NSQ

The NATIONAL STANDARDS for QUALITY ONLINE LEARNING

2023 Annotated Bibliography

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VLLA VIRTUAL LEARNING LEADERSHIP ALLIANCE

QUALITY MATTERS QM

digital learning COLLABORATIVE

Introduction

The development of the *National Standards for Quality Online Learning* is a process that began almost two decades ago when the Southern Region Education Board (SREB) released its *Standards for Quality Online Teaching* (2006a) and *Standards for Quality Online Courses* (2006b), along with an accompanying *Checklist for Evaluating Online Courses* (2006c). The North American Council for Online Learning (NACOL) (which would later become the International Association for K-12 Online Learning [iNACOL]), in an effort to further formalize practice in the growing field of K-12 online and blended learning, released their own set of *National Standards for Quality Online Courses* and *National Standards for Quality Online Teaching* a year later (North American Council for Online Learning, 2007a, 2007b). These NACOL national standards were an adoption of the SREB standards with some additions due to NACOL's involvement with the Partnership for 21st Century Skills initiative time (Berge & Clark, 2009). Two years later, iNACOL would release their *National Standards for Quality Online Programs* (Wicks & Pape, 2009). Following their release, the online course standards were used to provide reviews of course content in organizations like the California Learning Resource Network and the Texas Agency's Texas Virtual School Network (Smith, Bridges, & Lewis, 2013). The original standards would be updated in 2011 (iNACOL, 2011a, 2011b).

In 2019 iNACOL once again rebranded themselves to become the Aurora Institute, with a shift in the focus of their mission from K-12 online and blended learning to competency-based education and personalized learning. At this time the Virtual Learning Leadership Alliance and Quality Matters (later joined by the Digital Learning Collaborative), assumed responsibility for these online learning standards and – after a review by expert panels – released the *National Standards for Quality in Online Courses*, *National Standards for Quality in Online Teaching*, and *National Standards for Quality in Online Programs* (Virtual Learning Leadership Alliance & Quality Matters, 2019a; 2019b; 2019c). In March 2023 the *National Standards for Quality Online Learning* Leadership Team and Project Managers issued a request for proposals to complete an annotated bibliography of relevant research literature to inform the next revision cycle of the standards. [1]

As per the funder's request, this annotated bibliography reviews research articles, book chapters, dissertations, and reports that specifically address K-12 online, blended, and hybrid learning AND one or more of (1) artificial intelligence (AI); (2) synchronous online learning; (3) social and emotional learning (SEL) & life skills; (4) accessibility; (5) equity; (6) cybersecurity; (7) learner engagement; or (8) assessment. In this report, the researchers begin by outlining the specific steps that were used to conduct the search process. This is followed by a description of the annotation process and a discussion of the nature of the manuscripts that were identified. Next, the researchers examine general trends and broad themes from the literature that form the current data set. Finally, there is a commentary drawing out major ideas of what was there with an eye to making recommendations for standards and indicator updates, as well as areas where the research literature has not kept pace with the practice of K-12 distance, online, blended, and

[1] See https://docs.google.com/document/d/1FTSH08piJ6n3tsyt7jv8r6ZvQwEUMdIXYBEcEmoRkfI/edit?usp=sharing for a copy of the original scope of work.

hybrid learning that the *National Standards for Quality Online Learning* Leadership Team and Project Managers may want to remain sensitive to.

Methodology

The researchers were asked to undertake a search of scholarly research databases for articles and dissertations that specifically addressed the following topics in K-12 online, blended, and hybrid learning:

1. AI
2. Synchronous online learning
3. SEL & life skills
4. Accessibility
5. Equity
6. Cybersecurity
7. Learner Engagement
8. Assessment

It was asked that "research articles included must include a methodology and findings; however, strong theoretical articles that focus on online learning would also be appropriate. Additionally, research that focuses on emergency remote learning (learning that took place during the pandemic) [may be used] if findings have a significant impact on online, blended, or hybrid learning as defined below:

> K-12 online, blended, and hybrid learning is defined by the *VLLA Key Online Learning Terms and Definitions* as follows:
>
> a. Online Learning: Online learning, as one type of digital learning, refers to the medium or "vehicle" used for instruction. In the online learning medium, over three quarters or more of the instruction typically occurs asynchronously within an online course.
> b. Blended Learning: Blended learning is a formal education program in which a student learns at least in part through online learning, with some element of student control over time, place, path, and/or pace; at least in part in a supervised brick-and-mortar location away from home; and the modalities along each student's learning path within a course or subject are connected to provide an integrated learning experience. (1) Reference: Christensen Institute, Blended Learning, What is Blended Learning
> c. Hybrid Learning: Hybrid learning includes a combination of traditional classroom instruction and online instruction to meet the educational needs of the learner."[2]

Based upon this direction, the researchers used a variety of terms related to K-12 distance, online, and blended learning (e.g., distance learning, online learning, virtual learning, cyber learning, emergency remote learning, distributed learning, e-learning, digital learning, hybrid

[2] Taken from the original *Scope of Work: 2023 National Standards for Quality Online Learning Annotated Bibliography*.

learning, virtual school, cyber school, correspondence education, concurrent teaching, co-seating, co-locating, etc.), along with the required topics and variations deviations (see Table 1 below).

Table 1.
Search Terms for Each of the Eight Categories

QM-Provided Category	Terms searched (in addition to the category label)
AI	Large language models Chatbots Robots Dynamic testing Machine learning
Accessibility	Dis/abilit(ies) Learning difficulty Learner support Special education Inclusion Special needs
Assessment	Data-based decision making Performance Placement Achievement Evaluation Summative Formative
Cybersecurity	Privacy laws, protections, and security Data security Information protection Cyber attack
Equity	Social justice Anti-racism Cultural responsiveness Anti-oppressive pedagogy Opportunity to learn
Learner Engagement	Engagement Presence (on its own and combined with instructor, learner, cognitive) Behavioral engagement Persistence
SEL & life skills	Affective engagement Emotional engagement Emotional presence Social engagement Social presence Social support Emotional support

	CASEL Belonging
Synchronous online learning	Synchronous Zoom Teams Skype Real-time online Live online

Google Scholar was used as the main search engine to identify possible research for inclusion in the project. Prior to searching, we established a library link to our respective institutions. "Library links are article-level links to subscription full text for patrons affiliated with a library" (*Google Scholar*, n.d., para. 3), which meant that in addition to public open access material, *Google Scholar* also identified full text options for any database for which the libraries of our representative institutional libraries subscribed. The important aspect of using *Google Scholar* was that in addition to peer reviewed journal articles, conference proceedings, and dissertations and theses, *Google Scholar* allowed the researchers to identify actual research more easily from policy institutes, think tanks, and other organization that produce research with a level of methodological rigor or external review.

These search parameters were applied to literature published since January 1, 2017. The decision to limit the search to the past six years was based on the fact that Arnesen et al. (2019) conducted an extensive search of peer reviewed journal articles related to K-12 online learning from 1994 to 2016, and were able to identify 356 articles that they have made publicly available at https://tinyurl.com/K12OnlineLearningData. As this data has already been collected and analyzed, it was appropriate to begin the search where these authors left off. The search process concluded on July 1, 2023. The search identified the following 88 pieces of literature for potential inclusion.

AI – 16 items
Accessibility – 10 items
Assessment – 12 items
Cybersecurity – 7 items
Equity – 2 items
Learner Engagement – 14 items
SEL & Life Skills – 8 items
Synchronous Online Learning – 19 items

A closer review of this literature, as well as using the reference lists for additional items for possible inclusion yielded a final pool of 77 pieces of literature (see Appendix A for the literature that met the inclusion criteria, and Appendix B for a list of literature that was excluded or discovered and/or published after the search concluded).

Annotations

Given the constraints for the project, it was determined that the researchers would annotate approximately half of the overall sample. The annotations would follow a consistent format that was derived based on the structure abstract format from two of the journals represented in the pool of literature – the *Journal of Computer Assisted Learning* (see https://onlinelibrary.wiley.com/journal/13652729) and the *Journal of Information Technology Education: Research* (see https://www.informingscience.org/Journals/JITEResearch/Overview). Using these two models, the annotations included the following four categories (and the descriptions from the respective journals have been included below):

> *Background:* What motivated the research? What problem was it meant to solve? What are the limitations to existing knowledge or ways of addressing the problem? Phrase this so that it communicates the importance of the study. (maximum: 2-3 sentences)
>
> *Background:* Explain in a sentence or two in what way does this paper address the problem?
>
> - * - * - * - * - * - * - * - * - * - * - * - * -
>
> *Methods:* Describe the sample population (if applicable), research design, conceptual framework, and/or analytic approach. Please be concise stating the specific method or approach. (2-3 sentences)
>
> *Methodology:* Mention for the reader the methods used in the paper. Briefly describe any research sample.
>
> - * - * - * - * - * - * - * - * - * - * - * - * -
>
> *Results and Conclusions:* Give a high level overview of the most important findings and conclusions. Please do this in 'normal' language rather than in numeric form unless absolutely necessary. (2-3 sentences)
>
> *Findings:* List the paper's major findings
>
> - * - * - * - * - * - * - * - * - * - * - * - * -
>
> *Recommendations for Practitioners:* Enter any recommendations for practitioners

It was determined that (a) any piece of literature that did not have an abstract at all WAS included, (b) any piece of literature that already had a structured abstract, even if the structure was different than above, WAS NOT be included (there was one exception made to this criteria), and (c) the remainder of annotated literature was determined based on the researchers' judgment on items that were potentially the most meaningful. These annotations can be found in Appendix C, while the author provided abstracts for all of the literature in the sample can be found in

Appendix D (and Appendix E contains both the author written abstracts and the researchers' annotations for those pieces of literature that were annotated).

Search Results

While the researchers were able to identify specific categories for each of the pieces of literature during the initial search phase, upon closer review of each item to determine its final inclusion it became apparent that most of the pieces of literature could have been placed in multiple categories (see Table 2 for an analysis of the eight categories represented by each of the pieces of literature). In fact, only 15 of the 77 pieces of literature could be placed into a single category (i.e., nine in Learner Engagement, two in AI, and one each in Accessibility, Cybersecurity, SEL & Life Skills, and Synchronous Online Learning).

Table 2.
QM Categories for Each Piece of Literature.

