enable students to take greater ownership of their learning.	O	O	O	O	O	O
3. I believe online technologies allow students and teachers to do things that would be difficult or impossible in the traditional classroom.	O	O	O	O	O	O
4. I believe it is important for teachers to explore new teaching strategies that blend face-to-face and online learning.	O	O	O	O	O	O
5. I believe individual student access to devices in classrooms enables development of important skills (e.g., creativity, collaboration, critical thinking, communication).	O	O	O	O	O	O

B.1 BLENDED LEARNING MODELS

B.1.1 Allows students to move on fluid schedules among learning activities according to their needs. Teachers provide support and instruction on an as-needed basis while students work through course curriculum and content

- Flipped Classroom
- Enriched Virtual
- Hybrid Classroom
- Flex
- Station Rotation
- A la Carte
- Individual Rotation

B.1.3 Students move through spots in a classroom on a fixed schedule, where at least one of the spots is an online learning location.

- Individual Rotation
- Flipped Classroom
- Lab Rotation
- Enriched Virtual
- A la Carte
- Station Rotation
- Flex

B.1.4 Students learn at home via online coursework and lectures, and teachers use class time for teacher-guided practice or projects

- Station Rotation
- Flipped Classroom
- Flex
- Individual Rotation
- A la Carte
- Enriched Virtual
- Lab Rotation

B.2 EFFECTIVE BLENDING

You want students to watch a video of an educational, but highly debated topic and write a short response. Which is the most effective example of blended teaching?

- Assign the video as homework and have students post their responses online
- Have students submit responses online, and pair up students with opposing viewpoints in a face-to-face discussion in class
- Show the video in class and discuss it as a class
- Give students time in class to respond to a peer's response via a discussion board

B.3.2 Which of the following categories do your guidelines fit into? Check any that apply.

- Student movement (how students physically move from one activity to another)
- Systems and setups (logins, passwords, updated software)
- Hardware management (checking out devices, headsets)
- Students helping other students (peers helping each other than always asking the teacher)

B.4.3 Evaluate your rationale. Select any 3 of the following benefits that you included in your rationale (maximum of 3).

Learning Effectiveness

- Increases student participation
- Allows a more interactive experience using technology
- Students are creating something new using technology in this activity
- Allows for individual pacing
- Allows us to personalize learning for individual students
- Increases personal interaction with or between students
- Helps ensure student preparation for in-person activities
- Enables learning to take place in authentic places outside the classroom

Access and Flexibility

- Gives increased access to entire class
- Gives increased access to ELL or struggling learners
- Allows those who miss class to have access to materials

Cost Effectiveness

- Reduces supplies required for the activity
- Reduces time required by students
- Reduces time required by teacher

Other

- Other:

P.1 STUDENT GROUPING

Use the trackers to answer the following questions.

ATTENDANCE TRACKER

SIS ID	Student Name	NOTES	Days > M	T	W	R	F	M	T	W	R	F	M	T	W	R	F	M	T	W	R	F	M	T	W	R	F
			1.1.a	4.1.a	2.1.b	4.1.a	5.2.e	3.1.b	5.2.e	5.3.a	5.3.a	6.1	2.1.b														
30662667	Celadon, Erika																										
30662654	Centro, Jenny				T																						
30662636	Cerulo, Misty											X															
30662666	Lillis, Jessie						A		A																		
30662655	Pallet, Ash											X															
30662645	Pewter, Brock											X															
30662656	Rocket, James		T					T			T																

Key
T = Tardy
A = Absent/Unexcused
X = EXcused/Field Trip
I = In School Suspension
O = Out of School Suspension

GRADE BOOK

SIS ID	Student Name	Letter Grade	Total Points	Grade Percent	Each Points >		5		10	10		5		25	15		15	15		25	15		50
					Standards & Assignments		1.1.a	Post #1	2.1.b	WS #1	WS #2	3.1.b	WS #1	4.1.a	WS #1	Quiz #1	5.2.e	WS #1	Quiz #1	5.3.a	WS #1	Quiz #1	6.1	Essay #1
30662667	Celadon, Erika	A	180	95%				3		10	10		3		24	14		15	15		24	14		48
30662654	Centro, Jenny	B	159	84%				5		9	10		3		23	11		15	11		25	8		39
30662636	Cerulo, Misty	B	119	85%				5		9	10		5		21	11		14	11		22	11		-
30662666	Lillis, Jessie	A-	140	90%				3		10	10		3		23	10		-	-		24	11		50
30662655	Pallet, Ash	B	119	85%				5		9	8		4		21	14		13	14		20	11		-
30662645	Pewter, Brock	C	105	75%				4		8	9		5		20	8		12	10		19	10		-
30662656	Rocket, James	C-	133	70%				2		9	9		3		19	11		11	10		20	9		30

MASTERY TRACKER

SORT: Last, First / A - Z	1.1.a	2.1.b	3.1.b	4.1.a	5.2.e	5.3.a	6.1
Celadon, Erika 30662667	NEAR MASTERY	MASTERY	NEAR MASTERY	MASTERY	MASTERY	MASTERY	MASTERY
Centro, Jenny 30662654	MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	NEAR MASTERY
Cerulo, Misty 30662636	MASTERY	MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION
Lillis, Jessie 30662666	NEAR MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	NEAR MASTERY	MASTERY
Pallet, Ash 30662655	MASTERY	MASTERY	MASTERY	MASTERY	MASTERY	NEAR MASTERY	REMEDIATION
Pewter, Brock 30662645	MASTERY	MASTERY	MASTERY	REMEDIATION	NEAR MASTERY	NEAR MASTERY	REMEDIATION
Rocket, James 30662656	REMEDIATION	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	REMEDIATION

P.1.1 Misty, Ash, and Brock would best be homogeneously grouped to work on _____

1.1.a

6.1

5.2.e

3.1.b

P.1.2 Misty, Ash, and Brock would best be heterogeneously grouped to work on _____

3.1.b

5.2.e

4.1.a

5.3.a

P.2.2 Label the following guidelines as Effective or Ineffective for managing a class in which students are working at various paces. If the guideline is ineffective, re-write it to be effective. If the guideline is effective, write what makes it effective.

	Choose		Re-write or Justify
	Effective	Ineffective	If ineffective, write your revised guideline here. If effective, write what makes it effective.
1. Provide whole class instruction for course content.	○	○	
2. Prioritize answering questions for students who are furthest behind.	○	○	
3. Provide students with additional resources to use if they get stuck.	○	○	
4. Group students together who are working on similar activities.	○	○	
5. Have students seek help from peers before consulting the teacher.	○	○	
6. Let students attempt to discover solutions on their own.	○	○	
7. Give prizes to students who finish ahead of or on your own specified deadline.	○	○	

Use any of the trackers to answer the following question.

LMS ACTIVITY TRACKER					
Student Name	Login ID	SIS ID	Section	Last Activity	Total Activity
Celadon, Erika	ec2667	30662667	3rd	Yesterday, 1:28pm	23:13:26
Centro, Jenny	jc2654	30662654	3rd	Yesterday, 1:32pm	25:11:45
Cerulo, Misty	mc2636	30662636	3rd	2 Days Ago, 1:31pm	22:08:53
Lillis, Jessie	jl2666	30662666	3rd	2 Days Ago, 12:12pm	12:47:32
Pallet, Ash	ap2655	30662655	3rd	Today, 7:15am	46:39:51
Pewter, Brock	bp2645	30662645	3rd	Today, 7:22am	40:27:12
Rocket, James	jr2656	30662656	3rd	2 Days Ago, 12:53pm	10:26:44

Student	Top Interest	Second Interest	Third Interest
Erika	Sports	Music	Movies
Jenny	Movies	Reading	Video Games
Misty	Reading	Music	Art
Jessie	Movies	Sports	Music
Ash	Sports	Video Games	Movies
Brock	Music	Art	Sports
James	Art	Movies	Music

P.2.3 Which students are most likely to be excited about creating a video for a project?

Jenny, Jessie, and James

Jenny, Ash, and James

Jenny, Jessie, and Ash

Erika, Ash, and James

Use the trackers to answer the following questions.

