

A Systematic Review of Online Teaching Methods in Higher Education

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Since the pandemic began, online teaching methods have received increased interest and review. Educators rapidly developed delivery techniques to meet the needs of students forced to become remote learners. Some of these methods were successful; others did not meet program objectives, especially in educator preparation programs (EPPs). The speed of changing to an online environment limited the ability of educators to research and adapt known evidenced-based practices. This systematic literature review provides research and insight into student-focused outcomes related to effective online teaching practices. Over 600 articles, across multiple disciplines were reviewed based on research and results using different techniques, pedagogy, and design in the online environment. The five main strategies, methods, or philosophies that most affected student outcomes in the online community were engagement, collaboration, beliefs, knowledge, and enactment of knowledge/practice. Each topic is discussed in depth and recommendations are made for effective online teaching and also specific applications to EPPs.

Keywords: teacher education, online teaching, online instruction, higher education, pandemic, strategies, methods

INTRODUCTION

Online education has been part of academia since the 1980s. Almost every institute of higher learning uses online resources to partially or completely deliver course instruction. This wealth of experience has provided researchers with enormous data output on the effectiveness of this discipline in several aspects of student outcomes. Traditionally, online courses were limited to programs that did not require face-to-face interaction for successful completion. Several disciplines, including EPPs, resisted fully online programs because of perceptions of the lack of rigor to meet standards necessary for preparing the student for field placement. Despite this resistance, the pandemic made the transition a requirement and forced educators to

reevaluate the characteristics of effective instruction. In this case, the past can inform online instruction's present and future application across all domains. Research has been conducted into student outcomes based on course design and execution within the online environment. Principles gathered from this research provide stepping stones for non-traditional disciplines to redesign programs to fit within the online construct.

Online education transformed from a convenient option to a mandatory format during the pandemic. This rapid change from face-to-face to online instruction presented great challenges for higher education courses traditionally taught in the classroom. Educators were forced to quickly adapt instructional techniques to fit the online environment. These adaptations did not always meet the intellectual rigor expected from higher education courses. Classroom community, student feedback, and informal assessments are just examples of course culture and content that present difficulties for educators to replicate in the online environment.

Although these challenges extended across all domains of education, there were specific obstacles for EPPs. These programs rely on practice-based approaches to effectively train candidates for future classroom performance (Brownell et al., 2019). Practice-based approaches have traditionally been executed face-to-face to ensure they replicate the classroom environment and provide instantaneous peer and instructor feedback. EPP instructors struggled to translate the complexity of practice-based approaches to the online format (Green et al., 2013). In addition, field placements for teacher candidates were also redirected to a virtual placement while still being held to the same academic outcomes as previous face-to-face programs.

The first part of this study sought to understand the research into student outcomes from varying principles of online education design and execution and present a comprehensive review of the most effective practices across several domains. The second part of this study sought to apply those practices to EPPs and provide research-based recommendations for developing practice-based approaches online while still maintaining the standards and rigor expected of teacher candidates.

Purpose

With the increase of synchronous and asynchronous teaching during and post-pandemic, it became essential for educators to understand and implement online teaching practices that meet the rigorous standards of higher education. This review sought to identify and define effective online teaching practices being used worldwide which have shown success in providing student outcomes commiserate with in-person instruction.

To narrow the findings to usable information for practitioners, the researchers focused on evidenced-based practices resulting in positive student outcomes. This focus provides the most useful theories and practices for ensuring student success in higher education in the online format. Each identified strategy will allow the researchers to generalize specific practices for use across multiple fields of study. This literature review was conducted to provide insight into the following questions related to online teaching:

- What evidenced-based practices are being used worldwide to improve student outcomes?
- What principles of instruction are common among the most successful online techniques?
- How can current online practices inform present instruction to improve online teaching?

METHODS

Article Procurement

We conducted a multilevel process to search for articles related to online teaching practices. Two researchers conducted an initial database search, exclusion through a review of abstracts, and a full-text review for inclusion. Then for the final selection, three researchers reviewed the final articles using the *Modified Mixed Methods Appraisal Tool (M-MMAT)* quality indicator scoring index. Two researchers conducted an independent electronic search of Academic Search Premier, ERIC, Education Full Text, Professional Development Collection, and APA PsycArticles databases through the EBSCO host system with the following Boolean search terms: (a) *higher education* OR *college* OR *university*, (b) AND *online teaching*, and (c) *strategies* OR *methods*. Other combinations of related search terms (e.g., *online*

instruction, technique, practice, practice-based, evidenced-based) were used to verify that the reported set produced the most relevant and complete list of articles for this review.

Two researchers conducted the initial electronic search through an independent search of each database. An independent search was used because searching multiple databases simultaneously can exclude some articles, based on the inclusion criteria, because of the different formats and reporting across databases. A separate search of each database ensures the maximum return of related content for review. Inclusion criteria used in the search for each database were as follows: (a) peer-reviewed, (b) published later than 2010, and (c) available in the English language. Each search was uploaded to the Rayyan systematic review website (<https://www.rayyan.ai/>).

Full-Text Inclusion Criteria

After removing duplicate articles, the initial search resulted in 620 research articles. In the next step, two researchers used the Rayyan platform to conduct an abstract review of the uploaded search results. The following criteria were used for inclusion of articles for full-text review: (a) empirical study, (b) instructional practices in an online environment, and (c) conducted in a higher education setting. The initial blind review resulted in a 91% agreement between the two researchers and subsequent shared reviews of articles in dispute, with a review of inclusion criteria, brought a 100% agreement. This process resulted in the inclusion of 160 articles for the full-text review. The first full-text review consisted of two researchers cooperatively verifying the presence of the inclusion criteria within the body of each study. This review narrowed the included articles to 61 studies that met all inclusion criteria. The remaining 61 articles were evenly distributed between three researchers, in pairs, for a quality review using the M-MMAT to exclude articles that did not meet peer-reviewed and previously validated quality indicators.