Author(s) Year	AI	Accessibility	Assessment	Cybersecurity	Equity	Learner Engagement	SEL & life skills	Synchronous online learning
Aguilar et al. (2022)						X		X
Alebaikan et al. (2022)					X	X	X	
Alvarado-Alcantar & Keeley (2020)		X			X			
Alvarado-Alcantar et al. (2018)		X			X			X
Amundson (2021)						X		X
An et al. (2022)		X			X	X	X	
An et al. (2021)					X	X		X
Baliram et al. (2021)			X			X		
Beasley & Beck (2017)		X			X	X		
Beaulieu (2022)						X		X
Bhuyan et al. (2020)				X		X		
Black et al. (2022)					X	X		
Boninger et al. (2019)	X			X	X	X		
Boninger et al. (2020)				X				
Bowen et al. (2022)				X			X	
Catalano et al. (2020)		X			X			
Chen & Wang (2018)	X					X		
Chiu (2023)					X	X	X	
Choi et al. (2017)			X					
Cooper et al. (2023)							X	
Crouse & Rice (2018)		X			X	X		X
Daftary (2022)		X		X	X	X	X	X
Douglas et al. (2023)						X		
ElSayary et al. (2022)						X		

Fees et al. (2018)					X		X			
Frazier & Tolbert (2023)			X				X			
Greer (2020)						X	X			X
Gresse Von Wangenheim et al. (2022)	X		X							
Harris et al. (2022)							X			
Holstein et al. (2019)	X		X							
Howley (2022)						X	X			X
Hrastinsk et al. (2021)							X			X
Hu et al. (2017)			X				X			
Jimoyiannis et al. (2021)							X			X
Jones & Figueiredo-Brown (2018)		X				X				
Katz et al. (2022)	X	X	X			X	X			
Khazanchi et al. (2022)							X			
Ko et al. (2022)						X	X			X
Kurt et al. (2022)							X			
Ladendorf et al. (2021)			X				X			
Levin (2020)					X	X				
Levine et al. (2023)		X				X		X		
Li et al. (2022)	X		X							
Liao et al. (2021)							X	X		X
Lindfors & Pettersson (2021)							X			X
Love & Ewoldt (2021)		X				X				X
Luo et al. (2017)							X	X		X
Ma et al. (2022)							X			
Martin et al. (2017)							X			X
Middleton (2020)			X			X				
Miller (2022)						X		X		

Ouherrou et al. (2019)		X			X	X	X		
Park & Shin (2021)	X								
Pelaez et al. (2022)	X								
Rajendram et al. (2022)						X			
Rehn et al. (2018)						X	X	X	
Reinhart & Banister (2018)			X			X			
Rice (2018)		X	X		X				
Rice & Ortiz (2020)		X			X				
Rice & Ortiz (2021)		X		X	X	X			
Rice and Deshler (2018)		X			X				
Sayed et al. (2023)	X		X						
Shelton & Gezer (2023)		X			X	X			
Shively & Geesa (2023)					X		X		
Solovieva et al. (2020)	X	X				X	X		
Solyst et al. (2022)						X	X	X	
Song (2017)	X		X						
Standen et al. (2020)	X	X	X		X	X	X		
Tan et al. (2017)						X			
Tate & Warschauer (2022)		X			X				
Tysinger et al. (2016)		X			X		X		
Vladimirovna et al. (2020)						X	X		
Wang et al. (2021)	X	X			X	X			
Yu & Ha (2021)									
Yue et al. (2022)	X					X	X		
Zayet et al. (2023)	X		X			X			
Zeng & Luo (2023)								X	
Zhang & Lin (2020)						X			

Overall, the literature was categorized as follows:

AI – 15 items
Accessibility – 22 items
Assessment – 17 items
Cybersecurity – 8 items
Equity – 33 items
Learner Engagement – 51 items
SEL & life skills – 19 items
Synchronous online learning – 21 items

Some general trends that were noted included the fact that almost all the pieces of literature in the Synchronous Online Learning category were also coded as falling into the Learner Engagement category. Similarly, there was a high degree of correlation between the Accessibility category and the Equity category. Finally, those items that were coded as falling into the AI also tended to be coded with the Assessment category or the Learner Engagement category.

Relationship to Existing Standards

Previous annotation projects for the *National Standards for Online Learning* included a listing of the articles and then a table that indicated which of the standards that each piece of literature focused or touched on (see Kennedy et al., 2018; Shattuck & Birch, 2018a, 2018b). The researchers examined these previous efforts for guidance on approaching the current effort and found them lacking in both accuracy and usefulness. For example, Shattuck and Birch (2018a) included their "analysis of the research gathered in general relationship to the iNACOL standards" (p. 2) – as this was prior to the development of the *National Standards for Quality Online Learning*. Of the 166 items listed there were numerous entries that included five or more of the 11 standard areas. Even items where the authors indicated only a single area were inaccurate. For example, the authors suggested that Barbour and Mulcahy (2006, 2008), as well as Johnston and Barbour (2013), were all aligned with:

> Standard H – The online teacher develops and delivers assessments, projects, and assignments that meet standards-based learning goals and assesses learning progress by measuring student achievement of the learning goals.

However, these studies were media comparison studies where Barbour, Mulcahy, and Jonhston compared how students in an online environment performed compared to students in a traditional face-to-face setting (Clark, 1983). There was no data collection around standards-based assessments or student achievement based on learning goals. All the elements of the standard were simply absent in these three research studies.

Conversely, Shattuck and Birch (2018a) indicated that several pieces of literature that were included in their sample were just not related to any of the 11 iNACOL standards. One example was McAllister and Graham (2016), who reported on a study of university-level online

teaching endorsement programs, including the structure of those endorsements (e.g., undergraduate/graduate, number of credits/courses, for credit/non-credit, etc.), the nature of their experiences (e.g., coursework, practicums, capstones, etc.), and the specific content that was included. The authors concluded that there was a "focus on online pedagogy, instructional design, and online field experience as well as to increase the focus on ethics and online safety, [but] not enough programs include curriculum for online privacy, acceptable use policies, safety, and legal issues" (p. 279). This finding would seem to be related to several of these 11 iNACOL standards.

Standard A – The online teacher knows the primary concepts and structures of effective online instruction and is able to create learning experiences to enable student success.
Standard B – The online teacher understands and is able to use a range of technologies, both existing and emerging, that effectively support student learning and engagement in the online environment.
Standard C – The online teacher plans, designs, and incorporates strategies to encourage active learning, application, interaction, participation, and collaboration in the online environment.
Standard D – The online teacher promotes student success through clear expectations, prompt responses, and regular feedback.
Standard E – The online teacher models, guides, and encourages legal, ethical, and safe behavior related to technology use.
Standard F – The online teacher is cognizant of the diversity of student academic needs and incorporates accommodations into the online environment.
Standard G – The online teacher demonstrates competencies in creating and implementing assessments in online learning environments in ways that ensure validity and reliability of the instruments and procedures.
Standard H – The online teacher develops and delivers assessments, projects, and assignments that meet standards-based learning goals and assesses learning progress by measuring student achievement of the learning goals.
Standard I – The online teacher demonstrates competency in using data from assessments and other data sources to modify content and to guide student learning.
Standard J – The online teacher interacts in a professional effective manner with colleagues, parents, and other members of the community to support students' success.
Standard K – The online teacher arranges media and content to help students and teachers transfer knowledge most effectively in the online environment.

Finally, the task undertaken in these earlier annotation projects was simply to identify literature (not necessarily research) related to K-12 online course design, online teaching, and online program administration – broadly speaking. The authors were able to use more generalized search terms such as K-12, online learning, online teaching, and online programs. In contrast, the task provided by the funder of this annotation project outlined eight specific topics to focus on. The selection of these topics represented areas within the research that were relatively new (e.g., AI or cybersecurity), generally under-researched in education (e.g., accessibility or equity), or only came to prominence during the recent pandemic (e.g.,

synchronous online learning or SEL and life skills) suggested a specific desire to either (a) ensure that the existing standards were robust enough to capture new understandings in these areas, or – more likely – (b) how these new or newly-focused areas could be incorporated into a revision of the existing standards or the addition of new standards. Even topics such as learner engagement or assessment were traditionally included in K-12 distance, online, and blended learning literature in a more general fashion, often not based on a systematic research process. As such, the alignment of the current data set to the existing *National Standards for Quality Online Learning* was not a useful analysis to provide.

This is not to suggest that the current data set of literature had no findings that were directly relevant to, or even supportive of, the current standards. For example, Love and Ewolt (2021) suggested that strategies validated from in person learning with students with learning disabilities could be translated online, including: graphic organizers, explicit instruction, chunking materials, models and examples, corrective feedback, modifications where necessary, and aligning to standards. If the researchers used the *Specific Review Standards from the QM K-12 Rubric, Fifth Edition for K-12 Reviews* (Quality Matters, 2020) as a basis for analysis, under the general standard of 'Learner and Instructor Support,' specific standard 7.2 indicates that "course instructions articulate or link to academic support services and resources that can help learners succeed in the course." The inclusion of the seven learner support strategies outlined by Love and Ewolt support this standard and provide a direct illustration of ways the standard could be achieved.

Similarly, the five specific standards under the 'Learning Activities and Learner Interaction' general standard read:

5.1 The learning activities promote the achievement of the stated learning objectives or competencies, and their relationship with learning objectives or competencies is clearly stated.
5.2 Learning activities provide opportunities for learner-content interaction that support active learning.
5.3 Learning activities provide opportunities for learner-instructor and learner-learner interaction.
5.4 Standards for instructor responsiveness and availability are clearly stated.
5.5 The requirements for learner interaction are clearly stated.

There are several examples throughout the current data set that provide examples of how these standards could be achieved. Sayed et al. (2023) found that adapted learning lessons produced better achievement outcomes than gamified lessons with a group of third graders; while Standen et al. (2020) reported that learners with intellectual disabilities were more engaged in controlled lessons, but those learned more from assigned lessons. Further Levine et al. (2023) examined how K-12 teachers used student SEL strategies in remote and hybrid classroom environments and found that teachers were employing a variety of strategies (e.g., focusing on relationships; building routines and predictability; creating space to identify and share feelings; incorporating movement, mindfulness, and play; implementing culturally affirming practices; providing student choice and leadership; and engaging and collaborating with families). These findings

provide specific examples of ways that SEL could be incorporated into the existing 'Learning Activities and Learner Interaction' general standard.

Another example is specific standard 6.3, which read, "the course takes advantage of technologies and tools that protect student privacy and maintain confidentiality of student information." Boninger et al. (2020) provided specific guidance for educational decision makers about how to choose digital platforms considering the need to keep data collection practices to a minimum and safeguard any data and personal information that is collected. Additionally, Levin (2020) provided insight into the types of cyber security threats that schools face, including data breaches that affected staff and students' personal data, ransoms, shutdowns, and class invasions where bad actors virtually entered online classrooms. Levin also reported that wealthier urban and suburban schools were more likely to be targeted., and to combat these threats the responsibility fell upon schools to vet the vendors – as opposed to putting pressure on families to consent to more invasive agreements.

These examples are simply an illustration of the hundreds of individual findings from the 77 pieces of research literature in the current data set that could have been pulled out to support specific standards from Quality Matters or the *National Standards for Quality Online Learning* initiative. Unfortunately, the parameters of the scope of work did not allow the researchers the resources to complete that thorough an analysis (which would have taken literally hundreds of hours to complete).

Manuscript Analysis

The researchers analyzed the 77 pieces of literature using several approaches. First, the researchers undertook an analysis similar to the one conducted by Arnesen et al. (2019) – which included an analysis of the authorship, dates of publication, geographic location of the study, sample, and two- and three-word themes from the abstracts and annotations. Finally, the researchers will provide a non-systematic analysis of some of the general themes and trends from the pool of literature.

Publication Trends

As Arnesen et al. (2019) was used as the basis for beginning the current literature search in 2017, it is useful to make comparisons of the current data to the findings that Arnesen and her colleagues reported. However, it is also important to note that Arnesen et al. focused solely on journal articles and included any article related to K-12 online learning. While the current data set is more expansive, in that it includes all forms of empirical research – as well as K-12 blended learning and K-12 hybrid learning; it is also more limited because it focused solely on the eight categories that were requested by the funder. As such, comparisons between the current data set and Arnesen at el. may reveal general trends, but these comparisons will also be skewed and less useful than more consistent data would be.

In their earlier, and much larger data set, Arnesen et al. (2019) reported there were 384 distinct authors who authored or co-authored 356 unique articles. Based on the 77 pieces of literature in the current data set (excluding Tysinger et al. [2016], which is the only piece of

literature that appears in both data sets), there were a total of 237 unique authors. This result represents a significant increase in the overall number of authors per paper, as compared to the Arnesen et al. data (an increase of almost three times). Interestingly, while Arnesen et al wrote that "of the 356 articles in the study, 204 (i.e., 57.3%) were written by the top 20 authors" (p. 38), in the current data set there were only seven authors who contributed to more than a single piece of literature (see Table 3 below).