ATTENDANCE TRACKER

SIS ID	Student Name	NOTES	1.1.a	4.1.a	2.1.b	4.1.a	5.2.e	3.1.b	5.2.e	5.3.a	5.3.a	6.1	2.1.b
	Days >		M	T	W	R	F	M	T	W	R	F	M
30662667	Celadon, Erika												
30662654	Centro, Jenny				T								
30662636	Cerulo, Misty											X	
30662666	Lillis, Jessie						A		A				
30662655	Pallet, Ash											X	
30662645	Pewter, Brock											X	
30662656	Rocket, James		T					T			T		

Key
T = Tardy
A = Absent/Unexcused
X = EXcused/Field Trip
I = In School Suspension
O = Out of School Suspension

GRADE BOOK

SIS ID	Student Name	Letter Grade	Total Points	Grade Percent	Standards & Assignments	1.1.a	Post #1	2.1.b	WS #1	WS #2	3.1.b	WS #1	4.1.a	WS #1	Quiz #1	5.2.e	WS #1	Quiz #1	5.3.a	WS #1	Quiz #1	6.1	Essay #1
	Each Points >						5		10	10		5		25	15		15	15		25	15		50
30662667	Celadon, Erika	A	180	95%			3		10	10		3		24	14		15	15		24	14		48
30662654	Centro, Jenny	B	159	84%			5		9	10		3		23	11		15	11		25	8		39
30662636	Cerulo, Misty	B	119	85%			5		9	10		5		21	11		14	11		22	11		-
30662666	Lillis, Jessie	A-	140	90%			3		10	10		3		23	10		-	-		24	11		50
30662655	Pallet, Ash	B	119	85%			5		9	8		4		21	14		13	14		20	11		-
30662645	Pewter, Brock	C	105	75%			4		8	9		5		20	8		12	10		19	10		-
30662656	Rocket, James	C-	133	70%			2		9	9		3		19	11		11	10		20	9		30

MASTERY TRACKER

SORT: Last, First / A - Z		1.1.a	2.1.b	3.1.b	4.1.a	5.2.e	5.3.a	6.1
Celadon, Erika	30662667	NEAR MASTERY	MASTERY	NEAR MASTERY	MASTERY	MASTERY	MASTERY	MASTERY
Centro, Jenny	30662654	MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	NEAR MASTERY
Cerulo, Misty	30662636	MASTERY	MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION
Lillis, Jessie	30662666	NEAR MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	NEAR MASTERY	MASTERY
Pallet, Ash	30662655	MASTERY	MASTERY	MASTERY	MASTERY	MASTERY	NEAR MASTERY	REMEDIATION
Pewter, Brock	30662645	MASTERY	MASTERY	MASTERY	REMEDIATION	NEAR MASTERY	NEAR MASTERY	REMEDIATION
Rocket, James	30662656	REMEDIATION	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	REMEDIATION

P.2.4 You have decided to focus more class time on 6.1 before progressing. The best plan for re-teaching 6.1 is to _____

- ask Erika to help James understand how he can improve, as you provide guidance and instruction to Misty, Ash, and Brock
- ask Jenny, Jessie, and Erika to work together, while you work with Misty, Ash, Brock, and James
- partner Brock and James together, and Misty and Ash together to work as partners in redoing the assignment
- group Misty, Ash, and Brock together for instruction while the other students work on different standards

Use the trackers to answer the following questions.

ATTENDANCE TRACKER

SIS ID	Student Name	NOTES	1.1.a	4.1.a	2.1.b	4.1.a	5.2.e	3.1.b	5.2.e	5.3.a	5.3.a	6.1	2.1.b	Days > M	T	W	R	F	M	T	W	R	F	M	T	W	R	F	M	T	W	R	F
30662667	Celadon, Erika																																
30662654	Centro, Jenny				T																												
30662636	Cerulo, Misty											X																					
30662666	Lillis, Jessie						A		A																								
30662655	Pallet, Ash											X																					
30662645	Pewter, Brock											X																					
30662656	Rocket, James		T					T			T																						

Key
T = Tardy
A = Absent/Unexcused
X = EXcused/Field Trip
I = In School Suspension
O = Out of School Suspension

GRADE BOOK

SIS ID	Student Name	Letter Grade	Total Points	Grade Percent	Each Points >	Standards & Assignments	1.1.a	5 Post #1	2.1.b	10 WS #1	10 WS #2	3.1.b	5 WS #1	4.1.a	25 WS #1	15 Quiz #1	5.2.e	15 WS #1	15 Quiz #1	5.3.a	25 WS #1	15 Quiz #1	6.1	50 Essay #1
30662667	Celadon, Erika	A	180	95%				3		10	10		3		24	14		15	15		24	14		48
30662654	Centro, Jenny	B	159	84%				5		9	10		3		23	11		15	11		25	8		39
30662636	Cerulo, Misty	B	119	85%				5		9	10		5		21	11		14	11		22	11		-
30662666	Lillis, Jessie	A-	140	90%				3		10	10		3		23	10		-	-		24	11		50
30662655	Pallet, Ash	B	119	85%				5		9	8		4		21	14		13	14		20	11		-
30662645	Pewter, Brock	C	105	75%				4		8	9		5		20	8		12	10		19	10		-
30662656	Rocket, James	C-	133	70%				2		9	9		3		19	11		11	10		20	9		30

MASTERY TRACKER

SORT: Last, First A - Z	1.1.a	2.1.b	3.1.b	4.1.a	5.2.e	5.3.a	6.1
Celadon, Erika 30662667	NEAR MASTERY	MASTERY	NEAR MASTERY	MASTERY	MASTERY	MASTERY	MASTERY
Centro, Jenny 30662654	MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	NEAR MASTERY
Cerulo, Misty 30662636	MASTERY	MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION
Lillis, Jessie 30662666	NEAR MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	NEAR MASTERY	MASTERY
Pallet, Ash 30662655	MASTERY	MASTERY	MASTERY	MASTERY	MASTERY	NEAR MASTERY	REMEDIATION
Pewter, Brock 30662645	MASTERY	MASTERY	MASTERY	REMEDIATION	NEAR MASTERY	NEAR MASTERY	REMEDIATION
Rocket, James 30662656	REMEDIATION	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	REMEDIATION

P.2.5 You asked your students to re-evaluate their mastery goals for the end of the 3rd quarter, which is 3 weeks away. They have been taught about SMART goals, and they know that they are allowed to work at their own pace (within reason). What advice would you give these students about the new goals they have set for themselves, using the information you have about them on the trackers? You may select one answer or more than one answer for each goal.

	Modify plan to be more SPECIFIC	Make this goal more MEASURABLE	Make this goal more AMBITIOUS	Make the goal more REASONABLE	Adjust TIMING (pacing) of goal	This goal looks good
Erika's Goal: "Go back and get a better score on the 6.1 assessment by next week"	☐	☐	☐	☐	☐	☐
Misty's Goal: "Master 6.1 in the next two weeks"	☐	☐	☐	☐	☐	☐
Jenny's Goal: "Play an educational game on 'FunBrain' this week to learn more about standard 5.3.a"	☐	☐	☐	☐	☐	☐
Jessie's Goal: "Write a 13-chapter textbook about 5.2.e by the end of the quarter to demonstrate mastery (instead of the other mastery options)"	☐	☐	☐	☐	☐	☐
James's Goal: "Write a reflection about what I did poorly on my post and what I could have done better for 1.1.a by the end of the week to make up the points I missed and achieve mastery"	☐	☐	☐	☐	☐	☐
Brock's Goal: "Review chapter 3 vocabulary and re-take assessments for 5.3.a within 5 weeks"	☐	☐	☐	☐	☐	☐

T.1 BASIC SYNCHRONOUS AND ASYNCHRONOUS COMMUNICATION

Identify the characteristics/benefits listed below as belonging to:

A) asynchronous text-based discussion (an online discussion board),
B) synchronous video conferencing (an online video chat), or
C) in-person conversation.

You may need to select one, more than one, or all for each benefit.

	Asynchronous	Synchronous	In-Person
1. Provides flexibility in regards to time	☐	☐	☐
2. Provides flexibility in regards to place	☐	☐	☐
3. Allows interpretation of body language, such as facial expressions	☐	☐	☐
4. Provides opportunities for immediate response	☐	☐	☐
5. Provides time to craft a response	☐	☐	☐
6. Allows group collaboration	☐	☐	☐
7. Allows many people to share ideas at once	☐	☐	☐
8. Allows focus on one person's idea at a time	☐	☐	☐
9. Allows for spontaneity in discussion structure	☐	☐	☐
10. Conveys tone of voice quite easily	☐	☐	☐
11. Allows easy, low-cost revisiting of the conversation	☐	☐	☐
12. Allows for editing and/or revising of thoughts	☐	☐	☐
13. Individuals can contribute ideas to the group before being influenced by others' ideas	☐	☐	☐
14. Provides an avenue of conversation for less outgoing students	☐	☐	☐
15. Prevents the feeling of isolation	☐	☐	☐

T.2.2 Evaluate your discussion prompt. Select any of the following details that you included in your discussion prompt.