Quality Indicators Mixed Methods Appraisal Tool (MMAT)

We assessed the quality and rigor of the articles by adapting the M-MMAT (Mathews et al., 2017 adapted from Pluye, et al., 2011) to code and classify articles. The tool provides questions to aid in appraising qualitative, quantitative, and mixed methods studies. The articles were divided among three researchers so that each article was blindly reviewed by at least two. Then, the applicable questions were applied to each article to determine the inclusion and exclusion of the full-text articles for further analysis. Articles that received no answers to the questions were excluded. The researchers met regularly to compare the results of their evaluations. In total, we found 34 articles that met our quality criteria.

Coding Procedures

In addition to appraising the quality of the studies, our team reviewed each full-text article. It coded for the following criteria: Research Questions/Purpose, Theoretical Framework, Sample/Participants, Inclusion Criteria, Person Implementing, Intended Outcomes, Design, Measures/Data Sources, Analysis, Description of the Intervention/Approach (specific to each treatment), and Results. While the quality of articles is important, we also wanted to ensure that we pulled relevant information from each article to determine the practice-based approaches being used across various disciplines. Coding the full-text articles this way helped us develop themes described in detail in the Results section.

RESULTS

Given the different foci of the research on the impact of online education in higher education, data analysis was conducted in two parts. First, the elements of the study features were synthesized and a quality analysis was executed to better identify what was and was not investigated and the conditions in the literature. Second, the studies were synthesized by instructor-focused or student-based outcomes in higher education across disciplines.

Study Features

To meet our inclusion criteria for student-focused outcomes within online learning, studies needed to examine the efficacy of online learning and teaching in a higher education setting. We defined student-focused outcomes as teaching tools that increase engagement, peer-facilitated discussions and instruction, collaborative activities, feedback, modeling, and impact on skills. This included (a) student knowledge of the content, (b) engagement in the course content, (c) collaboration with peers and faculty, (d) beliefs regarding content, and (e) ability to implement the discipline into practice. Of the 18 studies that met the selection criteria for student-focused outcomes, we discovered a variety of professions using online learning to prepare individuals for their field of study. The assortment included a variety of studies, ranging from 2011 to 2020, outside of education that met the inclusion criteria (see Appendix 1 for specifics regarding the design of each study):

- No content area was mentioned in two studies (Wang & Liu, 2020; Wang, 2018), as well as ELA/ESL (Chang & Windeatt, 2016; Whittingham, 2013), nor was technology use in the course curriculum mentioned in two different studies in each area (Tsai, 2016; Tsai, 2013).
- The focus of the other studies were on math and business majors (Borman & Sleigh, 2011; Rufer & Adams, 2013; Yang, 2017), psychology (Campbell, 2014; Salter & Conneely, 2015; Szabo, 2015), nursing and healthcare (Edwards et al., 2012; Mokel & Canty, 2020; Olesova et al., 2016), and education (teacher-preparation programs) (Faucette & Nugent, 2015; Jackson & Jones, 2019; Uribe & Vaughan, 2017), each of these content areas were the subject of three studies each.

Theoretical Perspectives

Across the various disciplines found in the articles featured in this review, a variety of theoretical perspectives are present. However, there were some similarities among the papers, even for studies outside the field of education. The most common perspective in these papers is a *constructivist* theory of learning. This theory posits that students learn best through collaboration when given authentic experiences to enact acquired knowledge. Four studies specifically cited the use of this theory (Faucette & Nugent, 2015; Rufer & Adams, 2013; Szabo, 2015; Wang, 2018); a fifth study utilized Vygotsky's social development theory (SDT; Edwards et al., 2012), which is a foundation of constructivist learning; and a sixth study used social constructivist ideas to examine collaborative learning and self-regulated learning (Tsai, 2013). In addition to SDT, Edwards et al. (2012) also applied a quantum perspective of learning, which utilizes exchange theory and is founded on the idea that everything that exists is connected; learning is accomplished through discovering those connections. A seventh article utilized theories related to collaboration, similar to constructivist theories, however, this study specifically focused on team-based learning, the idea that students learn best when given opportunities to work in small groups (Tsai, 2016).

Campbell (2014) and Wang and Liu (2020) focus on social theories of learning, specifically social presence theory and teaching presence. Both studies examine the presence of students and teachers for developing connections that ultimately increase learning. Whittingham (2013) and Yang (2017) did not explicitly state a theoretical foundation. These articles focused more on specific instructional practices and their effect on student learning when implemented online. Salter and Conneely (2015) and Uribe and Vaughan (2017) did not use a theoretical framework, per se, but focused on using feedback for student learning. Uribe and Vaughan (2017) used feedback to understand how students use it to improve their learning, whereas, Salter and Conneely (2015) set out to understand how feedback can increase student engagement.