Table 3.
Top Authors by Number of Publications

Arnesen et al. data set		Current data set	
# of Articles	Author	Author	# of Literature
57	Michael K. Barbour	Mary F. Rice	5
19	Cathy Cavanaugh	Rebecca Alvarado-Alcantar	2
18	Ken Stevens	Faith Boninger	2
16	Elizabeth Murphy	Randa Keeley	2
15	Charles R. Graham	Alex Molnar	2
14	Margaret D. Roblyer	Kelsey R. Ortiz	2
14	Jered Borup	Christopher Saldaña	2
12	Leanna Archambault	Dennis E. Beck	1
11	Diana L. Greer	Erick W. Black	1
10	Dennis E. Beck	Richard E. Ferdig	1
10	Niki E. Davis	Sean J. Smith	1
9	Kathryn Kennedy	Jinnie Choi	1
8	Kevin M. Oliver	Chin-Hsi Lin	1
8	Dennis M. Mulcahy	Anne Ottenbreit-Leftwich	1
8	Maria Rodriguez-Manzanares	Lindsay A. Thompson	1
8	Richard E. Ferdig	Mark Warschauer	1
7	Glenn Russell	221 Other Authors	1
7	Sean J. Smith		
7	Erick W. Black		
6	4 Authors		
5	11 Authors		
4	9 Authors		
3	24 Authors		
2	38 Authors		
1	276 Authors		

The remaining 230 authors contributed to only one journal article, dissertation, book chapter, or conference proceeding. Arnesen et al. also noted that "the number of authors who published only one article (n = 276) represents just under three-fourths (i.e., 71.9%) of the 384 authors in the study" (p. 38). In the case of the current data set, the number of authors who published only one piece of literature (n = 230) represented almost all (i.e., 97.0%) of the 237 authors. Also of note is that of the 384 distinct authors in the Arnesen et al. data set, only 11 of them appear in the current data set – and only four of those 11 were among the top 20 authors in the Arnesen et al. data set.

Arnesen et al. also reported that "around 2006, as the number of articles published each year began to grow in larger numbers, so did the number of authors for many of the articles" (p. 40). As indicated above, the current data set supports the growth in the number of authors for each article. However, the current data set is inconsistent with respect to the growth in the overall amount of scholarship (see Table 4 below).

Table 4.
Pieces of Literature Each Year from the Current Data Set

Year	Pieces of Literature
2017	7
2018	9
2019	3
2020	11
2021	13
2022	23
2023	10

While the pieces of literature from these eight categories increased from 2017 to 2018, there was a significant drop in 2019 – with some rebound in 2020 and 2021. It wasn't until the effects of the pandemic were beginning to subside did the level of productivity return to its original trajectory (and, with half of 2023 included in the current data set, it would appear there will be a decrease in the number for 2023).

As noted above, one of the major differences between the sample in the current data set and the Arnesen et al. data is the inclusion of peer reviewed research published in outlets other than an academic journal (see Table 5 below).

Table 5.
Types of Publications Represented in the Current Data Set

Type of Publication	Pieces of Literature
Journal Article	68
Report	3
Dissertation	3
Conference Proceeding	2
Book Chapter	1

While the current data set includes nine pieces of literature that were not published in peer reviewed journals, the researchers' investigated each outlet to ensure that there was a form of peer review undertaken for each report, dissertation, conference proceeding, and book chapter prior to publication. For example, the National Education Policy Center requires that each of its reports undergo an external review by one of its fellows not involved in the report prior to publication (in addition to the review undertaken by the editorial board). Dissertations are

reviewed by a committee of two to four internal and external faculty and expert practitioners prior to being approved for acceptance.

However, a focus on solely the 68 journal articles does allow a comparison with the Arnesen et al. data. For example, Arnesen and her colleagues found that 102 of the 155 journals in their sample published only a single article (or 65.8% of their sample). Similarly, the current data set revealed that 37 of the 47 journals (or 78.7%) only published a single article (see Table 6 below).

Table 6.
Top Publishing Journals

Journal Name	# of Articles
Interactive Learning Environments	6
Journal of Online Learning Research	6
TechTrends	4
Online Learning	3
American Journal of Distance Education	2
Education and Information Technologies	2
Journal of Information Technology Education: Research	2
Journal of Learning Analytics	2
Sustainability	2
Technology, Pedagogy and Education	2
British Journal of Educational Technology	1
Educational Media International	1
Journal of Computer Assisted Learning	1
Journal of Physical Education, Recreation & Dance	1
Journal of Research on Technology in Education	1
32 Other Journals	1

Of the 10 journals that published more than a single article, three of those journals were not represented in the Arnesen et al. data (i.e., [1] Journal of Information Technology Education: Research; [2] Sustainability; and [3] Technology, Pedagogy and Education). Additionally, of the 37 journals that only published a single article, five of them (i.e., those specifically named above) were a part of the Arnesen et al. data.

Of the 77 pieces of literature, there were a total of 68 items where the sample was able to be determined (see Table 7 below).

Table 7.
Sample Investigated in the Study

Sample	Pieces of Literature
K-12 students	19
Full-time online teachers	14
K-12 teachers	11
Journal articles	6
K-12 students & teachers	4
Pre-service teachers	3
Policy	2
Practitioner resources	2
Images	1
K-12 students & tutors	1
K-12 students, teachers, & parents	1
Online school leaders	1
Online teachers	1
Cybersecurity incidents	1
Telehealth providers	1

There were four variables that included K-12 students (i.e., K-12 students; K-12 students & teachers; K-12 students & tutors; and K-12 students, teachers, & parents), which represented over a third of the pieces of literature (i.e., 36.8%). Similarly, the variables that included teachers (i.e., full-time online teachers; K-12 teachers; K-12 students & teachers; K-12 students, teachers, & parents; and online teachers) also represented almost half of the pieces of literature (i.e., 45.6%). Interestingly, there was only one piece of literature that included parents as a part of the sample. While not part of the formal analysis undertaken by Arnesen and her colleagues, their abstract analysis did reveal a focus on teacher preparation, with some interest in student characteristics necessary for K-12 online learning.

Similarly, Arnesen et al. did not examine the geographic scope of the research or of the authors in their analysis. However, other examinations of the broader field of K-12 distance, online, and blended learning has found that the literature in the field is largely focused on the United States (Barbour, 2011, 2018a, 2018b, 2020; Barbour & Kennedy, 2014; Borup and Archambault, 2019; Hu et al., 2019). Interestingly, the current data set reveals some positive trends in increasing the geographic scope of K-12 distance, online, blended, and hybrid learning research – at least based on these eight categories (see Table 8 below). In the current data set, there were five pieces of literature that did not provide any geographic reference. At the same time, there was one piece of literature with data from two countries, one piece of literature with data from five countries, and one piece of literature with data from eight countries.

Table 8.
Geographic Setting for the Study

Country	Pieces of Literature	% of the Sample
United States	46	63.9
China	5	6.9
Australia	3	4.2
Canada	2	2.8
South Korea	2	2.8
Sweden	2	2.8
United Arab Emirates	2	2.8
Brazil	1	1.4
Burkina Faso	1	1.4
Denmark	1	1.4
Egypt	1	1.4
England	1	1.4
Ethiopia	1	1.4
Greece	1	1.4
Hong Kong	1	1.4
India	1	1.4
Ireland	1	1.4
Kenya	1	1.4
Korea	1	1.4
Lithuania	1	1.4
Malaysia	1	1.4
Mexico	1	1.4
Morocco	1	1.4
New Zealand	1	1.4
Russia	1	1.4
Saudi Arabia	1	1.4
Singapore	1	1.4
Taiwan	1	1.4
Turkey	1	1.4

The literature identified for this report represents data from 29 different countries, with 27 of the pieces of literature (or 37.5% of the sample where a country was identified) including data from a country that is not the United States.

It is important to note that while this initial analysis may seem like a “insider baseball” commentary that may be of interest to academics but does not reveal all that much useful information to the lay reader. Nothing could be further from the truth. This analysis has revealed some trends that should be useful to a practitioner audience. For example, Arnesen et al. (2019)

found that most of the research that was published was authored by individuals who were brand new to the field and/or only had a single contribution to the field. Additionally, they also found that the majority of research had been published in journals where no other K-12 online learning research had been published. These findings suggest that most of the 356 articles that Arnesen and her colleagues identified were written by scholars who may not have been well grounded in the field of K-12 distance, online, and blended learning research and what was already known in the field. Similarly, since their articles were being published in journals that did not have a focus on the field, it is quite possible that those journal editors and the peer reviewers of those manuscripts may have been equally ignorant of what was already known in the field. Unfortunately, the research identified around these eight categories reveal similar trends. Further, 46 of the 77 pieces of literature identified (or 59.7%) were published from 2021-23, suggesting that the focus of the research may have been on pandemic-induced emergency remote learning or the equally underprepared remote learning. Based on these realities, the "findings" from much of this research should be approached with caution.

A more positive outlook on this same data could indicate that because of the pandemic there is a greater interest in the field broadly speaking – as evidenced by the number of new scholars researching and the number of new journals publishing that research. It will tell whether these scholars continue to explore issues surrounding K-12 distance, online, blended, and hybrid learning, as well as whether these journals continue to be interested in publishing that research. Another positive outcome revealed in this analysis is the broader geographic scope of research being conducted and published in English language outlets. Within the field of education, it is quite common to look outside of one's own jurisdiction for promising practices and an increase in the scholarship from outside of the United States allows practitioners and policymakers an opportunity to see how other nations are approaching issues surrounding K-12 distance, online, blended, and hybrid learning.

Abstract and Annotation Analysis

Similar to Arnesen et al. (2019), the researcher also undertook an analysis of the common phrases found in the authors' original abstracts and the researchers' annotations. As described by Arnesen and her colleagues:

> We also analyzed the abstracts of the top 20 most cited articles for the most commonly used words and phrases (i.e., abstract words and phrases analysis) using a word counting program available at textalyser.net. We compiled abstracts into a single document consisting of 1,641 words and pasted the document into the website. We ran the program to explore the most commonly mentioned words and phrases. Phrases mentioned three or more times in the two-word phrase category and two or more times in the three-word category were included in the list. (p. 37)

Using a similar procedure, the researchers created a single document that contained all of the authors' original abstracts, which consisted of 14,747 words representing abstracts from 75 pieces of literature (note that some journal articles did not include an abstract). After excluding the specific search terms (and their derivatives), the most common two-word phrases were

learning environment and/or learning environments with more than 40 instances (see Table 9 for the top 10 phrases).

Table 9.
Frequency of Two-Word Phrases in the Authors' Own Abstracts

Two-Word Phrase	Uses
learning environment(s)	44
high school	16
covid-19 pandemic	13
personalized learning	12
United States	11
professional development	11
instructional materials	10
small group	9
sustained attention	7
digital competencies	7

Interestingly, while the above list was generated based on eight categories provided by the funder, there is some consistency with the list of two-word phrases identified by Arnesen and her colleagues. For example, the focus on learning environments, high school, and the United States were both present. One of the main differences was the focus on teacher education and rural schooling in the Arnesen et al. data. Many of the same phrases also appeared in the three-word analysis (see Table 10 below)

Table 10.
Frequency of Three-Word Phrases in the Authors' Own Abstracts

Three-Word Phrase	Uses
online learning environment(s)	39
small group instruction	16
general education core	12
group response intervention	12
core curriculum sessions	8
high school students	6
personalized learning programs	4
learners' digital competencies	3
high-stakes test scores	3
online instructional materials	3

Similar to the two-word phrases, the focus on the learning environment(s) remains strong. Interestingly, one of the key differences between the two-word and three-word phrases is the presence of more specific strategies in the three-word phrases. For example, "small group instruction" which represents "small group instructional," "targeted small group," "curriculum

sessions small," and "sessions small group" or "group response intervention" which represents "group response intervention," "small group response," and "response intervention sessions." Again, the main difference between Table 10 and the Arnesen et al. data was their focus on teacher education, rural schooling, and research/theory.