- how students will respond to other students in the discussion board? (Round-Robin, partners, etc.)
- content guidelines for each post? (initial, response, continuing/closing discussion)
- length guidelines for each post?
- a timeline for each post? (when to post the initial post, a response, or final response)
- a question that gets at deeper level thinking? (e.g., analyze, evaluate questions)
- group students into small enough groups?
- outline how you will assess the discussion? (a rubric or expectation guidelines)

T.2.3 You began the semester with an icebreaker discussion on the Learning Management System's discussion board (students are in groups of 4). This is a discussion just to help students get familiar with the process of online discussion and to get to know each other better. This is the prompt you gave the students:

"By Tuesday night at 8 pm, introduce yourself to the class by responding to these two ideas (initial post worth 4 points):

1. In one short paragraph, introduce yourself and share one thing about yourself or your background that you don't think others in your discussion group (or your teacher) know about you.

2. In another short paragraph, write about some positive and negative experiences you have had with homework assignments in the past.

Respond to the person who posted before you by Thursday at 8 pm (response worth 4 points). If you are the first to post, you may choose who to respond to. Be thoughtful and ask them questions. If someone asks you a question, reply to them by Friday at 8 pm (additional response worth 2 points)."

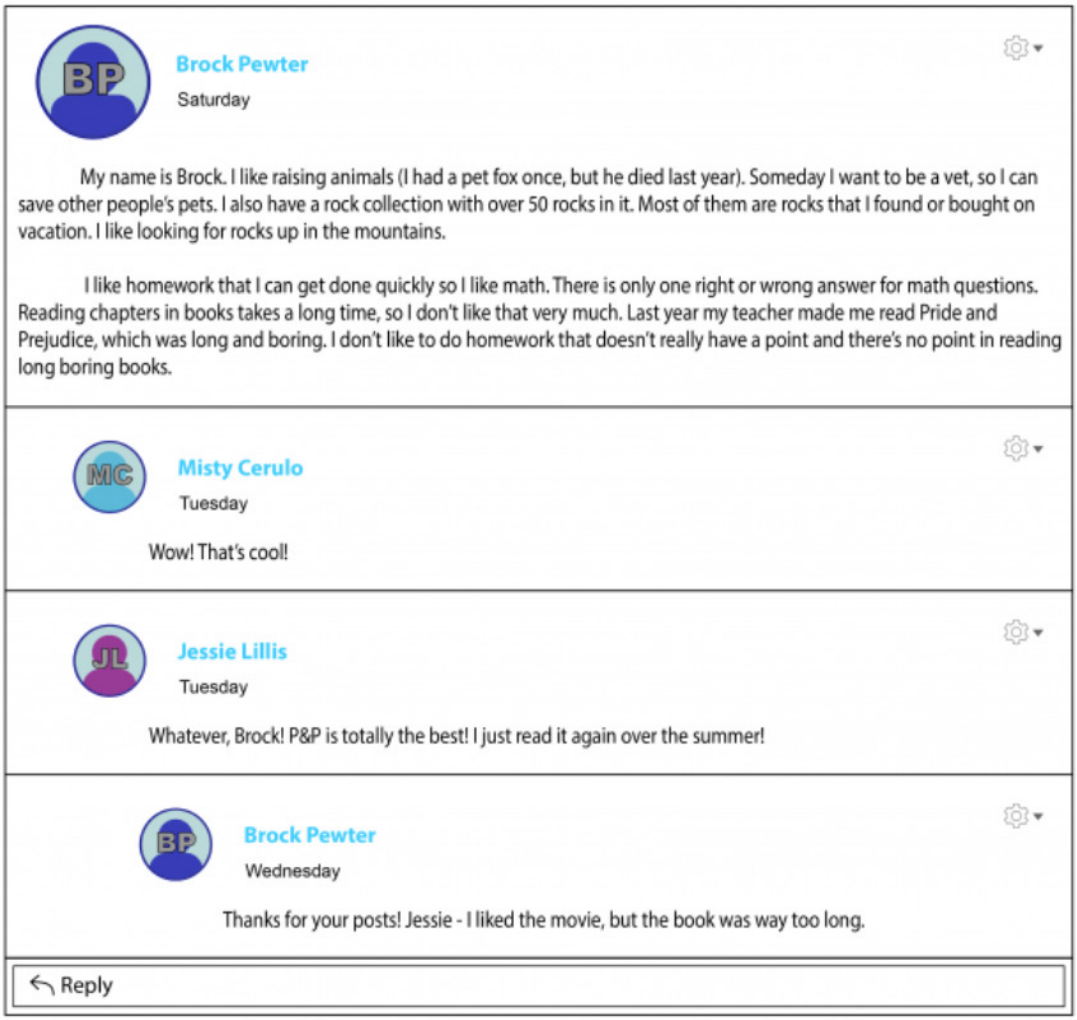
You check the discussion board Monday evening and this is what you see:

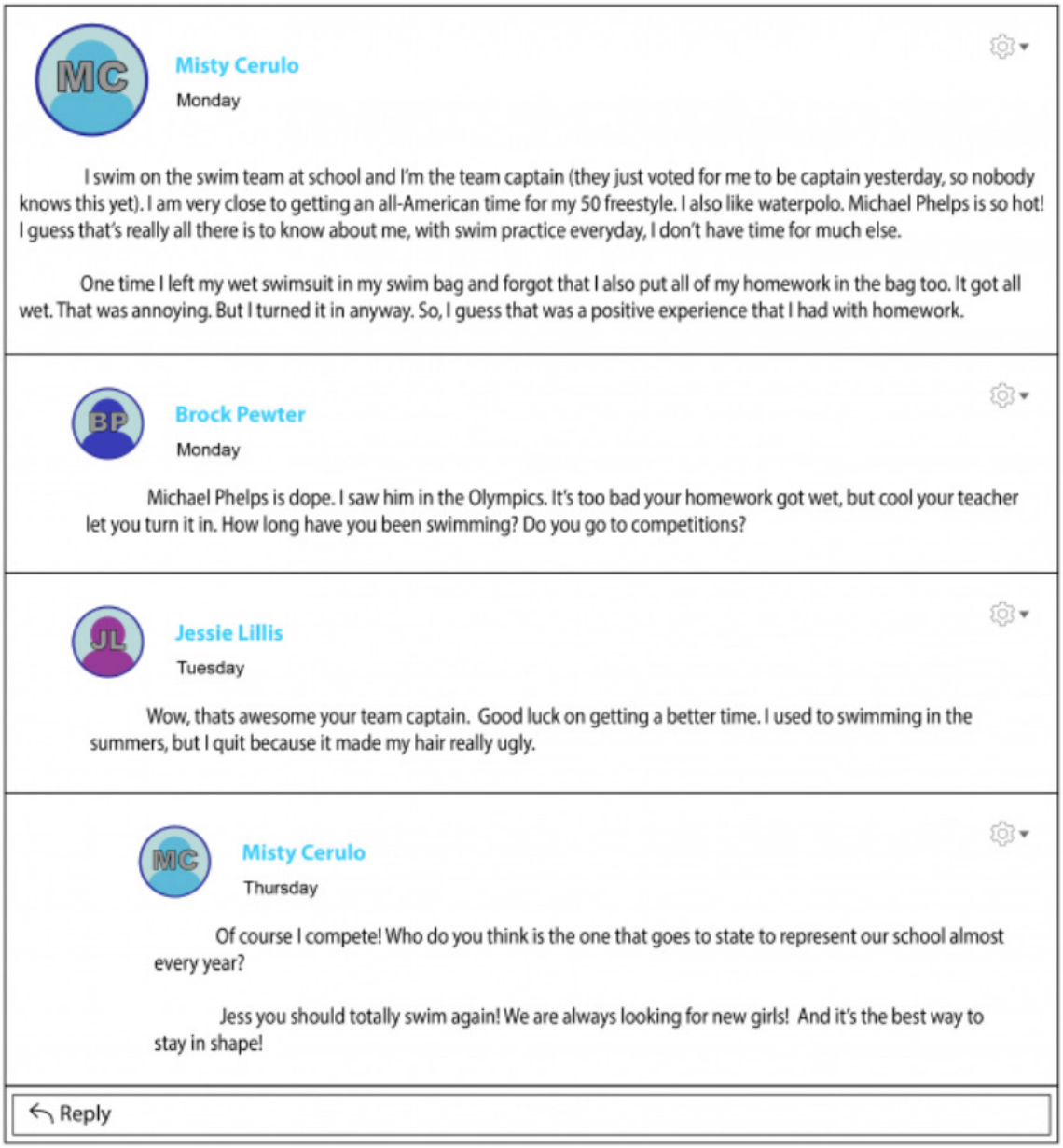
What do you do first to encourage more participation? You are trying to train them to use discussion boards and interact online.