The remaining articles use theoretical frameworks that share some similarities to previously mentioned ones, yet differ enough to not be grouped. Borman and Sleigh (2011) used Kolb's model of reflective learning, which focuses on students being provided with opportunities to actively and continually practice their understanding to develop it. Chang and Windeatt (2016) used Dillenbourg's concepts of situation, interactions, learning mechanisms, and effects of collaborative learning. Using this lens helped the researchers examine how the students they studied interacted with each other. Similarly, Jackson and Jones (2019) used a situated learning model to apply newly learned concepts in authentic situations. Olesova et

al. (2016) brought a practical inquiry model into their foundations, specifically using Community of Inquiry (CoI) and cognitive presence. Finally, Mokel and Canty (2020) used Leininger's transcultural nursing theory, which is derived from cultural care theory. This theory posits the importance of developing cultural competence, specifically for nursing students, to foster more positive interactions among individuals.

Sample Characteristics

This review focused on outcomes for students across disciplines. Across each of these papers, various participants were highlighted from varying degree-seeking levels (e.g., undergraduate, graduate). Eight of the studies focus on student outcomes, including participants who were enrolled in undergraduate coursework (Borman & Sleight, 2011; Campbell, 2014; Faucette & Nugent, 2015; Olesova et al., 2016; Salter & Conneely, 2015; Tsai, 2013; Tsai, 2016; Uribe & Vaughan, 2017). Of the other studies, seven focused on graduate-level students (Chang & Windeatt, 2016; Edwards et al., 2012; Mokel & Canty, 2020; Rufer & Adams, 2013; Szabo, 2015; Whittingham, 2013; Yang, 2017). One study included participants from a post-baccalaureate program (Jackson & Jones, 2019). The remaining two were unspecified, listing their participants as "degree seeking" or "college students" (Wang & Liu, 2020; Wang, 2018).

Study Design

The 18 studies had varying approaches to their study design. Five of the studies were qualitative (Chang & Windeatt, 2016; Faucette & Nugent, 2015; Jackson & Jones, 2019; Mokel & Canty, 2020; Yang, 2017), six were quantitative (Campbell, 2014; Olesova et al., 2016; Rufer & Adams, 2013; Tsai, 2013; Tsai, 2016; Wang & Liu, 2020), and seven were considered mixed methods (Borman & Sleight, 2011; Edwards et al., 2012; Salter & Conneely, 2015; Szabo, 2015; Uribe & Vaughan, 2017; Wang, 2018; Whittingham, 2013).

Among the qualitative articles we identified, Jackson and Jones (2019) and Mokel and Canty (2020) employed a case study approach, Chang and Windeatt (2016) used grounded theory, and Faucette and Nugent (2015) used a phenomenological approach. Among the articles that used quantitative methods, Wang and Liu (2020) employed social network analysis, using online text posts from students to analyze "students' interactions and collaborative knowledge constructions" (p. 372). Most of the remaining quantitative studies utilized a quasi-experimental design (Campbell, 2014; Rufer & Adams, 2013; Tsai, 2013; Tsai, 2016). Within the group of mixed-methods studies, we found that they employed a wide range of analysis methods: the authors used participatory action research (Szabo, 2015), quasi-experimental (Wang, 2018), and case study designs (Uribe & Vaughan, 2017).

Intervention Design and Implementation

The majority of the included articles were conducted as data collection research. Sixteen studies reviewed current online teaching practices through instructor and student perspectives using qualitative, quantitative, and mixed methods collection methods (Borman & Sleight, 2011; Campbell, 2014; Chang & Windeatt, 2016; Edwards et al., 2012; Mokel & Canty, 2020; Olesova et al., 2016; Rufer & Adams, 2013; Salter & Conneely, 2015; Szabo, 2015; Tsai, 2013; Tsai, 2016; Uribe & Vaughan, 2017; Wang & Liu, 2020; Wang, 2018; Whittingham, 2013; Yang, 2017). Faucette and Nugent (2015) and Jackson and Jones (2019) reviewed the effectiveness of online field training for teacher candidates.

The remaining articles studied specific interventions or strategies in the online environment. All interventions and strategies were implemented within higher education courses across multiple disciplines. The most common strategies were implemented in discussion boards on online platforms. These strategies were used to measure student engagement as related to feedback, teacher presence, and structure of the discussion question or group (Campbell, 2014; Olesova et al., 2016; Salter & Conneely, 2015; Szabo, 2015; Wang, 2018). Two studies evaluated the effectiveness of teacher and peer feedback in online courses using multifaceted and scheduled constructs (Chang et al., 2016; Uribe & Vaughn, 2017). Several studies used unique interventions within the online environment; these included reusable learning objectives (RLO), literature circles, 3D virtual world training, artistic pedagogical technology (APT), and MyMathLab (Borman & Sleight, 2011; Edwards et al., 2012; Rufer & Adams, 2013; Whittingham, 2013). The last group

of studies evaluated self-regulated, team-based, and co-regulated learning within the context of feedback and teacher initiation (Tsai, 2013; Tsai, 2016).

Impact

The 18 included studies were published across 17 unique journals from 2011 to 2020. Five themes were created after the completion of the M-MMAT. These themes include engagement, collaboration, beliefs, knowledge, and enactment of knowledge/practice.

Engagement

Six studies (Borman & Sleight, 2011; Mokel & Canty, 2020; Olesova et al., 2016; Salter & Conneely, 2015; Wang & Liu, 2020; Whittingham, 2013) examined the extent to which students' perceptions of their experiences within the course led to more engagement and/or increased motivation to participate in the online instructional engagement approaches. These studies found students indicated consistent structure, variety within the assignments, and an authentic agglomeration of applications were most worthwhile, while too much direct instruction interfered with their learning, knowledge growth, and interactions between course peers. Traditional online discussion formats, such as chat rooms and discussion boards, do not influence student engagement; however, Whittingham (2013) concluded that creating small groups of students for activities, such as literature circles, prompted friendships and engagement with students. Asynchronous, structured forums with clear expectations and communication goals are important to increase student knowledge construction through engagement and collaboration with course peers. Other course assets useful to students included instructor constructive feedback, interactive lecture components (case studies, instructor modeling), and outside resources not offered by the instructor.