It should be noted that in order to generate the top 10 two-word phrases, 20 different phrases associated with the search strategy were excluded (e.g., online learning, student disabilities, student engagement, social presence, etc.). Similarly, 33 three-word phrases were excluded to generate the list in Table 10. In both cases phrases around remote learning and remote teaching were excluded – but the presence of these terms positively suggests that the authors' themselves were aware that the pandemic and the dramatic pivot to a distance learning setting was not the same as traditional K-12 distance, online, and blended learning.

Additionally, the researchers created a single document that contained all their own annotations, which consisted of 16,666 words representing annotations of 35 pieces of literature. Table 11 presents the 10 most common two-word phrases.

Table 11.
Frequency of Two-Word Phrases in the Researchers' Annotations

Two-Word Phrase	Uses
learning environment	13
personalized learning	10
professional development	10
problem solving	10
trait score	9
perceived success	8
content knowledge	7
high school	6
mentor teachers	6
professional learning	6

It should be noted that the top three two-word phrases from the researchers' annotations were among the top six in the list generated from the authors' own abstracts. The other two-word phrases that the authors' themselves included in those top six tended to describe the conditions of where the study occurred (i.e., in a high school in the United States during the COVID-19 pandemic).

Finally, the frequency of the three-word phrases from the researchers' annotations is presented in Table 12 below.

Table 12.
Frequency of Three-Word Phrases in the Researchers' Annotations

Three-Word Phrase	Uses
problem solving assessment	9
online learning environment	6
performance problem solving	6
traditional face-to-face instruction	4
asynchronous online learning	4
teacher candidate's mentor	3
school building closures	3
content area taught	3
online teaching self-efficacy	3
elementary math teachers	3

It should be noted that unlike the authors' own abstracts, where there were 75 abstracts and each tended to be only 100-125 words in length, the 35 researchers' annotations were both structured in a specific format and on average between 300-350 words in length. As such, it would be easy to include the phrase "asynchronous online learning" or "elementary math teachers" three or four times in the annotation of a single article. Therefore, the three-word analysis of the researchers' annotation is less useful than the data presented in Tables 9 through 11.

Thematic Analysis

Major themes were identified in the full data set based on repetition (i.e., frequency of occurrence) and resonance, which is the quality of seeming both new and somehow familiar (Miller, 2015). Often this happens because resonant ideas are ones that enable key understandings of phenomena. These studies were evaluated by a single rater for consistency. Although several of the items might address more than one major idea, the sense-making process was oriented toward considering the primary foci of the items in this corpus. We express these themes as tensions because of the way in which they reflect seeming contradiction or oppositional ideas operating in the research, sometimes even operating in the same article (Smith & Sparkes, 2005). The three major themes as tensions that we identified were:

1. Working to maintain personal relationships with students while offloading as much of the relational work as possible to automated processes.
2. Promoting learner autonomy and self-regulated learning while designing highly regimented lessons and courses; and
3. Balancing the microelements of instructional delivery with the macroelements of course and program design.

Each of these themes as tensions are discussed in greater detail below. We have also cited many specific examples from each tension.

Working to maintain personal relationships with students while offloading as much of the relational work as possible to automated processes.

Of the entire article set, 19 of them dealt with this tension. While not every article articulated both sides of the tension, many did, often in the broader context of notions of equity. Tate and Warshauer (2022) mentioned relational ideas in their position paper on equity in online learning. For an example from a study, Tan et al. (2017) wrote about learner dashboards in online environments as a 'double-edged sword' that had the potential to motivate and organize learners as well as demoralize and put pressure on them. Further, teachers would be able to leverage these dashboards to enhance communication with students and families and therefore, build stronger relationships and home/school connections. However, there was also potential to offload all the responsibility for the communication onto the information on the dashboard with the end effect being that learners would feel even more isolated.

There were also many articles where teachers expressed specific concerns about a perceived lack of relational connection with students (Alvarado-Alcantar et al., 2018; Catalano et al., 2020; Cooper et al., 2023; Douglas et al., 2023; Howley, 2022). For example, Howley (2022) studied physical education online during the emergency conditions using interviews and photo artifacts. Findings from that study revealed that teachers were worried about making emotional connections with students and hoped for technological solutions and pedagogical tools to support such work in the future. It was unclear whether those tools and strategies were supposed to support teachers in doing relational work or replace them. In addition, when Douglas et al. (2023) interviewed teachers of online course curriculum, these researchers found that while teachers saw value in doing high school work online and they saw the possibilities for strong academic discourse in online settings, observations of students online revealed that they rarely, if ever engaged in such discourse with peers. The options for addressing this challenge were to do less work online or to take on new pedagogical solutions. To address this, researchers like Song (2019) have been conducting specific research to gather information about learners to facilitate processes for seeking information about learners.

However, in studies of social-emotional learning support specifically many of the strategies undertaken relied less on innovative technologies and more on strategies like routines and predictability, making space for sharing feelings, allowing for experimentation and play, using culturally responsible or culturally affirming practices, and learning more about families (Baliram et al., 2022; Daftary, 2022; Levine et al., 2023; Miller, 2022; Shively et al., 2022). In these studies, very few technologies or pedagogical strategies specific to the online environment were mentioned at all.

In several of the studies, it was evident that at least some of the responsibility for doing cognitive engagement is related to relational and interactional processes with humans who are in the class together. For example, ElSayary et al. (2022) conducted an online survey and held a focus group with preservice teachers. The analysis of their data found a strong correlation between the three types of engagement that enhance online and blended learning. Social/emotional engagement had a positive, strong correlation with cognitive and behavioral engagement. Also, the relationship between social/emotional and cognitive engagement was stronger than the relationship between cognitive and behavioral engagements. Amundson (2021)

also found that social presence of instructors held a slight positive correction with teacher's perceived learning. Finally, in a qualitative content analysis, Jones (2018) again found that the advertisements for virtual charter schools were likely to suggest to parents of students with various learning differences and challenges that they were not welcome or that they would be welcome only if they could perform to a standard of – ablism – or a body that fit some social norm of not needing accommodations – or 'readiness' to be successful with minimal support from the school program. This is important because although these advertisements are not instructional materials, they are important artifacts of family communication and send signals about what relational expectations and standards to which the school holds itself.

Promoting learner autonomy and self-regulated learning while designing highly regimented lessons and courses.

There were 29 studies that had addressed the tension of self-regulation and learner autonomy alongside a researcher interest in designing curriculum that will either recommend or require learners to take certain pathways as a strategy to guarantee their success in the course. There were also studies asking questions about broader notions of teacher autonomy and shared decision making in online schools (e.g., Frazier et al., 2023). These questions should also guide leaders about choosing instructional materials deliberately and based on more information than cost (Rice & Ortiz, 2021).

Notable studies about self-regulation include work from Vladimirovna et al. (2020), who developed an instrument to capture the level of self-regulation for digital literacies that parents, teachers, and students bring to digital learning environments. Their work also accounted for the connection between the regulation of learning and the regulation of emotions and emotional responses. The relatedness of affect and learning was also highlighted in Standen et al.'s (2020) work where student achievement and responses to instructional materials were gathered; researchers found that the students – all of whom had been identified as having intellectual disability – were more engaged in the lessons when they were less bored. Also interesting was the idea that frustration was unpleasant for the students, but being frustrated some of the time did not impede their learning. Thus, asking learners to do difficult tasks and having them struggle might not be pleasant for them or adults who support them, but it can be a productive part of the learning process.

Research studies in this dataset sought to address important questions regarding adaptive learning and gamification. For example, Sayed et al. (2023) tested whether students displayed higher achievement in a gamified setting or an adapted learning setting. Students chose the setting they preferred. More measurable learning occurred with the adaptive learning lessons where instruction was provided according to an algorithm in a prescribed order. However, another study by Katz et al. (2022) found that a recommender system for so-called personalized learning had substantial gaps in content coverage for different skill levels of learners.

Such questions about so-called personalization have been raised in policy papers by Boninger et al. (2019, 2020) in that online learning providers are advised to ask careful questions about whether the instruction is can actually lead to content coverage, appropriate cognitive challenge, meaningful interaction opportunities, and eventual achievement, or if the objective is

to keep the learners on the program using the materials for the maximum amount of time possible. Such concerns loom at more studies and more classrooms enact practices where students must engage in practices, such as wearing devices that gather data about them (Holstein et al., 2019). Moreover, it cannot be assumed that having humans make all the design decisions about design and learner autonomy is a fail-safe solution, since in Rice's (2018) study, course designers and content experts–who had training in universal design for learning—made decisions about accessibility that relied on highly structured objectives, voluntary reporting from vendors (even when their own designers found the products to not match what was reported) and beliefs about who would take the class that did not include learners who had traditionally struggled with math, when in all likelihood students who struggled with math would be a large part of their enrollment in a large state online program.

So, there is the tension between the expectation for learners to be self-regulatory and autonomous against the expectations of the curriculum as well as findings from studies that demonstrate that support from adults is integral to learners' success, particularly in K-12 online learning. For example, Aguilar et al. (2022) found that synchronous activities combined with homework completion were strong predictors of success in online learning for elementary school students. Synchronous instruction, by nature, provides more support from adults (teachers) and the homework completion can be read as a signal that parents are able to monitor and support at home. Small effects from family support were also noted by Ma et al. (2022).

Researchers such as Lindfors (2021) and Martin et al. (2017) have also studied synchronous learning and found that students tend to feel anchored and supported with some synchronous instruction in many cases. However, Martin and her colleagues noted that attitude was the more frequently studied variable and more research about motivation in synchronous online learning was needed. It is important to consider the ways in which researchers in K-12 online learning and perhaps online learning in general tend to use terms like engagement, motivation, and presence–sometimes without very much nuance and sometimes with great distinction and differences from researcher to researcher (Solyst et al., 2022). Practitioners might not be able to make sense of these differences as they try to learn from research. Also, while those differences might be scientifically crucial to the academe, they might not always be so in practice settings.

Balancing the microelements of instructional delivery with the macroelements of course and program design.

There were 29 items that were judged to have a focus on the tension between microelements of instruction and macroelements of course and program design. What is meant by this is that strong policies and guidance about issues related to concerns such as accessibility, use of theories of learning, and cyber security would have broad effects on individual courses.

For accessibility, there have been on-going concerns about the accessibility features of digital instructional materials. Vendors will often say that materials are accessible, when it is more helpful for vendors to lay out what features they have that promote accessibility. For example, Rice and Deshler (2018) conducted content analyses of online digital instructional materials from large national vendors and a small school district where teachers made the

materials. The large vendors were introducing large numbers of words and not providing any support in line with research about vocabulary, while the teacher-produced materials were considerably more aligned with research. Also, Rice and Ortiz (2020) conducted a survey of 111 teachers about accessibility from a state undergoing corrective action due to the failure of students to achieve in their largely asynchronous virtual schools. The teachers' responses were largely mixed, revealing that they likely did not have the opportunity to learn about accessibility of instructional materials or could not apply whatever learning opportunity that they had been given. Smith and Harvey (2014) scanned free online lessons targeted to K-12 students and found that many had accessibility gaps. Finally, Crouse et al. (2018) found in interviews with teachers that teachers being able to make instructional materials more accessible was crucial to their work. More professional learning about discernment of materials at the teacher level as well as more discernment at the level of course and program design, then, would seem to be useful.