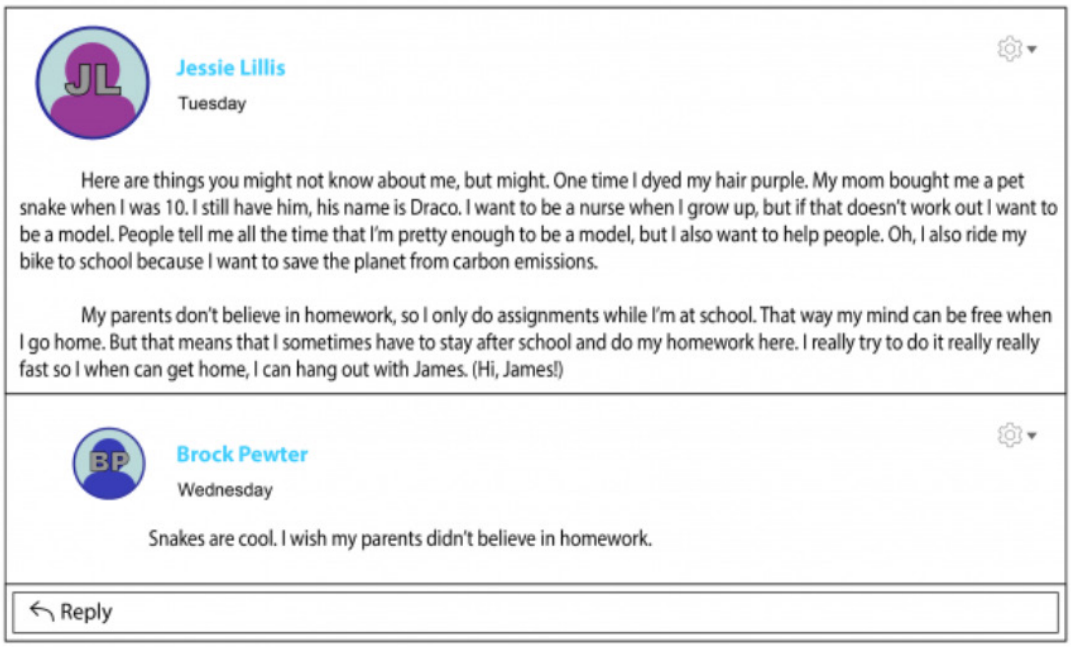
- Post to the discussion board complimenting the two students who have participated
- Post to the discussion board asking the two students who haven't participated to make an initial post
- Email students / parents of students who haven't participated individually to remind them to participate in the discussion board
- Remind students in class about the assignment

T.2.4

You check the discussion board right after the Thursday night deadline. This is what you see:





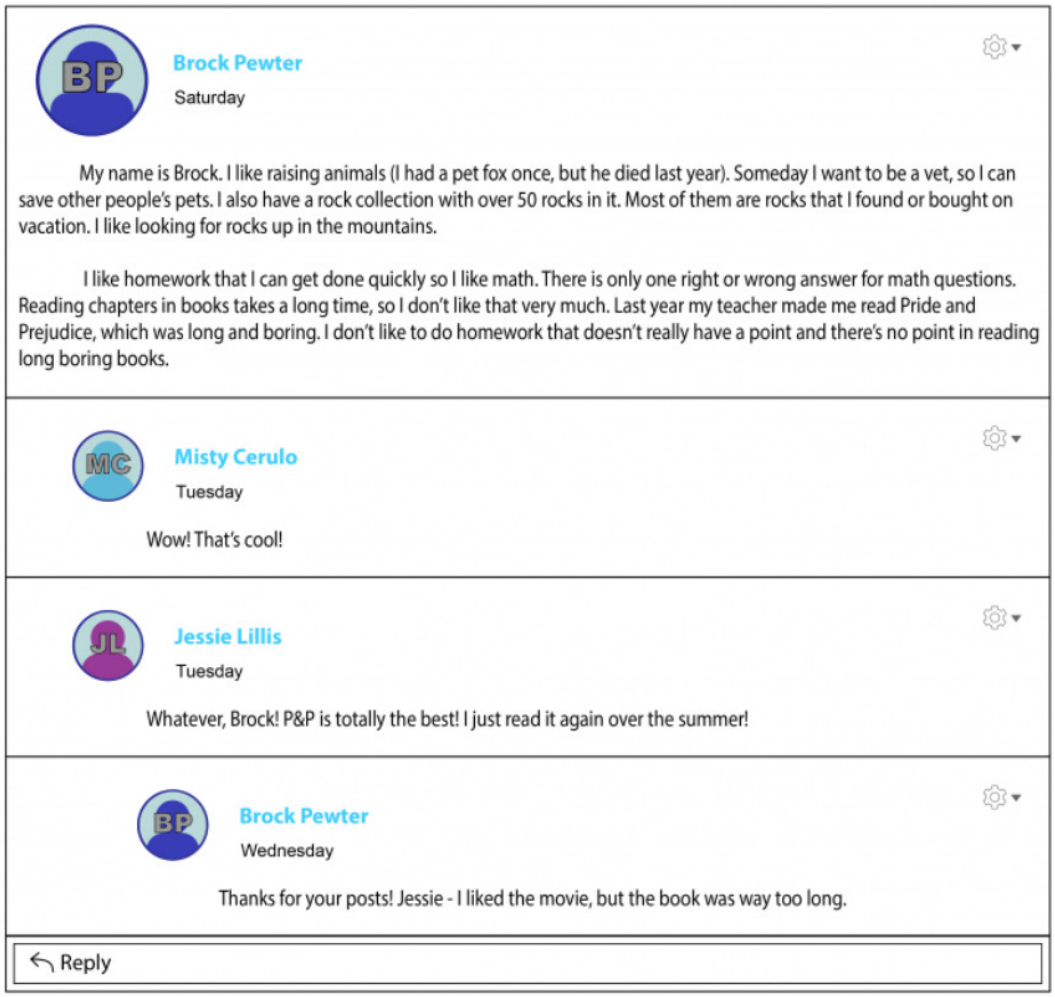


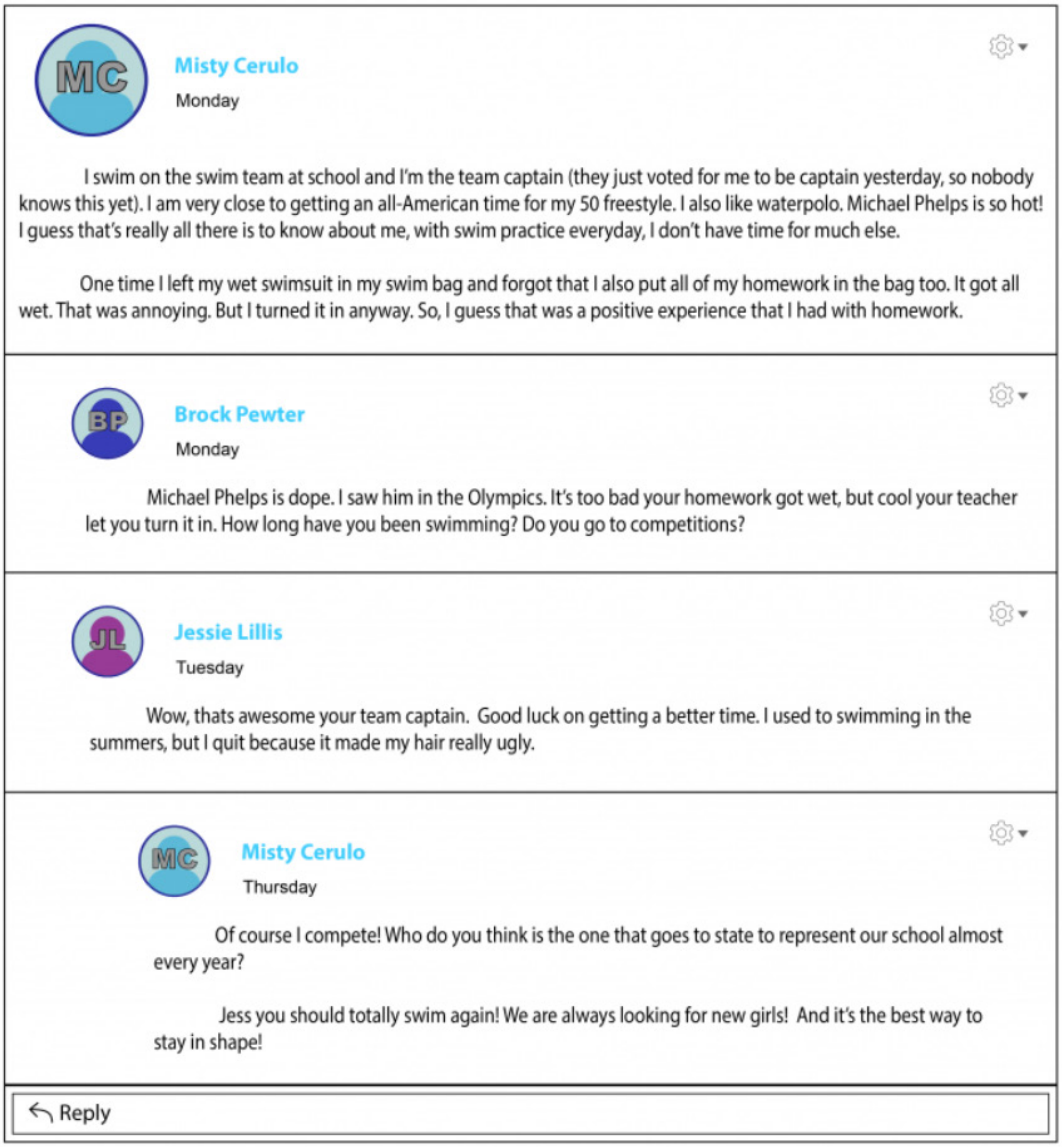
How will you categorize/grade the responses?