Collaboration

Six studies (Chang & Windeatt 2016; Edwards et al., 2012; Szabo, 2015; Tsai, 2013; Tsai, 2016; Wang & Liu, 2020) examined the extent to which an online course deepened student sense of collaboration and connection with peers. Three of the six studies used peer- and instructor-facilitated discussions to foster collaboration. Wang and Liu (2020) found that when the instructor required students to interact with each other, they quickly became comfortable and their collaboration helped to improve their participation in the course. Szabo (2015) found that while peer-facilitated discussions increased student participation and collaboration, instructor-only facilitation resulted in longer and more developed forum posts. Time must be given to develop collaboration in online courses, as Chang and Windeatt (2016) found. Facilitating discussions for students can foster this collaboration, thus leading students to engage in these practices on their own, often leading to increased participation in the course.

Tsai (2013) and Tsai (2016) found that collaborative pedagogies also improved student achievement. Two such pedagogies were used: collaborative learning and co-regulated learning. Collaborative learning is the process of students in a social context engaging in knowledge building. In contrast, co-regulated learning is an extension of self-regulated learning: students learn to regulate learning within a group setting and alone. By using these two practices designed to increase collaboration, students were able to work together to ultimately increase their skills by the end of the course. Edwards et al. (2012) employed a unique approach to increase collaboration among their students: photovoice. A method often used to elicit photographic data from participants. Edwards et al. (2012) found that students who engaged in a photovoice activity believed they grew to better know themselves and others in their online community.

Beliefs

Two studies measured student beliefs or attitudes regarding changes in beliefs as a result of a student's involvement with an online learning experience. Faucette and Nugent (2015) conducted a training session to prepare students for online internships. They found that student interns felt more knowledgeable, capable, and passionate about their upcoming online teaching experience. University mentors contributed to the interns' communication, online teaching skills, confidence, and enhanced attitudes for future online teaching opportunities. Jackson and Jones (2019) provided evidence that after a course in facilitating

effective online environments for K12 populations, in-service teachers recognized designing and implementing a course required less time and effort than previously thought. Both studies acknowledged the importance of community, and the value of authentic experiences were needed to change student beliefs.

Knowledge

Four studies provided insight into how student knowledge improved as a result of online learning experiences (Borman & Sleigh, 2011; Uribe & Vaughn, 2017; Wang, 2018; Wang & Lui, 2020). These studies were a compilation of experiments using specific interventions and coding of student feedback surveys. Borman and Sleigh (2011) utilized an electronic toolkit to enhance student learning within the online environment. These supplemental toolkits exist for almost any type of subject. Student participation within the toolkit and responses to a satisfaction survey revealed ways in which these toolkits can increase student knowledge. Student perceptions of the usefulness of the toolkit were paramount to predicting engagement and knowledge acquisition. In the study, the toolkit was enhanced by using interactive lecture elements, which students found to be valuable in engaging with the toolkit and deepening subject knowledge. There was some concern that the toolkit was biased toward conscientious students due to the satisfaction survey at the end of the course.

Feedback was also found to be an important factor in increasing student knowledge. Wang and Lui (2020) provided data on teacher feedback by studying the effect of teacher presence in the online environment. Their research found that feedback was one of the most important aspects of teacher presence, valued by students and added to their overall content knowledge. Wang and Liu (2020) also found that feedback and presence could become disruptive to the student learning experience by limiting their ability to create and learn if it became too directive in nature. Uribe and Vaughn (2017) used a multifaceted feedback structure in an online course to understand how student knowledge construction could be affected. Explicit feedback was found to be the most significant in affecting student knowledge. The multifaceted approach to feedback resulted in the creation of a feedback cycle with experienced pitfalls reported in the study. This cycle provides educators with a purposeful approach to feedback within the online environment, which envelopes the instructor-student relationships and details the response to feedback during the cycle from both parties. Overall, students found this cycle to be very helpful in being successful on formative assessments and created a space for both instructor and students to reflect on the feedback process.

Course design and application were the last factors affecting student knowledge in the research. Clear communication of goals and objectives, clarity of assignments and due dates, clear expectations, and feedback were all elements of course design and application cited by students as factors in facilitating knowledge acquisition (Wang & Lui, 2020). In addition, students reported the most helpful courses provided consistent structure, a variety of assignments, and application-focused (Wang, 2018). One specific strategy that improved student knowledge was the use of case studies. This approach encouraged students to seek resources outside of the course, which led to an enhancement of the knowledge available in the online course (Wang, 2018). The last finding in the research completed by Wang (2018) showed a causal relationship between adaptation of course design to each specific set of students and student ability to acquire and deepen content knowledge. This would suggest that instructors should continually reevaluate their course design and procedures for each course and make changes accordingly to ensure each student's unique needs of learning and knowledge are met.

Enactment of Knowledge/Practice

Eight studies (Borman & Sleigh, 2011; Campbell, 2014; Faucette & Nugent, 2015; Jackson & Jones, 2019; Rufer & Adams, 2013; Tsai, 2013, 2016; Wang & Liu, 2020; Yang, 2017) investigated how an experience in online learning affected how students are able to implement a practice or strategy. Wang and Liu (2020) ascertained that too much direct instruction hindered student interactions and knowledge construction. Students need to be accountable for their learning while practicing knowledge of content. When Rufer and Adams (2013) allowed students to engage with related information, examples, and information, the students produced learning content rich in multimedia, interactivity, and feedback. The reusable learning objects (RLOs) helped students identify the resources that could be used to leverage a

better understanding of core competencies. These authors posit a significant positive relationship between student outcomes and the use of the RLO intervention.