Theories of learning that guide instruction also have bearing on how courses are taught, but also how they are designed and how programs are run (Hrastinski et al., 2021; Liao et al., 2021; Rajendram et al., 2022; Yu et al., 2021; Zhang et al., 2020). For example, Reinhart and Bannister (2018) developed an "Innovate, Instruct, Inspire" rubric based on the Quality Matters Rubric. The foundational theories of learning and thinning about what constitutes achievement, then, are in alignment with the foundations of Quality Matters. However, it is also possible for other programs to operate using other theories that they may or may not articulate or to be operating atheoretically. Whatever these large guiding structures are, they have the potential to guide individual classroom practices. For example, Hrastinski et al. (2021) studied mathematics teaching online and found that teachers in that study commonly asked the students to explain their thinking, rather than focusing on getting the correct answer as the primary objective. Such a focus on process and dialogue *could be* incorporated in the foundational logic and philosophy of a course or program but looking at Reinhart and Bannister's (2018) rubric, a reader cannot derive a value around discourse. Instead, the focus is on frequent activity changes, individual assessments, and explicit instruction and expectation. While there might be room for discourse, it does not encourage it, per se. Encouraging programs and courses to take specific stances that travel through the courses to individual lessons might guide goals for professional learning, which was highlighted as a key need in several studies (Hu et al. 2017; Jimoyiannis et al., 2021; Ko et al., 2022; Yu et al., 2021), as teachers generally seemed willing to learn new strategies and practices they thought would support students if they were given sufficient time and opportunity to learn them.

Other important questions about instructional delivery included issues of what data to collect from students, what to do with such data, and what to teach students about their data and cybersecurity (Bhuyan et al., 2020; Bowen et al., 2020; Fees et al., 2018; Levin, 2020). For example, Levin's (2020) work featured a catalog of all cybersecurity breaches endured by U.S. school districts in the year 2020. This work also explained how data breaches that affected staff and students' personal data, ransoms, shutdowns, and class invasions where bad actors virtually entered online classrooms. Wealthier urban and suburban schools were more likely to be targeted. To combat these threats, the author puts responsibility on schools to evaluate the vendors rather than putting pressure on families to consent to more invasive agreements. Under the current threats, it seems crucial to provide course and program guidance that includes

addressing cybersecurity as a vendor vetting issue rather than merely a student user responsibility issue.

Summary

The purpose of this section is to provide a summary and some final recommendations based on the research reviewed. In this report, researchers considered publication trends for the past six years. They found that only 7 authors contributed more than one article and that several of these so-called top authors tended to be very active. By contrast there were 230 authors that only contributed articles. The publications from which conclusions were drawn came from a variety of journals, with *Interactive Learning Environments* and the *Journal of Online Learning Research* the most represented with 6 articles each. The sampled populations for the studies reviewed were mainly K-12 students (19 articles), full time online teachers (14 articles), and K-12 teachers (11 articles)–mainly those teaching online in an emergency school building closure situation due to the pandemic. The geography of the articles represented was also diverse, with 27 of the articles coming from outside of the U.S., but nonetheless, almost 70% of the sample consisted of articles from the U.S.-based authors.

The keyword analysis of abstracts from both authors and from the researchers revealed key topics in addition to the initial topics assigned to the researchers by Quality Matters. The prominent topics that emerged included: (1) high school (2) COVID-19 (3) personalized learning (4) professional development (5) instructional materials (6) sustained attention (7) and digital competences.

Analysis of article findings into themes revealed three key tensions. These tensions were that online educators in their settings see a need to provide relational support and care to students, but they are also expecting to do so with technological support that they either do not currently know how to use or access or which do not exist yet. Even so, they consider these relationships paramount to providing high quality online learning and they think this is easier to do when they use structures like synchronous instruction where teachers and students can share a time-space. Teachers also see that learning online requires adults to attend to the range of human emotions learners will affect to support learning, but they find it difficult to hold this in mind alongside beliefs that children ‘just need to pay attention’ or certain learners are inherently unready or unfit to learn online. There seems to be a need to acknowledge and unpack these contradictions of framings for students to make progress in giving the support and in deciding how best to use various technologies when it might be appropriate to offload the support to a program or application.

A second tension focused on the need to understand how so-called self-regulation operates well in online settings where there are very few choices that students can make about their learning and most lessons are either assigned or recommended to them. In such cases, it might be fairer to say that school officials are seeking compliance instead of self-regulation, which in most models occurs as learners engage in cycles of forethought (planning), using strategies (activity), and evaluation (reflection). These choices are even limited in circumstances of gamification. Moreover, there might be limitations on learners’ access to content coverage in environments where lessons depend on mastery. There seems to be a need to carefully evaluate

instructional materials to understand algorithmic possibilities for what choices are actually there, for how much time is really intended using the program and what the time is actually supposed to help the child learn to do, and also what access to content.

A third tension involves the need for coherence between the microelements of instruction and the macroelements of course and program design. These emerge on several fronts, including the need to ensure that materials are accessible as a matter of program policy, to establish and maintain coherence about underlying theories of learning, and to be clear with families about issues of data privacy and cyber security since the likelihood schools providing access to student data through leaks and via hacks is very high at present.

With these ideas in mind, the researchers make the following recommendations.

1. Professional learning for teachers in online environments should have some focus on social and emotional learning for students, with meaningful opportunities built into lessons, courses, and programs for relationships (a) between teachers and students, (b) between teachers and parents, (c) students amongst each other, and (d) teachers amongst each other. Standards might address how to put careful thought into how technologies might support these efforts without making it the technologies' job.

2. School leaders with purchasing power need to learn more about how to be critical of personalized learning materials and ask good questions about how algorithms are built and trained. Moreover, school leaders and teachers need to be careful about designing entire programs and courses around personalized products that might just be built for the purposes of keeping children occupied. Will the vendor give teachers access to what items children were given and what items they missed instead of just a general report? How much time is the vendor recommending for results? What independent research has been done on the product? What choices are *really* available? What about content coverage for students starting with different levels of previous achievement? Standards need to include very specific guidance to ask questions and potentially what sorts of questions to ask.

3. Online courses and programs need to consider their foundational beliefs and understandings about learning and what constitutes acceptable evidence of progress. If schools are deeply interested in self-regulation and learner autonomy they will choose different types of instructional materials, professional learning opportunities for teachers, relational models for learner communication, lesson templates, rubrics, and assessment guides and more. Standards should require specificity about underlying theories and beliefs and then explanations of how these show up from top-to-bottom.

4. Accessibility should be considered as part of the foundational beliefs and might be better to exist as part of every standard, rather than as a standalone enterprise. Accessibility is part of choosing materials before classes begin. But also, relational work in teaching will facilitate the understanding of accessibility needs and support the collective will for making educational opportunities accessible writ large. For example, per the Individuals with Disabilities in Education Act (IDEA, 2004), students are guaranteed access to their

peers. They are also guaranteed content coverage at grade level. And family input. And subsequent court rulings, such as *Endrew F vs. Douglas County Schools* (2017) has said students are guaranteed plans that calculate for their substantial progress, not just their participation.

5. Cybersecurity should emerge as a separate standard or as an indicator on several standards highlighting it as a school's obligation to keep student data safe and to vet vendors, rather than merely a students' responsibility not to engage in online mischief. Schools might also lay out a plan for avoiding incidents where student, family and employee data and personal information is stolen and what steps will be taken if such events occur despite best efforts.

Many of the eight topics provided by the funder were issues that have only recently begun to impact the field of K-12 distance, online, blended, and hybrid learning (and education as a whole). Given the researchers' focus on peer reviewed research publications, there are several issues not raised in our analysis that the funder may wish to consider as it explores updates to the *National Standards for Quality Online Courses, Programs, and Teaching*. The last part of this document will articulate several items that were not in the dataset analyzed but that researchers feel should have been and deserves some attention.

1. Studies showed insufficient attention to the contextual differences between asynchronous and synchronous instruction. Often these differences were only discussed in terms of temporality (e.g., asynchronous means students can 'work at their own pace' and synchronous means that students meet together regularly for a length of time or that it more resembles 'regular school'). These understandings about temporality seem insufficient to characterize the attentional and intellectual requirements of the two types of learning. Also, the history of why asynchronous learning was preferred up until the pandemic is usually not discussed in a context at all, with Rice and Ortiz's (2020) study being an exception. Any adjustments to the standards regarding synchronous and synchronous instruction differences should consider more than the superficial definition of whether the learners are all working at the same time with the teacher or not.

2. Studies about uses of artificial intelligence and its various applications that were available during the search period were more focused on sorting students into categories and sorting content for them than empowering learners. While these tools can monitor students and give feedback to them in some instances, there were no studies where students were able to shape the AI. All these items were planned and put upon the learners. Again, this comes down to what providers of educational experiences are willing to commit to and then embody as foundational beliefs.

3. Somehow, studies about actual achievement as measured by specific outcomes such as credentials (e.g., graduation, course credit) were largely absent from the landscape. Instead, achievement in these studies, when mentioned, was ill-defined as meeting the objectives set forth by computer programmers in the digital course materials. In the case of remote online learning due to school building closures there was fear expressed about a lack of achievement, especially for populations like multilingual learners and students

identified with disabilities, but actual documentation was lacking. This might be a misstep. Standards might draw out the need for a broad range of achievement goals for courses and programs, where it is discernible, and clearly explained what these outcomes really are and what they mean.

4. There are new and emerging phenomena reported where students who are identified with social and emotional challenges are being placed in in-school online learning programs and given asynchronous assignments to avoid documentation for suspensions and other forms of in-school discipline. There were no studies about this at the time of document retrieval for analysis. There were also no research studies available that discussed broader issues of online learning in the context of the new climate of intense school discipline measures. Standards might consider offering initial humane guidance principled in the least restrictive environment (LRE) about the need to consider how to place students into online learning programs.

With these considerations, the researchers hope that more children will have access to high quality online learning experiences.

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Appendix A – List of Literature That Met the Inclusion Criteria

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Appendix B – List of Literature That Was Initially Identified, But Later Excluded

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Appendix C – Researcher Annotations

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Background: This study was conducted within the context of the rapid transition to remote learning in the Spring 2020. It was designed investigate the barriers to distance learning faced by low-income K–12 students, and whether there was a relationship between reported participation in live instruction and reported student engagement during the remote learning provided from March to June 2020.

Methods: Participants were randomly selected from 1,181 families with children enrolled in 19 high-need K–12 public schools located in a large urban district in southern California. The data collection included telephone surveys conducted in both English and Spanish by the non-profit organization that managed the school, which were undertaken following the conclusion of 2019-20 school year. A total of 3,473 calls were made with a final response rate of 34% (although it was unclear if it was 34% of the 1,181 families or 34% of the 3,473 telephone call). The sample was 95.2% Hispanic, which the authors indicated was reflective of the broader district-wide demographics. The data were analyzed using regression analysis that compared the responses from the telephone survey with school data such as language proficiency, grade point average in the previous grading period, and special education status.

Results/Findings: The authors found that synchronous class activities positively predicted engagement with distance learning as measured by homework completion. At the elementary level, for every additional hour of live instruction per week there was a 26% increase in the probability of reporting that students have completed all their schoolwork (as opposed to "some" or "none"). At the middle and high school level, every hour of live instruction increasing the probability of reporting completion of "all" schoolwork by about 12%.

Recommendations for Practitioners: Within the context of this study, the authors recommended live online instruction to increase students' engagement through connectedness with teacher and peers, which was particularly important in earlier grades where students typically have not developed the required abilities for independent learning. Additionally, schools need to address disparities in digital readiness among households, as live instruction will not enhance learning unless students can meaningfully take advantage of synchronous activities offered by teachers.

Amundson, A. (2021). *Social presence theory: Creating engaging and strong online learning communities at the K-12 level*. Unpublished doctoral dissertation, Hamline University. https://digitalcommons.hamline.edu/hse_all/4529

Background: The setting was a full-time online school that was created by a school district in Minnesota, which was created for the 2020-21 school year in response to a demand within the district for this option in light of the pandemic. The author indicated that the purpose of the dissertation study was to explore online teaching communities and how it related to achieved learning in order to discover best teaching practices in creating strong relationship based online

communities with student-student collaborative learning activities, which was undertaken through the lens of social presence. In her own words, "I am investigating social presence in online synchronous K-12 classrooms because I want to find out the effect it has on engagement in the classroom and whether social presence yields higher academic achievement."