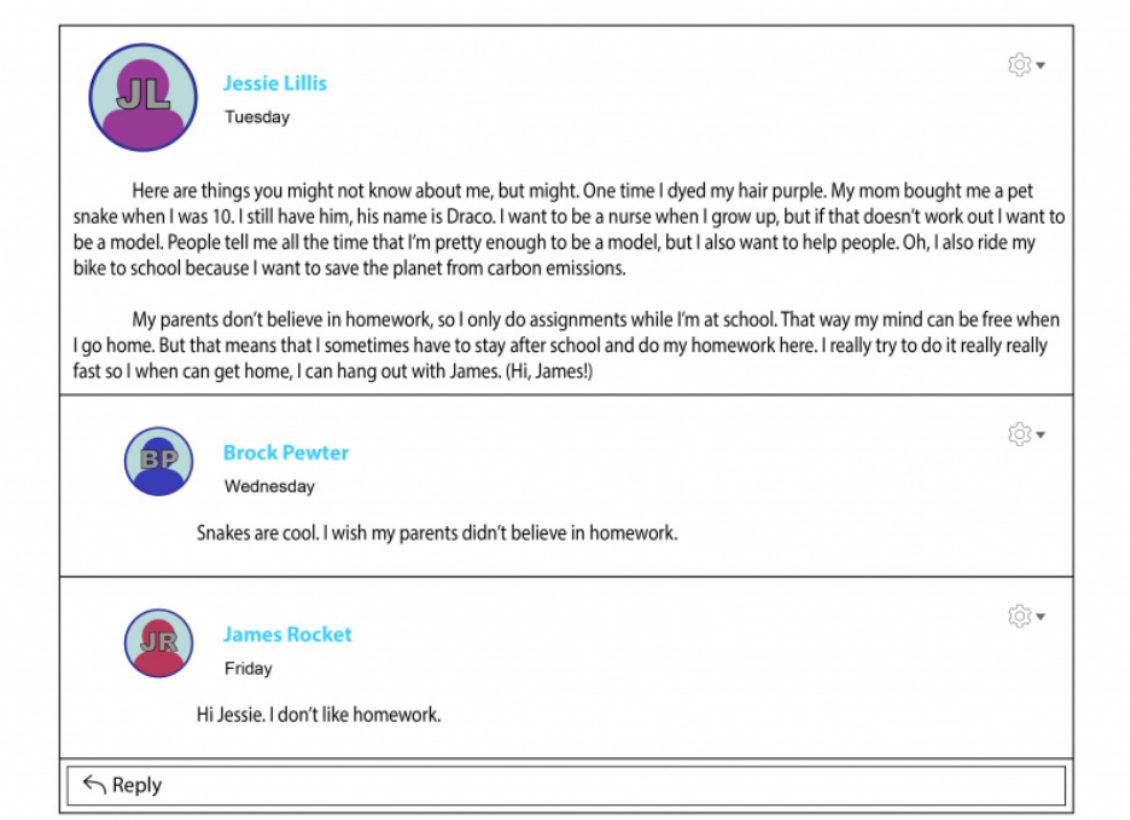
	Non-participating	Fly-by posting	Participating/Reflecting but not Inquiring	Thorough Participation
Brock's responses	○	○	○	○
Misty's responses	○	○	○	○
Jessie's responses	○	○	○	○
James's responses	○	○	○	○

T.2.5

It is now Saturday and you have decided to give each student feedback in the grade book for their discussion board posts.





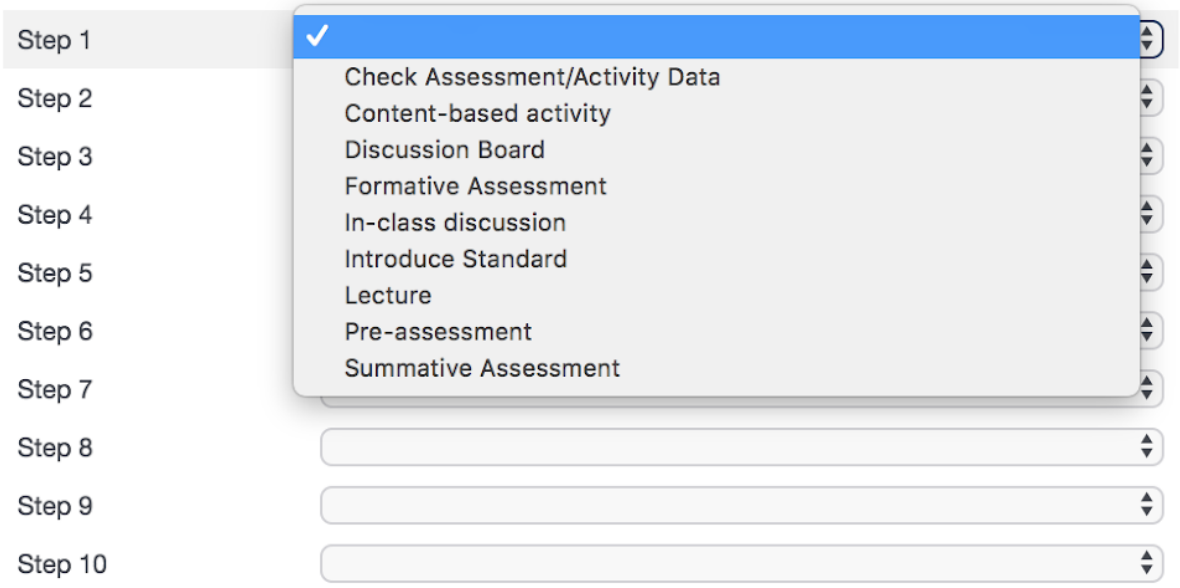


Choose the best feedback for each student. The feedback should encourage good discussion board participation in the future. Select all that apply.

	Brock	Misty	Jessie	James
"Thank you for your thoughtful initial post."	☐	☐	☐	☐
"Many of your responses were fly-by posts. Please remember to add something to keep the discussion going when responding to peers."	☐	☐	☐	☐
"Remember to ask others questions about themselves and their ideas in the discussion."	☐	☐	☐	☐
"Missed you in the discussion this week. Is everything ok? Did you have access?"	☐	☐	☐	☐

RTD.1 COLLECTING & RECOGNIZING TRENDS IN DATA

RTD.1.1 Create an outline for a blended unit using the choices in the drop-down menus. This outline is meant to guide you as you teach the content. The content you are teaching in this blended unit is new to students. Include between 5-10 steps. There is not "one correct" answer. Each response may be used once, more than once, or not at all.



RTD.1.2 A 5th grade teacher has asked you for help in gathering real-time data for this standard: “Students are able to evaluate the contributions of key people and groups to the Revolutionary War."