Tsai's (2013, 2016) interventions regarding co-regulated learning and collaborative learning contributed to the practice of knowledge for students in these studies. Faucette and Nugent (2015) found that providing students with a five-week session before the semester, students were more knowledgeable, capable, and enthusiastic about online teaching. Whereas, Borman and Sleight (2011) designated weekly MyMathlab assignments with face-to-face lectures. Survey data determined MyMathlab resources were viewed by students positively, increased their engagement in learning, and were a useful tool for knowledge practice. Yang (2017) asked students to respond to reflection questions regarding instructional strategies used in the course. Within this study, the author stated that various instructional strategies and course design features were effective. Instructional strategies included case studies, video tutorials, instructional notes for each course section, and mini-projects. However, it was also noted that students used many outside resources not offered by the instructor to increase their knowledge and practice of the subject.

Jackson and Jones (2019) and Campbell (2014) studied the practice of faculty member and in-service teacher actions about the enactment of their students' knowledge. Campbell found no effect on the outcome according to the number of assignments completed or exam scores when allocating more feedback to students. Teacher presence also made no difference in discussion grades. Jackson and Jones (2019) analyzed in-service teachers' knowledge and practice of virtual teaching practices after they completed a course involving weekly blog posts during the in-service teacher's virtual field experience. All participants stated that they believed the effort and time necessary to design and implement a course was less than originally thought. The effective elements that provided the enactment of knowledge included the importance of community, watching other teachers teach, and authentic experience (Campbell 2014; Jackson & Jones, 2019).

Critique

As we examine the scope of these papers, multiple drawbacks appear when moving online instruction forward. A major shortcoming of all the papers was a lack of rigor in their research design related to subject selection and outcome measures. Authors utilized convenience sampling, such as their course or classroom. We need more studies that include larger sample sizes and more complex research design methods for study replication.

Embodied within the research design is a need for measures that precisely measure student learning outcomes. How do we know that students are learning without performance or knowledge metric to gauge impact? Many of these papers examined student grades, the number of discussion posts (both original and responses), and the number of emails between the student and instructor as "evidence" of student learning. These measures are appropriate for examining student outcomes; however, they are not sufficient for proving causation. Moreover, these measures do not articulate the impact of the individual course or the amount of knowledge students obtained to practice. In addition, these measures do not chronicle the impact of learning and understanding of course content for students to demonstrate knowledge. We need studies on how students transfer what they learn from online/virtual coursework into increasingly authentic environments, such as the special education classroom.

Five research teams designed their studies in a manner that took into account qualitative information from their subjects (e.g., blog posts, comments, surveys) as well as the quantitative aspects of their studies (Borman & Sleight, 2011; Salter & Coneely, 2015; Szabo, 2015; Uribe & Vaughn, 2017; Whittingham, 2013). The use of student-produced qualitative data provided subject insight into the intervention or strategy effectiveness and impact that aids in validating the quantitative student outcome results. This method strengthens educational research by providing perspective to the research results.

DISCUSSION

As we have previously said, online instruction has been implemented in higher education for many years, however, studies about online teaching methods and strategies have not been consistently reviewed

for their impact on student learning and knowledge. This is important as higher education increases the number of courses and programs offered primarily online.

Increased student engagement was found when courses provided consistent structure and variety of assignments (Borman & Sleigh, 2011; Mokel & Canty, 2020; Olesova et al., 2016; Salter & Conneely, 2015; Wang & Liu, 2020). Direct instruction decreased student engagement unless additional opportunities in small groups were provided for peer interaction (Whittingham, 2013). In collaboration, peer-facilitated discussions were the most effective in building online communities but adding instructor-led discussions to clarify expectations led to deeper and more fully developed discussions (Chang & Windeatt 2016; Szabo, 2015; Wang & Liu, 2020). In addition, co-regulated and team-based learning significantly affected student outcomes (Tsai, 2013; Tsai, 2016). Student beliefs were found to be important for future ability to design and execute in their field. The greatest positive impacts on a student's belief in their abilities were the authenticity of experiences offered in the course and the sense of community among peers and instructors (Faucette and Nugent, 2015; Jackson & Jones, 2019).

Knowledge is key to preparing students for success. Imparting field-specific knowledge is the basis for all learning outcomes. The major keys to improving student outcomes of topic knowledge were feedback, course design, and application (Uribe & Vaughn, 2017; Wang, 2018; Wang & Lui, 2020). Multi-faceted feedback across several domains was very effective (Uribe & Vaughn, 2017) but studies showed that any organized feedback system provided the environment for an increase in student knowledge (Wang & Lui, 2020). Course design and application was found to be most effective when it was adapted to individual classes (Wang, 2018). Each group of students provides a unique community that requires continual changes and adaptations of course design and planned applications to ensure the acquisition of actionable knowledge. Enactment of knowledge and practice is essential to building skills in students. This process was best accomplished through planned assignments within the courses, which offered authentic experiences that mirrored real-world expectations. The amount or difficulty of the assignments was not significant in producing the desired student outcome. These outcomes were most affected by community support within the course, the ability to observe professionals enact the knowledge or practice, and the authenticity of the experience (Campbell, 2014; Jackson & Jones, 2019).