Methods: The data collection was based on a survey that included both Likert-style questions (consistent with instruments utilized by Richardson [2003] and Gunawardena [1997]) and open-ended questions focused on culturally responsive teaching (modelled after Lawrence [2020]). A total of 78 of the 225 teacher who taught 100% online completed the survey. The quantitative data was analyzed for reliability, as well as using descriptive statistics and a correlation analysis to measure perceived social presence and perceived learning. The qualitative data was analyzed using an unnamed thematic analysis.

Results/Findings: The author reported that there was a weaker correlation between the variables, which in her own words meant that "the more a teacher agreed that there was a social presence in their classroom, the more likely they would agree that students were learning and progressing academically in online settings. Also, the more a teacher disagreed that there was social presence in their online classroom, the more likely they would disagree that students were learning nor progressing academically." It should be noted that these findings were based on the teacher's own perception of social presence in their online teaching, and not any objective or third party measure.

Recommendations for Practitioners: The author suggested a total of five recommendations for practice. The first was the need for an attendance policy to ensure that students were consistency in their involvement/participation in both the synchronous and asynchronous aspects of the online course. The second was to seek opportunities for student-student interaction, particularly without the presence of the teacher. The third was to ensure that students knew both how to use the technology (i.e., to avoid some of the basic troubleshooting issues) and how to use the technology within the context of learning (i.e., how to learn online). The fourth was for teachers to incorporate strategies that made students feel more comfortable in the online environment (e.g., using additional wait time, being more patient with students, providing more anonymous ways to interact initially, incorporating more planned opportunities for social interactions, etc.). The fifth and final recommendation was that teachers needed to be more collaborative with the sharing of strategies and resources, particularly those that they found to be more useful.

Baliram, N., Koetje, K., & Huff, E. (2021). Virtual learning environments and a needs assessment of K-12 teachers. *AILACTE Journal, 28*, 27-53. https://eric.ed.gov/?id=EJ1340480

Background: In the author's own words, "the purpose of this study was to examine the level of support teacher candidates and mentor teachers received at the start of the 2020-21 school year as they transitioned to a virtual learning environment. The researchers sought to identify any obstacles teacher candidates and mentor teachers encountered as they attempted to build an online community. Additionally, the investigators wanted to better understand what tools teachers were using and how the faculty and university supervisors in the teacher education program might modify their program offerings to further support them."

Methods: The sample included 92 of 98 pre-service teacher candidates and 60 of 140 mentor teachers from a single university teacher preparation program in Washington. The data collection included a survey that consisted of 21 multiple choice questions and 5 free responses, which was administered to the teacher candidate after they had completed two months of virtual student teaching and to the mentor teachers at the end of the quarter. The quantitative data was analyzed using descriptive statistics and the qualitative data was analyzed using an unnamed thematic analysis.

Results/Findings: The authors indicated that both the pre-service teacher candidates and the mentor teachers generally felt supported by their administration, and even more supported by their own specific teams. In retrospect (i.e., near the end of the Fall 2020 semester), approximately half of respondents felt confident about their ability to teach in a virtual context during the Spring 2020 based on the training they had received prior to the pandemic. Although, those who felt extremely unconfident about their ability to teach online prior to the school closures reported that they had gained confidence by the time the survey was administered in late Fall 2020 (and the authors noted there was a pattern with these participants also rating the level of support they received as unsatisfactory – but did not indicate the statistical nature of that pattern). The three main obstacles that respondents face were (1) being able to use breakout rooms, (2) policies around student camera use (particularly those that did not require it), and (3) the flexibility given to choose their own location for teaching (i.e., on site or remotely). Finally, the authors summarized their findings around the respondents ability to build community online by quoting the response of one of the mentor teachers: "authenticity + intentionality + time."

Recommendations for Practitioners: The authors recommended that teacher preparation programs focus on training candidates for technology fluency and encourage a mindset of creativity and flexibility rather than prioritizing certain tools. The authors recognized that school systems have their own adopted tools, as such teacher preparation programs should encourage attendance by their teacher candidates at district trainings on their specific tools and integrate these trainings into program requirements. The authors also recommended that teachers should explore "strategies for increasing student camera usage during synchronous classes," but did not consider any of the privacy or compliance issues of this practice within their article.

Black, E. W., Ferdig, R. E., Fleetwood, A., & Thompson, L. A. (2022). Hospital homebound students and K-12 online schooling. *PLoS ONE, 17*(3), e0264841. https://doi.org/10.1371/journal.pone.0264841

Background: The advances in healthcare mean that more children are surviving illness and disability, which has also resulted in a small but significant number of students with chronic illnesses or disabilities may not be healthy enough to attend school in a traditional environment. Online learning is often seen as a viable alternative for hospitalized or homebound students. The goal of this study was to analyze how students with hospitalized or homebound designation performed in K-12 online classes compared to non- hospitalized or homebound counterparts.

Methods: The data comprised of de-identified student data over a period of six years from the Florida Virtual School (FLVS) itself, and was divided into two cohorts: (1) FLVS students who

were classified as hospitalized or homebound (n=375), and (2) all non hospitalized or homebound students enrolled in FLVS (n= 1,191,508). The authors used chi-square tests were used to explore student outcomes and Z-tests determine whether two cohorts differed significantly, as well as descriptive statistics for any variables that did not have a defined set of categories (e.g., pass/fail, specific letter or number grade, male/female, etc.).

Results/Findings: The authors report three main findings. First, students designated as hospitalized or homebound performed similarly to non-hospitalized or homebound designated counterparts across core content areas. Second, Student course enrollments resulting in a grade were significantly different between hospitalized or homebound students and non-hospitalized or homebound students. Third, hospitalized or homebound student completion rates were positively correlated with two important aspects of enrollment.

Recommendations for Practitioners: The main recommendation was at the administrative level, where the authors suggested that the low enrollments here may point to a lack of awareness of the opportunity that online schooling can provide – particularly for this population of students. The authors suggested that "data findings suggest that practicing pediatric healthcare professionals should be made aware of the positive potential outcomes for their patients."

Boninger, F., Molnar, A., & Saldaña, C. (2020). *Big claims, little evidence, lots of money: The reality behind the Summit Learning program and the push to adopt digital personalized learning programs*. National Education Policy Center. https://eric.ed.gov/?id=ED607124

Background: Summit Schools was an 11-school charter school network with ties to the Chan Zuckerberg Foundation operating in the state of California leading up to the pandemic. The network marketed promises of personalized learning experiences, despite the fact that there had not been any independent evidence evaluation of these claims. Researchers at the National Education Policy Center in Boulder, Colorado conducted a review of partner school contracts to learn about the potential for privacy risks.

Methods: Researchers requested a number of records about achievement from the network and they were not granted access. Therefore, they were only able to examine publicly available records, which included graduation rates, test scores from national groups (e.g., AP, I-BAC, Smarter Balance), California State test scores, and information from partner groups and states like Washington state and Stanford University. Information from these data were then laid against claims made by the group.

Results/Findings: The researchers determined that Summit Public Schools Group had *little to no basis* in the available data on which they could base claims to success and achievement at their schools. Instead, researchers found that Summit Public Schools collected an enormous amount of data from students (personal information and user data) and the uses of it were unclear.

Recommendations for Practitioners: The researchers recommended that all personalized learning programs be regularly reviewed to evaluate their claims of success. They also recommended that programs for algorithms be evaluated regularly for biases. Finally, the researchers recommended that schools that gather data and personal information from students online develop a standard

data protection agreement that includes information about how and when they will de-identify data and articulates how data will be used.

Boninger, F., Molnar, A., & Saldaña, C. M. (2019). *Personalized learning and the digital privatization of curriculum and teaching*. National Education Policy Center. https://eric.ed.gov/?id=ED595239

Background: Corporate entities such as the Bill and Melinda Gates Foundation and the Chan Zuckerberg Foundation have spent large amounts of money developing so-called personalized learning initiatives. These are supposed to result in customized learning for children and are built on the premise that algorithms will choose lessons at the appropriate level of challenge. Researchers at the National Center for Education Policy in Boulder, CO evaluated the evidence on the effectiveness of personalized learning.

Methods: The researchers used a combination of traditional literature review and policy analysis techniques, although these were vaguely described.

Results/Findings: The researchers found only weak support for personalized learning as an effective educational tool. There was much more evidence suggesting that personalization as a restricted, data-centric, hyper-rational approach to curriculum and pedagogy that limits students' agency, narrows what can be learned in school, and limits the ability of schools to respond effectively to a diverse array of students. For-profit entities seemed to be promoting a multitude of personalized learning offerings that privatize consequential educational decision-making, compromise children and teachers' privacy, and distort pedagogy in ways that stifle students' learning and their ability to grow as people and as participants in a democratic system.

Recommendations for Practitioners: Researchers recommend external review of personalized educational programs and products. They also recommend that algorithms be tested for biases and assessments be evaluated for both reliability and validity. Finally, they recommended that data agreements be developed for students that make the entity collecting the data legally responsible for collecting it, that outline the data being collected about them and discuss when it will be deidentified and how the data will be used.

Catalano, A. J., Torff, B., & Anderson, K. S. (2021). Transitioning to online learning during the COVID-19 pandemic: Differences in access and participation among students in disadvantaged school districts. *The International Journal of Information and Learning Technology*, *38*(2), 258-270. https://www.emerald.com/insight/content/doi/10.1108/IJILT-06-2020-0111/full/html

Background: The study took place during 2020 when school buildings were closing in New York state and other locations around the world due to the COVID-19 pandemic. During the spring of this year, public K-12 teachers–most of whom had never had previous experience or instruction in how to teach online–were required to deliver instruction through online and distance modalities. Due to a concern about the participation rates for English learners and students with disabilities, researchers conducted a survey to find out whether these populations were able to participate.

Methods: Researchers surveyed 300 K-12 teachers in NY state about the tools and accommodations they were using in their online teaching practices as well as whether their students were participating in the online learning and the reasons for their lack of participation. The teachers who took the survey were graduate students at a large university in New York state. The survey was also posted to several listservs and Facebook pages for local school districts. Questions were asked in a variety of formats including multiple answers, fill in and Likert-type. Fill-in answers were coded where possible. One question asked for an extended response about what a school district could do to improve online learning in the future. Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 25. Most teachers who responded to the survey taught on the secondary level. There were 119 high school teachers (39.4%), 100 middle school teachers (33.1%), 71 elementary teachers (K-5) (23.5%) and seven prekindergarten teachers (2.3%). Three respondents taught special education in grades K-12. The respondents taught a diversity of subjects, including science (n=61), social studies (n =50), elementary grades (n =39), special education in either elementary or middle school (n =34) and ELA (n=32). Most participants taught in general education settings (n =236; 78.1%), with 54 (17.9%) working in special education and 10 (3%) employed teaching English learners. A large majority of respondents indicated that they have English learners in their classes, but only 10 respondents (3%) were certified to do so.

Results/Findings: Most respondents reported supporting SWD one-on-one via phone or video conferencing (53%; n=159); 46% reported providing different levels of learning materials (n=126) and 38% provided learning materials in different modalities (n=115). Teachers also reported giving SWD more time to complete their assignments and were in frequent communication with these students and their parents. Many teachers reported that SWD were also supported by a resource-room teacher or special education co-teacher. Others reported that the IEP goals separately via video conferencing or telephone or reading assignments aloud via video conferencing using closed captions. Nine percent (n=28) stated that they were not employing any accommodations. Several teachers responded that they were very overwhelmed creating content. Respondents reported that distance-learning assignments had not been completed by 29.59% of students overall, including 28.14% of general-education students, 30.18% of SWDs and 30.45% of ELLs. Assignments had not been completed by 27.2% of elementary students, 31.05% of middle school students and 25.25% percent of high school students. Respondents in high-needs districts reported noncompliance in 36.35% of their students. Teachers stated that the reasons students were not turning things in included a lack of parental supervision, lack of ability to understand the task, laziness, lack of motivation, and a sense they were on vacation.