The most fitting assessment for gathering real-time mastery data on this standard is _____

ranking a list of key people and groups from the Revolutionary War in order of importance and briefly defending the list.

answering fill-in-the-blank type questions about contributions to the Revolution using names of key people and groups from the Revolutionary War.

answering alternative response (True-False) questions about the Revolutionary War’s key people and groups.

writing an essay discussing the importance of key people and groups in the Revolutionary War.

Use the trackers to answer the following questions.

ATTENDANCE TRACKER

SIS ID	Student Name	NOTES	1.1.a	4.1.a	2.1.b	4.1.a	5.2.e	3.1.b	5.2.e	5.3.a	5.3.a	6.1	2.1.b
	Days >		M	T	W	R	F	M	T	W	R	F	M
30662667	Celadon, Erika												
30662654	Centro, Jenny				T								
30662636	Cerulo, Misty											X	
30662666	Lillis, Jessie						A		A				
30662655	Pallet, Ash											X	
30662645	Pewter, Brock											X	
30662656	Rocket, James		T					T			T		

Key
T = Tardy
A = Absent/Unexcused
X = EXcused/Field Trip
I = In School Suspension
O = Out of School Suspension

GRADE BOOK

SIS ID	Student Name	Letter Grade	Total Points	Grade Percent	Standards & Assignments	1.1.a	Post #1	2.1.b	WS #1	WS #2	3.1.b	WS #1	4.1.a	WS #1	Quiz #1	5.2.e	WS #1	Quiz #1	5.3.a	WS #1	Quiz #1	6.1	Essay #1
	Each Points >						5		10	10		5		25	15		15	15		25	15		50
30662667	Celadon, Erika	A	180	95%			3		10	10		3		24	14		15	15		24	14		48
30662654	Centro, Jenny	B	159	84%			5		9	10		3		23	11		15	11		25	8		39
30662636	Cerulo, Misty	B	119	85%			5		9	10		5		21	11		14	11		22	11		-
30662666	Lillis, Jessie	A-	140	90%			3		10	10		3		23	10		-	-		24	11		50
30662655	Pallet, Ash	B	119	85%			5		9	8		4		21	14		13	14		20	11		-
30662645	Pewter, Brock	C	105	75%			4		8	9		5		20	8		12	10		19	10		-
30662656	Rocket, James	C-	133	70%			2		9	9		3		19	11		11	10		20	9		30

MASTERY TRACKER

SORT: Last, First / A - Z		1.1.a	2.1.b	3.1.b	4.1.a	5.2.e	5.3.a	6.1
Celadon, Erika	30662667	NEAR MASTERY	MASTERY	NEAR MASTERY	MASTERY	MASTERY	MASTERY	MASTERY
Centro, Jenny	30662654	MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	NEAR MASTERY
Cerulo, Misty	30662636	MASTERY	MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION
Lillis, Jessie	30662666	NEAR MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	NEAR MASTERY	MASTERY
Pallet, Ash	30662655	MASTERY	MASTERY	MASTERY	MASTERY	MASTERY	NEAR MASTERY	REMEDIATION
Pewter, Brock	30662645	MASTERY	MASTERY	MASTERY	REMEDIATION	NEAR MASTERY	NEAR MASTERY	REMEDIATION
Rocket, James	30662656	REMEDIATION	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	REMEDIATION

RTD.1.3 Comparing students' grades to levels of mastery shows _____

- that lower grades correspond to number of standards needing remediation.
- very little correlation between grades and students' levels of mastery.
- that a higher grade is indicative of higher levels of mastery.
- whether or not students need more instruction on specific standards.

Use the trackers to answer the following question.

ATTENDANCE TRACKER

SIS ID	Student Name	NOTES	1.1.a	4.1.a	2.1.b	4.1.a	5.2.e	3.1.b	5.2.e	5.3.a	5.3.a	6.1	2.1.b													
	Days >		M	T	W	R	F	M	T	W	R	F	M	T	W	R	F	M	T	W	R	F	M	T	W	R	F
30662667	Celadon, Erika																									
30662654	Centro, Jenny				T																					
30662636	Cerulo, Misty											X														
30662666	Lillis, Jessie						A		A																	
30662655	Pallet, Ash											X														
30662645	Pewter, Brock											X														
30662656	Rocket, James		T					T			T															

Key
T = Tardy
A = Absent/Unexcused
X = EXcused/Field Trip
I = In School Suspension
O = Out of School Suspension

LMS ACTIVITY TRACKER

Student Name	Login ID	SIS ID	Section	Last Activity	Total Activity
Celadon, Erika	ec2667	30662667	3rd	Yesterday, 1:28pm	23:13:26
Centro, Jenny	jc2654	30662654	3rd	Yesterday, 1:32pm	25:11:45
Cerulo, Misty	mc2636	30662636	3rd	2 Days Ago, 1:31pm	22:08:53
Lillis, Jessie	jl2666	30662666	3rd	2 Days Ago, 12:12pm	12:47:32
Pallet, Ash	ap2655	30662655	3rd	Today, 7:15am	46:39:51
Pewter, Brock	bp2645	30662645	3rd	Today, 7:22am	40:27:12
Rocket, James	jr2656	30662656	3rd	2 Days Ago, 12:53pm	10:26:44

MASTERY TRACKER

SORT: Last, First A - Z		1.1.a	2.1.b	3.1.b	4.1.a	5.2.e	5.3.a	6.1
Celadon, Erika	30662667	NEAR MASTERY	MASTERY	NEAR MASTERY	MASTERY	MASTERY	MASTERY	MASTERY
Centro, Jenny	30662654	MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	NEAR MASTERY
Cerulo, Misty	30662636	MASTERY	MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION
Lillis, Jessie	30662666	NEAR MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	NEAR MASTERY	MASTERY
Pallet, Ash	30662655	MASTERY	MASTERY	MASTERY	MASTERY	MASTERY	NEAR MASTERY	REMEDIATION
Pewter, Brock	30662645	MASTERY	MASTERY	MASTERY	REMEDIATION	NEAR MASTERY	NEAR MASTERY	REMEDIATION
Rocket, James	30662656	REMEDIATION	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	REMEDIATION

RTD.1.4 Overall, the mastery data suggests that _____

- students master fewer skills based on more time in the LMS
- students who miss fewer days of school have more mastery over skills
- students master more skills during the first week of instruction
- students show higher mastery on standards that have multiple days devoted to them

Use the trackers to answer the following questions.

GRADE BOOK

SIS ID	Student Name	Letter Grade	Total Points	Grade Percent	Standards & Assignments	1.1.a	Post #1	2.1.b	WS #1	WS #2	3.1.b	WS #1	4.1.a	WS #1	Quiz #1	5.2.e	WS #1	Quiz #1	5.3.a	WS #1	Quiz #1	6.1	Essay #1
	Each Points >						5		10	10		5		25	15		15	15		25	15		50
30662667	Celadon, Erika	A	180	95%			3		10	10		3		24	14		15	15		24	14		48
30662654	Centro, Jenny	B	159	84%			5		9	10		3		23	11		15	11		25	8		39
30662636	Cerulo, Misty	B	119	85%			5		9	10		5		21	11		14	11		22	11		-
30662666	Lillis, Jessie	A-	140	90%			3		10	10		3		23	10		-	-		24	11		50
30662655	Pallet, Ash	B	119	85%			5		9	8		4		21	14		13	14		20	11		-
30662645	Pewter, Brock	C	105	75%			4		8	9		5		20	8		12	10		19	10		-
30662656	Rocket, James	C-	133	70%			2		9	9		3		19	11		11	10		20	9		30

ATTENDANCE TRACKER

SIS ID	Student Name	Days >	M	T	W	R	F	M	T	W	R	F	M	T	W	R	F	M	T	W	R	F	M	T	W	R	F
		NOTES	1.1.a	4.1.a	2.1.b	4.1.a	5.2.e	3.1.b	5.2.e	5.3.a	5.3.a	6.1	2.1.b														
30662667	Celadon, Erika																										
30662654	Centro, Jenny				T																						
30662636	Cerulo, Misty											X															
30662666	Lillis, Jessie						A		A																		
30662655	Pallet, Ash											X															
30662645	Pewter, Brock											X															
30662656	Rocket, James		T					T			T																

Key
T = Tardy
A = Absent/Unexcused
X = EXcused/Field Trip
I = In School Suspension
O = Out of School Suspension