The lack of quality research into online teaching practices became evident through the processes of quality evaluation and exclusion steps, resulting in only 1 study being included in this review. In addition, only 3 teacher education studies met the inclusion criteria (Faucette & Nugent, 2015; Jackson & Jones, 2019; Uribe & Vaughn, 2017). There is a pressing need for additional research into online course development and techniques, especially in the field of teacher education. This will also require continued replication of results to validate effective interventions and designs in the online environment and the addition of student-provided data into the research to ensure subject voices are being considered alongside the quantitative results of student outcomes. In addition, the result of many online course interventions can only be fully understood through longitudinal studies, which consider how effective the course has been in enacting knowledge within the specific field.

Lastly, the reviewed studies failed to consider culturally relevant factors within their research design. Cultural factors have been shown to affect student outcomes in all academic fields. Future studies must consider this impact when developing interventions or testing course designs to ensure the results best represent a universal application across populations and cultures. This could be best addressed through the development of community within the online environment. This cultural competence is necessary in course development and should be transferred to students for future application in their field. Only Mokel and Canty (2020) addressed this important aspect through their study into a course developed specifically to develop cultural competence.

It is evident through the data that community among students is effective in increasing student outcomes and building on the tenets discussed within this review (Chang et al., 2016; Szabo, 2015; Tsai, 2013; Tsai 2016, Wang, 2018; Whittingham, 2013). Leveraging the success of community within the online environment to produce cultural competence would be an effective tool to ensure student engagement within the course and build necessary tools for their future experiences within their fields.

Implications for Practice and Research

As more and more EPPs move their courses online, it is imperative for these institutions to consider principles and practices that will facilitate effective online instruction. Moreover, what is needed next is research examining the effectiveness of these approaches in deepening special and general education teacher candidates' knowledge and skills for effective instruction. In addition, support is needed from EPP administrations for teacher educators to learn these approaches and operationalize them within their EPP with efficiency and effectiveness.

Simply re-creating a face-to-face course in an online setting is ineffective and is not producing high-quality teachers with the knowledge needed to move our educational system forward. Hoping for similar results in an online setting without any modification of the course is a naive expectation. For an online course to prove successful, teacher educators must carefully consider the enactment of practices that will foster student engagement, collaboration among students, and acquisition of new knowledge. Our findings have provided evidence to support the inclusion of practices such as literature circles, innovative student grouping, consistent and thoughtful feedback, and the use of application-focused practices.

For teacher educators, several lessons can be learned from this literature review when considering the design and execution of online coursework. Collaboration and team-based learning were effective in producing positive student outcomes (Tsai, 2013; Tsai 2016). This was optimized by using instructor-supported group projects or discussions. This combination of student-led, instructor-supported group work produced discussions with the most depth of knowledge and provided clear and focused direction for group assignments (Szabo, 2015; Wang, 2018). Accordingly, instructor support should be minimized to examples and clarification while creating a space for the online community to develop between students.

Another lesson from the research is the need for authentic experiences in the online environment (Campbell, 2014; Jackson & Jones, 2019). Creating real-world experiences within an online course presents a unique challenge for teacher educators. Multiple tools should be implemented to ensure that assignments and projects provide experiences similar to those they will find in the classroom. These tools include case studies, virtual simulation, web-based tutoring, rehearsal, video analysis, and online lesson study (Benedict et al., 2022). Authentic experiences are effective and needed in preparing students for the classroom and providing content for effective feedback and self-reflection.

Many students feel isolated in online courses, often disconnected from their peers and instructor. Effective online instruction should include intentional community-building activities to bridge the social gap found in online settings. Relationships are a crucial part of teaching and learning, yet many online instructors fail to make this a focus of their pedagogy discarding the ability to model effective practices. With intentionally designed community building, instructors can facilitate building relationships among their students and between *themselves* and their students. Our research has revealed students expressed more positive feelings about their online coursework when instructors included spaces for them to collaborate and communicate with their peers. This resulted in more carryover of course content into the field of practice.

Furthermore, students expressed the importance that effective and continuous feedback had on their online coursework experiences. Online instructors who were absent, provided minimal communication, or only posted weekly announcements failed to meet this expectation. Students relayed through surveys that they needed to go beyond the coursework to supplement learning that was not gained through instructor feedback (Szabo, 2015). Continuous feedback allows students to quickly learn about potential mistakes, or what was done well, in order to improve on subsequent tasks or assignments (Uribe & Vaughan., 2017). Without this feedback, it is more likely that students will not acquire the necessary knowledge to meet learning targets. This is especially important in fields where course knowledge must be applied to detailed practice.

Future Directions

There are several limitations worthy of consideration when interpreting the findings in this review of the literature. First, many studies were developed utilizing the college or university instructor's course and practice. This may lead to bias in data collection and analysis by the researchers. Studies may need to bolster

external and internal validity to provide stronger evidence for research on teacher preparation programs. This will increase the investigative rigor of student engagement, content knowledge, and practice implementation.

Furthermore, the need for teacher educators/researchers to enhance the written description of study analysis is essential for applying methods and strategies in special and general education classrooms. Many qualitative studies merely gather decision-making approaches for reasons that govern an in-depth understanding of human behavior; however, most universities use performance-based assessments to measure progress, student behavior, and knowledge of content. Within these measures, we have the potential to better understand the impact of online instruction on the readiness of teachers when they step into their first classroom.