Recommendations for Practitioners: The researchers suggest more communication with parents and more resources for teachers. It might also be useful to talk directly with teachers about topics like bias against students who are poor, multilingual and/or have learning differences as these teachers seemed very eager to position the children in deficit for what was a very difficult situation. Professional learning for stronger instructional practices also seems necessary, rather than becoming frustrated that their parents are unable to teach them at home.

Cooper, C. M., Przeworski, A., Smith, A. C., Obeid, R., & Short, E. J. (2023). Perceptions of social-emotional learning among K-12 teachers in the USA during the COVID-19 pandemic. *School Mental Health*, *15*(2), 484-497. https://link.springer.com/article/10.1007/s12310-022-09563-w

Background: Social-emotional learning (SEL) has received increased attention in schools leading up to and during the COVID-19 pandemic. Previous research suggested that when teachers are under more distress and in more economically distressed schools they are less likely to implement SEL practices for students. At the onset of the pandemic, the researchers hypothesized that the stress of the pandemic and the school building closures would produce the high stress scenario that would lead to less SEL teaching.

Methods: A total of 637 K-12 teachers from 49 states were recruited using social media sites, emails to administrators with requests to email teachers, and direct emails to teachers using emails found on school websites. Most teachers identified as female, earned a Bachelor's or Master's degree, identified as White, and taught in public schools. Geographic setting of the school was balanced (i.e., 30.2% urban, 39.6% suburban, 29.5% rural), as was union membership (i.e., 50.1% union member, 49.9% nonunion). Teachers taught grades K through 3 (17.6%), 4 through 6 (12.7%), 7 and 8 (12.7%), 9 through 12 (35.4%), "other" grades (e.g., special education; 1.0%), and a combination of grade levels (20.5%). Differences based on race and ethnicity could not be calculated due to small samples of teachers who identified as Black/African American, Hispanic/Latinx, Asian/Asian American, Native Hawaiian/Pacific Islander, First Nations/Indigenous/Native American, and multiracial. The Teacher SEL Beliefs Scale is a 12-item scale that assesses teachers' comfort with, commitment to, and school culture surrounding SEL. The scale consisted of three subscales: Comfort, Commitment, and Culture. In the current study, the four-item Commitment subscale was not administered. Because there were survey items taken out, tests were re-done to ensure internal validity.

Results/Findings: The predictor variables of whether the teacher was using SEL practices were: teacher and school, school poverty level, perception of collegial and district support, and internalizing symptoms–or their own state of social and emotional health. These variables generally aligned with findings from previous research. One surprising finding was the high correlation between the perception of support, particularly at the administrative level for doing SEL and the teachers' willingness to do the practices. Unfortunately, most of the predictors around levels of personal mental health and the poverty of the school cannot be alleviated quickly by specific interventions at the school level.

Recommendations for Practitioners: The most promising strategy that school officials can do something about is ensure that administrators are able to convey a sense of support for SEL in schools. They might do this by building time into the school schedule or by providing curriculum resources, compensation, or other tools. For those factors which cannot be addressed adequately or at all by school interventions, it might be important to help teachers take stronger interest in the strengths of themselves and their communities and in allowing teachers as much agency as possible to be decision making agents for making plans to support children in communities that have economic challenges.

Crouse, T., & Rice, M. (2018). Learning to serve students with disabilities online: Teachers' perspectives. *Journal of Online Learning Research*, *4*(2), 123-145. https://www.learntechlib.org/p/182859/

Background: Although parents and children who have been identified with disabilities had been showing increased interest in online schools and programs leading up to the pandemic, there were few opportunities for teachers to learn instructional strategies for supporting this population for a few reasons. First, there were few models in general for online teacher preparation, and second, online learning was historically considered a highly restrictive setting for students identified with disabilities that special education did not like to place children into. The researchers conducting this study wanted to find out what teachers who were working with students identified with disabilities were able to learn to do for these students in terms of instructional practices. Research questions were 1. What do online teachers know about working with students with
disabilities in a virtual school setting? And 2. What do these teachers credit for their acquired knowledge?

Methods: Six teachers from four states participated in interviews where they discussed their teaching background and qualifications as well as their teaching practices. The data from these interviews were analyzed by two researchers engaging in cycles of repeated re-reading, note taking, comparisons, and theme-making across several sessions. Four major themes emerged from these cycles of analysis.

Results/Findings: The major themes around teacher knowledge for question 1 were: curriculum (e.g., lesson planning, monitoring progress), instructional grouping (e.g., one-on-one, small group based on practice needs), parent communication (e.g., multiple types of communication, and ability to explain concepts to parents), and technological support (e.g., text-to-speech, chatrooms, pointer tools). In terms of where the teachers learned these, the most common place was from their experience teaching offline before becoming online teachers. They also learned from their experiences working with the children and some from their preservice experiences and from their professional learning.

Recommendations for Practitioners: The researchers recommended making space for online teachers to discuss ways to repurpose their offline experiences for online teaching. These might be formal or informal professional learning. It was also important for teachers to feel some sense of agency in their teaching in order for them to be motivated to learn to do new instructional moves for students, so providing maximum opportunities for teacher decision making was also an important recommendation.

Daftary, A. M. H. (2022). Remotely successful: Telehealth interventions in K-12 schools during a global pandemic. *Clinical Social Work Journal*, *50*(1), 93-101. https://link.springer.com/article/10.1007/s10615-021-00818-8

Background: Schools perform services to students and have patrol roles in communities beyond providing instruction. One of those services is access to social service workers. During the school building closures associated with the COVID-19 pandemic, students may have needed

additional mental health support but they would have also been cut off from these services. The solution in some schools was to try to provide these services through telepresence. The research question for this study was: What were the challenges that SSWs experienced, and what are potential solutions, as they relate to the implementation of social emotional telehealth services for students during the spring semester of 2020?"

Methods: The research design was exploratory qualitative. Purposive and snowball sampling methods were used to identify social service workers employed in K-12 public schools during the spring of 2020 and to invite them to participate in the study. Researchers found participants through professional networks in Nevada, Colorado, and Minnesota. Twenty SSWs completed 1 to 2 hour semi structured interviews between May 4 and June 17, 2020, via video conference. Interviews had two parts: a semi-structured interview that was audio recorded and a demographic form. Interview questions focused on describing school social work practice before and during the spring semester of 2020). Examples of the questions included: (1) What has been your experience as an SSW during the COVID-19 health crisis?; (2) Can you describe your typical day as an SSW since the COVID health crisis?; (3) Since COVID-19, what are your biggest concerns or challenges as an SSW? How have you addressed them?; and (4) What has been the most helpful for you in this crisis? Three cycles of coding were used to analyze the data: holistic coding, linguistic frequency coding, and focused coding.

Results/Findings: There were several barriers to providing social work support to students through telepresence. The first was that students would miss their appointments. The second was that there were numerous technology barriers. The third was that student privacy was an issue both in keeping bad actors from coming online and breaking through barriers and in finding private places to do teletherapy in homes and other spaces.

*Recommendations for Practitioner*s: The researchers recommend building rapport with students and in finding creative ways to make the appointment model less relevant, such as holding drop in times. They acknowledged that there was little that could be done by telepractitioners to address internet issues. However, any school that is promising these types of services should consider what digital connectivity is available and what privacy they can guarantee before advertising these services to families.

Frazier, D. K., & Tolbert, J. B. (2023). Long-term educator professional development in online instruction and assessment during pandemic teaching. *The Teacher Educator, 58*(1), 91-108. https://doi.org/10.1080/08878730.2022.2145402

Background: In response to the pandemic, the Governor of a Midwestern state made emergency education relief grants available to educational institutions in the state. One regional university secured one of these grants to revive a graduate certificate in online learning and assessment program that had previously existed but had been closed around 2013. As the grant was secured in conjunction with one of the local educational service centers, the revived version of the certificate saw all courses being co-taught by one university faculty member and one K-12 professional from the service center. The grant provided funding that allowed a total of 58 educators to enroll in the graduate certificate free of charge (and 55 completed all four courses needed for the certificate).

Methods: The study was designed to explore the experiences of the 58 educators in this revived certificate program. The sample for this study was taken from the 58 educators who enrolled in one or more courses in the certificate program. The data collection includes surveys at the end of each of the courses, which had a range of 20-31 participants, and two focus group interviews with three of the educators. The quantitative data were analyzed using descriptive statistics and correlation, while the qualitative data were analyzed using inductive analysis.

Results/Findings: The authors grouped their findings into three broader categories. The first broad category was the reasons why the educators enrolled in the certificate programs, which included the immediate issue of providing educational opportunities during the pandemic, a way to earn four courses towards an eventual graduate degree for free, or the educator was selected by an administrator of personally asked to enroll. The second broad category focused on the educators' level of satisfaction with the content and what they still wanted to learn, which revealed that the educators were largely satisfied with the content. Some of the exceptions were instances where the content focused on tools or functions of the tool that were unavailable to the educator in their professional context or for educators outside of the core subject areas who indicated that there were few – if any – examples reflective of their context. The final broad category focused on the educators' own professional development, which was actually the culminating experience in the final certificate course (i.e., to create a professional development opportunity for their colleagues). The authors reported that the educators' tended to focus their professional development on more access to tools, opportunities for direct experience with the tools or strategies in their own contexts, or avenues for collaboration or exchange between professionals.

Recommendations for Practitioners: The recommendations for practitioners were primarily focused on teacher preparation. For example, the authors indicated that a strength of the certificate was that courses co-planned and co-taught by both university faculty who could provide the academic and research background and K-12 community school partners who were able to relate content to the actual experience in the educators' own classrooms. The authors also recommended that universities could better support their K-12 partners by assisting with planning, implementing, and measuring the impact of technology-related professional development and allowing researchers the opportunity to study best practices in technology-related professional development.

Harris, L., Dargusch, J., Ames, K., & Bloomfield, C. (2022). Catering for 'very different kids': distance education teachers' understandings of and strategies for student engagement. *International Journal of Inclusive Education, 26*(8), 848-864. https://doi.org/10.1080/13603116.2020.1735543

Background: The study occurred in a distance learning school in Australia with two regional campuses that collectively served the range of students from K-12. The instructional model relied upon asynchronous instruction and coursework with scheduled, but optional synchronous sessions. From 2013 to 2017 the distance learning school experienced significant growth, yet the outcomes for these distance learning students lagged behind their brock-and-mortar counterparts.

The authors sought to explore how teachers at this distance learning school understood and attempted to enact student engagement in their teaching.

Methods: The samples included 16 teachers who participated in two focus groups as a means of data collection. The researchers utilized a categorical analysis of the transcripts from the focus groups as a method of data analysis. While the article was published in 2022, it appears that the data was collected around 2017 (as the description and data of the distance learning school and its context are all based on information from that year). However, this is an assessment on the part of the annotator, as the authors do not indicate exactly when the data was collected.

Results/Findings: The authors reported that teachers had difficulty defining student engagement in a distance context, and when they did their descriptions tended to focus on aspects of behavioral engagement and, to a lesser extent, emotional and cognitive engagement. The authors indicated that there were few references to agentic engagement or what North American practitioners might describe as personalization.

Recommendations for Practitioners: While it was technically part of the findings, the authors explored with the teachers specific strategies that could be used in the distance learning environment to encourage student engagement. In response to this line of inquiry, the teachers recommended six strategies: (1) build relationships, (2) create a safe classroom environment through differentiation, (3) use technological tools to facilitate interaction and monitor progress, (4) make learning fun and relevant, (5) draw on school-wide pedagogical frameworks and teaching strategies, and (6) encourage self-regulation.