LMS ACTIVITY TRACKER					
Student Name	Login ID	SIS ID	Section	Last Activity	Total Activity
Celadon, Erika	ec2667	30662667	3rd	Yesterday, 1:28pm	23:13:26
Centro, Jenny	jc2654	30662654	3rd	Yesterday, 1:32pm	25:11:45
Cerulo, Misty	mc2636	30662636	3rd	2 Days Ago, 1:31pm	22:08:53
Lillis, Jessie	jl2666	30662666	3rd	2 Days Ago, 12:12pm	12:47:32
Pallet, Ash	ap2655	30662655	3rd	Today, 7:15am	46:39:51
Pewter, Brock	bp2645	30662645	3rd	Today, 7:22am	40:27:12
Rocket, James	jr2656	30662656	3rd	2 Days Ago, 12:53pm	10:26:44

MASTERY TRACKER								
SORT: Last, First		A - Z	1.1.a	2.1.b	3.1.b	4.1.a	5.2.e	5.3.a	6.1
Celadon, Erika	30662667		NEAR MASTERY	MASTERY	NEAR MASTERY	MASTERY	MASTERY	MASTERY	MASTERY
Centro, Jenny	30662654		MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	NEAR MASTERY
Cerulo, Misty	30662636		MASTERY	MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION
Lillis, Jessie	30662666		NEAR MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	NEAR MASTERY	MASTERY
Pallet, Ash	30662655		MASTERY	MASTERY	MASTERY	MASTERY	MASTERY	NEAR MASTERY	REMEDIATION
Pewter, Brock	30662645		MASTERY	MASTERY	MASTERY	REMEDIATION	NEAR MASTERY	NEAR MASTERY	REMEDIATION
Rocket, James	30662656		REMEDIATION	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	REMEDIATION

RTD.1.5 By looking at the activity data, we can infer that students who spend _____

more time in the LMS master the greatest number of standards

less time in the LMS having higher overall grade percentages

more time in the LMS also have the highest attendance rate

an average amount of time in the LMS need less remediation

Use the trackers to answer the following question.

ATTENDANCE TRACKER

SIS ID	Student Name	NOTES	1.1.a	4.1.a	2.1.b	4.1.a	5.2.e	3.1.b	5.2.e	5.3.a	5.3.a	6.1	2.1.b
	Days >		M	T	W	R	F	M	T	W	R	F	M
30662667	Celadon, Erika												
30662654	Centro, Jenny				T								
30662636	Cerulo, Misty											X	
30662666	Lillis, Jessie						A		A				
30662655	Pallet, Ash											X	
30662645	Pewter, Brock											X	
30662656	Rocket, James		T					T			T		

	T	W	R	F	M	T	W	R	F	M	T	W	R	F

Key
T = Tardy
A = Absent/Unexcused
X = EXcused/Field Trip
I = In School Suspension
O = Out of School Suspension

MASTERY TRACKER

SORT: Last, First / A - Z	1.1.a	2.1.b	3.1.b	4.1.a	5.2.e	5.3.a	6.1
Celadon, Erika 30662667	NEAR MASTERY	MASTERY	NEAR MASTERY	MASTERY	MASTERY	MASTERY	MASTERY
Centro, Jenny 30662654	MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	NEAR MASTERY
Cerulo, Misty 30662636	MASTERY	MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION
Lillis, Jessie 30662666	NEAR MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	NEAR MASTERY	MASTERY
Pallet, Ash 30662655	MASTERY	MASTERY	MASTERY	MASTERY	MASTERY	NEAR MASTERY	REMEDIATION
Pewter, Brock 30662645	MASTERY	MASTERY	MASTERY	REMEDIATION	NEAR MASTERY	NEAR MASTERY	REMEDIATION
Rocket, James 30662656	REMEDIATION	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	REMEDIATION

RTD.2.1 In helping students achieve mastery on 1.1.a and 5.3.a, it would be best to suggest _____

- Erika and Jessie work together
- Erika and Misty work together
- Erika and James work together
- Erika and Jenny work together

Use the trackers to answer the following question.

ATTENDANCE TRACKER

SIS ID	Student Name	NOTES	1.1.a	4.1.a	2.1.b	4.1.a	5.2.e	3.1.b	5.2.e	5.3.a	5.3.a	6.1	2.1.b
	Days >		M	T	W	R	F	M	T	W	R	F	M
30662667	Celadon, Erika												
30662654	Centro, Jenny				T								
30662636	Cerulo, Misty											X	
30662666	Lillis, Jessie						A		A				
30662655	Pallet, Ash											X	
30662645	Pewter, Brock											X	
30662656	Rocket, James		T					T			T		

Key
T = Tardy
A = Absent/Unexcused
X = EXcused/Field Trip
I = In School Suspension
O = Out of School Suspension

MASTERY TRACKER

SORT: Last, First A-Z		1.1.a	2.1.b	3.1.b	4.1.a	5.2.e	5.3.a	6.1
Celadon, Erika	30662667	NEAR MASTERY	MASTERY	NEAR MASTERY	MASTERY	MASTERY	MASTERY	MASTERY
Centro, Jenny	30662654	MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	NEAR MASTERY
Cerulo, Misty	30662636	MASTERY	MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION
Lillis, Jessie	30662666	NEAR MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	NEAR MASTERY	MASTERY
Pallet, Ash	30662655	MASTERY	MASTERY	MASTERY	MASTERY	MASTERY	NEAR MASTERY	REMEDIATION
Pewter, Brock	30662645	MASTERY	MASTERY	MASTERY	REMEDIATION	NEAR MASTERY	NEAR MASTERY	REMEDIATION
Rocket, James	30662656	REMEDIATION	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	REMEDIATION

RTD.2.2 Most students have not mastered _____

- 4.1.a
- 5.3.a
- 6.1
- 5.2.e

Use the trackers to answer the following question.

ATTENDANCE TRACKER

SIS ID	Student Name	NOTES	1.1.a	4.1.a	2.1.b	4.1.a	5.2.e	3.1.b	5.2.e	5.3.a	5.3.a	6.1	2.1.b
Days >			M	T	W	R	F	M	T	W	R	F	M
30662667	Celadon, Erika												
30662654	Centro, Jenny				T								
30662636	Cerulo, Misty											X	
30662666	Lillis, Jessie						A		A				
30662655	Pallet, Ash											X	
30662645	Pewter, Brock											X	
30662656	Rocket, James		T					T			T		

Key
T = Tardy
A = Absent/Unexcused
X = EXcused/Field Trip
I = In School Suspension
O = Out of School Suspension

MASTERY TRACKER

SORT: Last, First / A-Z		1.1.a	2.1.b	3.1.b	4.1.a	5.2.e	5.3.a	6.1
Celadon, Erika	30662667	NEAR MASTERY	MASTERY	NEAR MASTERY	MASTERY	MASTERY	MASTERY	MASTERY
Centro, Jenny	30662654	MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	NEAR MASTERY
Cerulo, Misty	30662636	MASTERY	MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION
Lillis, Jessie	30662666	NEAR MASTERY	MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	NEAR MASTERY	MASTERY
Pallet, Ash	30662655	MASTERY	MASTERY	MASTERY	MASTERY	MASTERY	NEAR MASTERY	REMEDIATION
Pewter, Brock	30662645	MASTERY	MASTERY	MASTERY	REMEDIATION	NEAR MASTERY	NEAR MASTERY	REMEDIATION
Rocket, James	30662656	REMEDIATION	MASTERY	NEAR MASTERY	NEAR MASTERY	NEAR MASTERY	REMEDIATION	REMEDIATION

RTD.2.3 Your subject area coordinator asked all the teachers to look at the data from the end of the quarter to determine areas for improvement in teaching next year. If this mastery data is from the end of the quarter, then next year, we should revise how we teach

_____

6.1

5.2.e

4.1.a

5.3.a

APPENDIX B

Informed Consent

INTRODUCTION

Thank you for agreeing to take this test. This research is being lead by Emily Pulham, PhD Candidate and Dr. Charles Graham in the Instructional Psychology and Technology Department at Brigham Young University.

RESEARCH STUDY INFORMATION

This research is being conducted in an attempt to measure teachers' knowledge, understanding and skill in selected blended teaching competencies. If you agree to participate, you will be asked to answer test items honestly and to the best of your ability. The test contains questions about basic technology, blending online and in-person learning, technology-mediated interactions, personalization, and real-time data usage. It is anticipated that this test will take about 35-45 minutes to complete.

RISKS

Participants may experience discomfort while reflecting on their own degree of knowledge or skills. The amount of time required for taking the test is 35-45 minutes, and this may be a sacrifice of time and energy that may take from other valuable teaching activities.
School district leaders will not have access to participant names or individual scores.

BENEFITS

Participants who complete the assessment will be presented with scores for each section, and specific materials that may be helpful in further developing their blended teaching knowledge and skills.