This review may demonstrate a bias toward high-quality, peer-reviewed, journal-published articles. Academic journals strive to publish articles with strong theoretical frameworks, so researchers can know the impact of teaching practices on students, both P12 and teacher-education programs. Teacher education/practitioner journals need to be utilized to feature written content for people who work/practice in special education. Upon completing this review, our team determined that a call for action is needed amid future research in higher education teacher preparation programs. Teacher education is uniquely poised to better understand the impact of online learning on future teacher effectiveness. Additional research is needed that uses performance-based assessments and credentialing exams, including problem-solving processes that require novice teachers to demonstrate skills and understanding of educational strategies and methods.

Lastly, we need to move beyond discussion posts to measure student growth and outcomes by grades, or the number of times they email an instructor to more authentic or dynamic discourse through collaborative experience. Our educational research for EPPs needs to have increased rigor and quality for all future studies to meet our changing field of teacher preparation in higher education programs. Across the nation, we are seeing a shift in what the classroom looks like; in response, we also need to shift our educational research to meet this changing classroom.

SUMMARY

As we have seen during and post-pandemic, we must ensure our EPPs are prepared to develop our future special education and general education teachers starting from day one in the classroom. Teachers report that the number one reason for leaving the field is a lack of preparation and confidence to deliver appropriate curriculum to the diverse population of students in current classrooms. To ensure this practice occurs, higher education universities that provide EPPs need to support more evidence-based research poised to propose authentic, innovative, constructive strategies and methods. For our field to ensure P12+ students' needs are met in the classroom, EPP instructors need to model these strategies and methods with the intention that general and special education teachers will have the ability to utilize them in their practice.

REFERENCES

- Benedict, A., Papacek, A., Rodgers, W., Wells, K., Koziarski, G., Colpo, A., & Robinson, R. (2022). *Learning to teach: Practice-based preparation in teacher education in virtual learning environments*. CEEDAR Center (Collaboration for Effective Educator Development, Accountability, and Reform). Retrieved from <https://ceedar.education.ufl.edu/wp-content/uploads/2022/03/CEEDAR-Virtual-Teacher-Prep.pdf>
- Borman, D. & Sleigh, A. (2011). An evaluation of the use of interactive approaches and integrated on-line resources. *Teaching Mathematics and its Applications*, 30, 166–177.
- Brownell, M.T., Benedict, A.E., Leko, M.M., Peyton, D., Pua, D., & Richards-Tutor, C. (2019). A continuum of pedagogies for preparing teachers to use high-leverage practices. *Remedial and Special Education*, 40(6), 338–355. <https://doi.org/10.1177/0741932518824990>

- Campbell, D.E. (2014). The influence of teacher immediacy behaviors on student performance in an online course (and the problem of method variance). *Teaching of Psychology*, *41*(2), 163–166. <https://doi.org/10.1177/0098628314530351>
- Chang, H., & Windeatt, S. (2016). Developing collaborative learning practices in an online language course. *Computer Assisted Language Learning*, *28*(8), 1271–1286. <https://doi.org/10.1080/09588221.2016.1274331>
- Edwards, M., Perry, B., Janzen, K., & Menzies, C. (2012). Using the artistic pedagogical technology of photovoice to promote interaction in the online post-secondary classroom: The students' perspective. *Electronic Journal of e-Learning*, *10*(1), 32–43.
- Faucette, N. & Nugent, P. (2015). Impacts of a redesigned virtual internship program on preservice teachers' skills and attitudes. *International Journal of E-Learning & Distance Education*, *30*(2).
- Green, N., Wolodko, B., Stewart, C., Edwards, H., Brooks, M., & Littlelyke, R. (2013). Collaborative self-study of online teaching in early childhood teacher education. *International Journal for Academic Development*, *18*(2), 166–177. <https://doi.org/10.1080/1360144X.2012.677747>
- Jackson, B.L., & Jones, W.M. (2019). Where the rubber meets the road: Exploring the perceptions of in-service teachers in a virtual field experience. *Journal of Research on Technology in Education*, *51*(1), 7–26. <https://doi.org/10.1080/15391523.2018.1530622>
- McDonald, M., Kazemi, E., & Kavanagh, S. (2013). Core practices and pedagogies of teacher education: A call for common language and collective activity. *Journal of Teacher Education*, *64*, 378–386. <https://doi.org/10.1177/0022487113493807>
- Mokel, M.J., & Canty, L. (2020). Educational outcomes of an online educational intervention teaching cultural competency to graduate nursing students. *Nurse Education in Practice*, *46*, 1–7. <https://doi.org/10.1016/j.nepr.2020.102832>
- Olesova, L., Slavin, M., & Lim, J. (2016). Exploring the effect of scripted roles on cognitive presence in asynchronous online discussions. *Online Learning*, *20*(4), 34–53.
- Pluye, P., Robert, E., Cargo, M., Bartlett, G., O’Cathain, A., Griffiths, F., . . . Rousseau, M.C. (2011). *Proposal: A mixed methods appraisal tool for systematic mixed studies reviews*. McGill University, Canada. Archived by WebCite®. Retrieved from <http://www.webcitation.org/5tTRTc9yJ> & <http://mixedmethodsappraisaltoolpublic.pbworks.com>.
- Rufer, R. & Adams, R.H. (2013). Deep learning through reusable learning objects in an MBA program. *Journal of Educational Technology Systems*, *42*(2), 107–120. <http://dx.doi.org/10.2190/ET.42.2.c>
- Salter, N.P., & Conneely, M.R. (2015). Structured and unstructured discussion forums as tools for student engagement. *Computers in Human Behavior*, *46*, 18–25. <http://dx.doi.org/10.1016/j.chb.2014.12.037>
- Szabo, Z. (2015). Better together: Teams and discourse in asynchronous online discussion forums. *Journal of Psychological and Educational Research*, *23*(1), 73–88.
- Tsai, C.-W. (2013). An effective online teaching method: The combination of collaborative learning with initiation and self-regulation learning with feedback. *Behavior & Information Technology*, *32*(7), 712–723. <http://dx.doi.org/10.1080/0144929X.2012.667441>
- Tsai, C.-W. (2016). Exploring the effects of online team-based learning and co-regulated learning on students' development of computing skills. *Interactive Learning Environments*, *24*(4), 665–680. <https://doi.org/10.1080/10494820.2014.917106>
- Uribe, S.N., & Vaughan, M. (2017). Facilitating student learning in distance education: A case study on the development and implementation of a multifaceted feedback system. *Distance Education*, *38*(3), 288–301. <https://doi.org/10.1080/01587919.2017.1369005>
- Wang, L. (2018). Effects of online learning communities on college students' knowledge learning and construction. *Journal of Interdisciplinary Mathematics*, *21*(2), 377–387. <https://doi.org/10.1080/09720502.2017.1420567>
- Wang, Y., & Liu, Q. (2020). Effects of online teaching presence on students' interactions and collaborative knowledge construction. *Journal of Computer Assisted Learning*, *36*, 370–382. <https://doi.org/10.1111/jcal.12408>

Whittingham, J. (2013). Literature circles: A perfect match for online instruction. *Tech Trends*, 57(4), 53–58.

Yang, D. (2017). Instructional strategies and course design for teaching statistics online: Perspectives from online students. *International Journal of STEM Education*, 4(1), 1–15.

<https://doi.org/10.1186/s40594-017-0096-x>

APPENDIX 1: RESEARCH ARTICLES FOCUSED ON STUDENT OUTCOME

Author(s)	Design	Intervention(s)/Measurement(s)	Results
<u>Teacher Education Field</u>			
Faucette & Nugent, 2015	Phenomenological	Online internship program measured by student artifacts, semi-structured interviews supervisor debriefings, and surveys	Initial resistance but positive reports; importance of collaborating teachers and peer interactions expressed
Jackson & Jones, 2019	Case Study	In-service teachers' experience during virtual field experience (VFE) measured by weekly blogs and interviews	Participants found VFE beneficial and an "authentic experience" but some challenges with support
Uribe & Vaughn, 2017	Mixed Methods	Multi-faceted feedback system in distance learning measured by focus groups, surveys, and formative assessments	Proposed feedback cycle developed with potential pitfalls
<u>English Language Learner Field</u>			
Chang & Windeatt, 2016	Quasi-experimental	Student collaboration/feedback measured through student work/discussions	Collaboration quantity and quality increased through course
Whittingham, 2013	Mixed Methods	Literature Circles in online environment measured through Likert Scale and open-ended surveys	Students preferred Literature Circles to traditional online discussions
<u>Psychology Field</u>			
Campbell, 2014	Causal-Comparative	Teacher presence/messaging intensity measured through student outcomes	No significant effect on student outcomes
Salter & Conneely, 2015	Mixed Methods	Structured vs. unstructured discussions effects on student engagement measured through Likert Scale and open-ended survey	Both techniques received positive responses, but structured was reported as more engaging
Szabo, 2015	Mixed Methods	Peer-facilitated vs. instructor-led online discussions evaluated by frequency and content of student posts	Peer-facilitated improved student participation while instructor-led resulted in higher quality posts

Author(s)	Design	Intervention(s)/Measurement(s)	Results
<u>Math/Business Field</u>			
Borman & Sleight, 2011	Mixed Methods	Electronic Toolkit (MyMathLab) measured engagement through software use time and student satisfaction survey	Increased engagement and mostly positive reviews
Rufer & Adams, 2013	Quasi-experimental	Reusable Learning Objectives (RLO) measured by student outcomes and relationship to RLOs	RLOs were effective in improving student outcomes
Yang, 2017	Phenomenological	Design/Strategies for STEM collected through student self-reflections	Effective strategies and design features provided
<u>Health Care Field</u>			
Edwards, et al., 2012	Mixed Methods	Artistic Pedagogical Technology (APT) measured with student survey and focus group	APT positively supported social interaction in an online course
Mokel & Canty, 2020	Case Study	Online cultural competency intervention results reported through online discussion posts using Leininger's Sunrise Enabler	New cultural knowledge, influence of culture on relationships, and implications for field education
Olesova et al., 2016	Quasi-experimental	Effect of scripted roles in discussions on cognitive presence measured frequency of cognitive indicators	Scripted roles had a significant effect through on cognitive presence for the integration indicator
<u>Technology Field</u>			
Tsai, 2013	Quasi-experimental	Collaborative (CL) and Self-Regulated Learning (SRL) with and without feedback or initiation collected through student outcomes	CL with initiation and SRL with feedback was significant in final student outcomes
Tsai, 2016	Quasi-experimental	Effects of team-based (TBL) and Co-regulated learning (CRL) on computing skills using student outcomes	CRL had a significant effect on student outcomes
<u>Unreported Field</u>			
Wang, 2018	Mixed Methods	Online learning community composition reported through knowledge level and participation	Communities led by a teaching assistant promoted knowledge construction
Wang & Lui, 2020	Correlational	Effect of teacher presence on student interactions and collaborative knowledge instructions measured with course and student artifacts	Design, organization, and facilitation have positive effects on interaction, but too much direct instruction can hinder collaboration