CONFIDENTIALITY

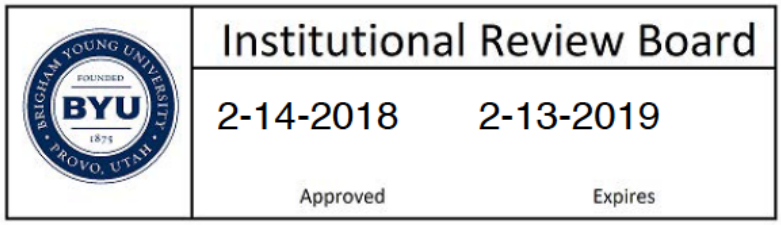
Participant names will not be collected as part of the research. Any findings from the research will be reported as aggregate and not individual data. Only the researchers will have access to the raw survey data. All data will be stored in a password protected location for up to 3 years.

PARTICIPATION

Your participation is voluntary and consent to participate in the research is given by participating in the survey. You may withdraw from the study at any time and for any reason. If you decide not to participate or if you withdraw from the study, there is no penalty or loss of benefits to which you are otherwise entitled. There are no costs to you or any other party.

CONTACT

You may reach the researchers at ebpulham@gmail.com or charles.graham@byu.edu for questions or to report a research-related problem. If you have questions regarding your rights as a research participant contact IRB Administrator at (801) 422-1461; A-285 ASB, Brigham Young University, Provo, UT 84602; irb@byu.edu. This research has been reviewed according to Brigham Young University procedures governing your participation in this research.



APPENDIX C

Factor Loadings for CFAs

Table B1

Reduced Confirmatory Factor Analysis Results for BLEND

Item	Factor Loading	SE	Standardized Factor Loading	Communalities
B1.1	1.000	0.000	0.085	.007
B1.2	4.809	13.443	0.407	.834
B1.3	7.274	20.373	0.616	.621
B1.4	6.046	16.949	0.512	.738
B2	6.848	19.153	0.580	.664
B3.2	0.128	1.934	0.011	1.000

Table B2

Further Reduced Confirmatory Factor Analysis for BLEND

Item	Factor Loading	SE	Standardized Factor Loading	Communalities
B1.2	1.000	0.000	.399	0.159
B1.3	1.573*	0.737	.627	0.393
B1.4	1.293*	0.573	.516	0.266
B2	1.436*	0.639	.572	0.328

*p=<.05

Table B3

Confirmatory Factor Analysis Results for TECH

Item	Factor Loading	SE	Standardized Factor Loading	Communalities
T1.1	-0.692	0.990	-0.132	.018
T2.2	-0.567	0.523	-0.294	0.087
T2.3	-1.041	1.121	-0.541	0.292
T2.4	-0.442	0.474	-0.229	0.053
T2.5	1.000	0.000	.399	0.159

Table B4

Confirmatory Factor Analysis Results for PERS (without P2.3 and P2.4)

Item	Factor Loading	SE	Standardized Factor Loading	Communalities
P1.1	1.000	0.000	0.146	0.469
P1.2	-2.853	4.162	-0.415	0.148
P2.2	1.965	3.053	0.267	0.145
P2.5	3.870	6.573	0.390	0.192

Table B5

Confirmatory Factor Analysis Results for RTD

Item	Factor Loading	SE	Standardized Factor Loading	Communalities
RTD1.1	1.000	0.000	0.226	0.949
RTD1.2	0.810	0.815	0.183	0.859
RTD1.3	1.666	1.149	0.376	0.859
RTD1.4	3.238	1.894	0.730	0.467
RTD1.5	2.422	1.706	0.546	0.702
RTD2.1	-0.557	0.708	-0.126	0.984
RTD 2.2	-0.007	0.707	-0.002	1.000
RTD 2.3	1.274	0.929	0.287	0.917

Table B6

Reduced Confirmatory Factor Analysis Results for RTD

Item	Factor Loading	SE	Standardized Factor Loading	Communalities
RTD1.3	1.000	0.000	1.081	Undefined
RTD1.4	0.287	0.341	0.398	.158
RTD1.5	0.173	0.224	0.245	0.060

Table B7

Confirmatory Factor Analysis Results for RTD and PERS combined

Item	Factor Loading	SE	Standardized Factor Loading	Communalities
RTD1.3	1.000	0.000	0.381	0.145
RTD1.4	1.148	0.633	0.437	0.191
RTD1.5	1.742	0.726	0.663	0.440
RTD2.1	-0.242	0.353	-0.092	0.008
RTD2.2	0.581	0.462	0.221	0.049
RTD2.3	1.233	0.572	0.469	0.220
P1.1	1.093	0.564	0.416	0.173

P1.2	-0.289	0.425	-0.110	0.012
P2.3	0.581	0.435	0.221	0.049
P2.4	-0.839	0.527	-0.319	0.102
P2.5	1.750	0.791	0.461	0.212

Table B8

Reduced Confirmatory Factor Analysis Results for RTD and PERS combined

Item	Factor Loading	SE	Standardized Factor Loading	Communalities
RTD1.3	1.000	0.000	0.368	0.136
RTD1.4	1.183	0.614	0.436	0.190
RTD1.5	2.090*	0.953	0.770	0.593
RTD2.3	1.207*	0.551	0.444	0.198
P1.1	1.099	0.573	0.405	0.164
P2.5	1.625*	0.793	0.414	0.171

*p<.05

DISSERTATION CONCLUSION

This dissertation has been an exploration of how blended and online teaching competencies are different, the language used to describe them, and how to assess them. With the rapid growth of blended learning in recent years (Molnar et al., 2017), there will be even more real-world contexts in which to study how well teachers function in these environments, and what can be done to support future teachers so they can use technology for pedagogically driven purposes, not just as a streamlining tools.

As we reviewed the literature of blended teaching competencies, several ideas and competencies were emphasized: personalization and flexibility, mastery-based progression, data usage, and integrating online and in-person learning. Taken together, these features make blended teaching a unique and separate concept from online teaching, a concept that will make it possible to guide the future practices of teachers as technology is used more and more for both pedagogical purposes and to improve student-centered learning.

The literature also revealed that an overwhelming majority of current competencies for blended teachers are written in such a way that they are generic, or specific to neither an online or in-person environment. This could create confusion for teachers migrating from traditional teaching to blended teaching, as they will be evaluating skill sets that are not specific to a blended or online environment.

The first iteration of the blended teaching competency assessment showed that there is room for improvement in the writing of items, and that the latent constructs of *Blending Online and In-person Learning*, *Technology-Mediated Interactions, Personalization,* and *Real-Time Data Practices* did not show unidimensionality when the CFAs were conducted. If a blended teaching competency is to be certified in the future with this objective test of knowledge, more

improvements are needed to refine the test items in accordance with our pilot test feedback, so as to make the test length reasonable and to improve its psychometric properties.

The field of blended learning in K-12 is still emerging and developing its own identity and place in the landscape of education in the United States. There are a variety of ways in which it is carried out, and it is possible that future analyses will be specific to the blended learning models that have been codified (Horn & Staker, 2014). I believe that this dissertation effort has been one that clarifies the ideas of the field, presents them in a coherent way, and provides ideas for future directions in K-12 blended teaching research.

DISSERTATION REFERENCES

Attride-Stirling, J. (2001). Thematic networks: An analytic tool for qualitative research. *Qualitative Research, 1*(3), 385–405. Retrieved from http://doi.org/10.1177/1468794107085301

Graham, C. R. (2006). Blended learning systems: Definition, current trends, and future directions. In C. J. Bonk & C. R. Graham (Eds.), *Handbook of blended learning: Global perspectives, local designs* (pp. 3–21). San Francisco, CA: Pfeiffer Publishing.

Horn, M. B., & Staker, H. (2014). *Blended: Using disruptive innovation to improve schools.* San Francisco, CA: Jossey-Bass.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010*). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies.* U.S. Department of Education. Retrieved from http://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf

Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation.* San Francisco, CA: Jossey-Bass.

Molnar, A., Miron, G., Gulosino, C., Shank, C., Davidson, C., Barbour, M. K., . . . Nitkin, D. (2017). *Virtual schools report 2017.* Boulder, CO: National Education Policy Center. Retrieved from http://nepc.colorado.edu/publication/virtual-schools-annual-2017

Pulham, E.B. (2018, September 27). TLA measurement fellowship: A new blended teaching assessment tool emerges [Web log post]. Retrieved https://learningaccelerator.org/blog/tla-measurement-fellowship-a-new-blended-teaching-assessment-tool-emerges