Hu, Y., Wu, B., & Gu, X. (2017). Learning analysis of K-12 students' online problem solving: A three-stage assessment approach. *Interactive Learning Environments, 25*(2), 262-279. https://doi.org/10.1080/10494820.2016.1276080

Background: The study in this article was part of a larger project known as the Evidence-Centered Problem-solving Assessment Design (EsCaPADE). For the purposes of this study, the authors created an online problem solving assessment system that presented students with three different cases. Each case included a "problem description panel, interactive problem-solving panel, simulation display panel, and question panel," and students had to complete each case within a 45-minute window. Students were required to access the online problem solving assessment system in a lab that hosted 40 students at a time.

Methods: The sample included 554 randomly selected grade three to five students from a single elementary school in Shanghai. The authors utilized a three-stage approach using the learning analytics generated by the online problem solving assessment system. "First, [they] clustered students into several groups based on certain general problem-solving summary variables. Second, cognitive diagnostic assessment (CDA) was used to investigate the cognitive attributes of students in each cluster in alignment with the testing problems. Third, sequential data mining was conducted to analyze the problem-solving behavior patterns for each cluster."

Results/Findings: The authors found that the students who exhibited the highest level of performance in problem solving tended to have higher scores in cognition, metacognition, and

efficiency. The authors described these students as the "thinking before leaping" type or students who thought through their options before acting. A second group was found to also have a high level of performance in problem solving, but this group of students had lower metacognitive scores and were thus less efficient and more impulsive in their approach. A third group who were found to have a middle level of performance in problem solving had similar trends to the first two groups, but these tended to be younger students who the authors speculated may have less experience with problem solving or the specific online system. The final group were described as having a low level of problem solving ability. The authors indicated that this group was characterized as only understanding the problems at a superficial level and their main approach to solving the problem was through trial and error.

Recommendations for Practitioners: The implications for practice from a K-12 distance, online, and blended learning context are limited. This is a good example of a study that wasn't focused on the distance, online, and/or blended environment… The data collection just happened to take place in an online system as the students were engaged in a blended setting. The study was solely focused on characteristics of problem solving. With that in mind, the authors did provide one specific recommendation from their findings. The authors reported that "when students spent more time on knowledge acquisition (i.e. understanding the underlying system structure), their problem-solving performance improved, whereas if they spent more time on knowledge application (i.e. actively working on a solution to the problem), their overall problem-solving performance worsened," which provides useful guidance to teachers who wish to incorporate or model problem solving in their own classrooms.

Katz, D., Huggins-Manley, & Leite, W. (2022). Personalized online learning, Test fairness, and educational measurement: Considering differential content exposure prior to a high stakes end of course exam. *Applied Measurement in Education* 35(1), 1-16. https://doi.org/10.1080/08957347.2022.2034824

Background: When learners have so-called personalized experiences in a course, there are questions when they come to the assessment as to whether all the students were able to gain access to the content needed in order to have an equitable chance of doing well. The purpose of this simulation study was to determine whether hypothetical learners would have equitable or approximately so chances to see all the major concepts and learn them before a test in a personalized learning program called Algebra Nation, which is part of Math Nation. The overarching research question of our simulation was: After engaging in the AI-enhanced curriculum for a full school year, what are the Algebra 1 content exposure differences amongst students who have received personalized instruction as well as students who have received non-personalized instruction?

Methods: The simulation study was intended to mimic the actual operation of the personalization system as designed. Researchers created and compared three groups of hypothetical students.
(1) Personalized growth group: Students who received topic and video recommendations and whose CYU trait scores grew within each section each time they say a new topic.
(2) Personalized non-growth group: Students who received topic and video recommendations but did not grow in CYU trait scores within each section.
(3) Control group: Students who did not receive topic or video recommendations but simply

advanced through the system linearly, moving from one topic to the next in order of their presentation in AN, which aligns with the state algebra standards progression.

The hypothetical students were generated by defining 20 clusters of students that represented peer trait score groups. These clusters were generated such that cluster 1 had the lowest average trait score estimate and cluster 20 had the highest average student trait score estimate. In each cluster, student abilities were generated from normal distributions with the mean and standard deviation equal to the cluster mean and standard deviation. These clustered "peer" students were used to create average abilities for each topic within each section. Researchers drew 100 students randomly, generated from a normal distribution with the specific cluster parameters describing the distribution from which to be drawn from each cluster. The trait score drawn for the student was subsequently treated as the true trait score of the student, with the exception that in the "growth group" this true trait score was increased by .1 logits within a given section for each new topic that was presented.Each students was sent through the recommender system in the program. Since the recommender system only estimates a student's trait score level based on three items, researchers generated item responses on the pretest for each section based on individual student true abilities. Probability scores were then estimated. The full process occurred whenever a simulated student was exposed to a new topic under the personalized recommender system. For control group students, no trait scores were needed as they did not play a role in their path through the system. Researchers kept track of what the students accepted as recommendations and how they interacted with the materials. Then they charted the student paths through the courses.

Results/Findings: In most instances, the median proportion of a section covered from the control group – the group that moved sequentially with no recommendation system – was higher than the recommendation system students. In some cases, the control group had only a few combinations of data for proportion covered. In the other sections, the range of the control group is often much smaller than the recommendation groups. However, for the recommender groups, the minimum and maximum content exposure in some sections was between 0% and 100% since the recommender can recommend within and outside the current section to maximize student mastery. To understand student peer clusters on content exposure, it seems like students in the highest cluster are more likely to be sent backwards since slightly more students, based on the 25th percentile lines in the box plots are likely not to have exposure to certain sections. The logic of mastery within the personalization system – moving forward, or at least seeing videos associated with later (and more advanced) topics, is not necessarily viewed as beneficial for high trait score students, meaning that cluster coverage does not seem to increase across sections as trait score increases.

Recommendations for Practitioners: Researchers recommended that measurement fairness needs to be a broader topic within personalized learning. There also needs to be more transparency from vendors about how students are routed through lessons and under what logics. For students where they are under legal requirement to have access to curriculum on par with peers and at grade level, there are serious implications when 'non-learners' and 'learners' in these environments may have uneven access to content coverage.

Khazanchi, D., Bernsteiner, R., Dilger, T., Groth, A., Mirski, P. J., Ploder, C., ... & Spieß, T. (2022). Strategies and best practices for effective eLearning: Lessons from theory and experience. *Journal of Information Technology Case and Application Research, 24*(3), 153-165. https://doi.org/10.1080/15228053.2022.2118992

Background: The authors begin this article with a statement about the impact of the pandemic and the rapid shift to eLearning on education is still being understood. However, based on their experience and understanding of the field of distance learning, both the challenges and best practices in the eLearning environment were not new, and could be described based on what was known from the existing literature.

Methods: The article was a commentary piece, which was in keeping with many of the articles published by this journal that focused on cases and application. The suggestions that were made tended to be fairly well grounded in either academic literature or examples from popular media – often both.

Results/Findings: As this article was not a research study, there were no findings as such. To use the authors' own words, "drawing upon more than two decades of research on distance learning and virtual teams, this paper provides practical guidance for being effective at eLearning."

Recommendations for Practitioners: In the concluding portion of the article, the authors summarized the 10 recommendations that they had developed throughout their commentary as:

"(1) have a clear and well-communicated syllabus;
(2) use a stable and robust eLearning platform;
(3) use multimode learning which combines online synchronous and synchronous face-to-face (F2F) class sessions. We believe that in a post-Covid-19 era, traditional F2F classes will still exist, but hybrid models that include F2F components will be part of the future of postsecondary education around the world. For example, in the USA alone according to a 2021 survey over a 70% of postsecondary students prefer taking at least one online class;
(4) being effective at building good eLearning experiences is hard and substantively more work than a traditional face-to-face class, particularly for instructors and even more so for the learners;
(5) choice of pedagogical approaches needs to be aligned with multiple learner styles, and intentionally empathetic – it is important to place yourself in the shoes of the learner.
(6) communicate early, clearly, and often – establish a "rhythm" or heartbeat for all class interactions (small groups, discussions, breakouts, office hours, assignments). Use a bundle of technology capabilities for communication (e.g., Skype, Discord, Slack, e-mail, eLearning platform messaging, text, phone, etc.) and predefine their purpose in collaboration with learners;
(7) breakup your online class into small sub-sessions with lots of interactions;
(8) where viable, instead of lectures, use a flipped classroom or other strategies to share expository information. Follow that up with discussions and reflections;
(9) remember that pedagogical-informed strategies must empower all eLearning; and
(10) be "available" and "present" online for your students."

Ko, E. G., Joo, S. H., Lim, K. Y., Resta, P. E., & Jang, E. K. (2022). How Korean K-12 educators adapted to online teaching and promoted digital equity during COVID-19: A mixed-method study on practices and perceptions. *Journal of Education and Training Studies, 10*(1), 59-80. https://doi.org/10.11114/jets.v10i1.5422

Background: When the pandemic hit in Spring 2020, South Korea already had a 30+ year history with K-12 distance learning. Investment by successive governments meant that the technical infrastructure, the instructional content, and much of the pedagogical knowledge was already in place when schools closed and learning transitioned to a remote context in April 2020. As the severity of the pandemic began to decrease there was a partial re-opening of schools in June 2020 using a blended model of instruction. Six months after the initial closure of schools, the authors sought "to understand and record how the South Korean K-12 administrators and teachers converted to online teaching and addressed related digital equity problems."

Methods: Participants in the study included approximately 150 K-12 school teachers. The authors utilized three methods of data collection: (1) online teaching readiness survey, (2) online teaching reflection survey, and (3) interviews. All three instruments were based on the Korean Ministry of Education's online teaching guideline, which "suggested the three methods of online learning: (a) one-way task-oriented lesson, which assigns quizzes or self-directed tasks asynchronously; (b) one-way content-oriented lesson, which uses teachers-created lectures or external resources to deliver the lesson contents asynchronously; and (c) real-time interactive lesson through which a teacher and students interact synchronously via video-conferencing tools." Quantitative data were analyzed using descriptive statistics, while qualitative data was analyzed used a thematic analysis through the lens of the Technological Pedagogical Content Knowledge (TPACK) framework.

Results/Findings: Most teachers reported digital inequity primarily in the form of differing levels of student digital literacy, while most administrators reported digital inequity in the form of student access to digital devices. Both teachers and administrators also reported facing technical and pedagogical challenges during the rapid transition to online teaching (specifically in areas that fell into the technological pedagogical content knowledge portion of the TPACK framework). Interestingly, there was one statement made by the authors was likely true of both online and face-to-face learning during and prior to the pandemic: "While students with self-directed learning skills, parental support, access to private tutoring and appropriate devices successfully executed online learning, marginalized students experienced difficulties without adequate support from guardians or teachers." In a predictable fashion, the authors reported that teachers felt most confident with teaching methods that were consistent with their classroom-based practices, which they also felt were more effective. These methods tended to focus on the provision of content, followed by task-focused activities. Interactive activities were the least used, but interestingly viewed as the most effective.

Recommendations for Practitioners: One of the most striking aspects of this study was the reality that in one of the most connected jurisdictions (which has historically prided itself on the citizenry's access to broadband and devices), the first set of findings that the authors reported related to a lack of student access and a lack of student knowledge. This is a lesson for teachers to make sure that during non-emergent times they prepare their students to know how to learn in

a digital environment. It is also a lesson for administrators to ensure that access to devices means access to specific device that is both capable of and has the facility to run the tools needed to learn online. Finally, the author's finding that both teachers and administrators were challenged by a lack of technological pedagogical content knowledge – especially given the pre-pandemic access to online learning tools, content, and teacher professional development – underscores the reality that there is a significant gap between a teacher knowing simply how to use an online teaching tool and a teacher being able to effectively teach using that online teaching tool.

Kurt, G., Atay, D., & Öztürk, H. A. (2022). Student engagement in K12 online education during the pandemic: The case of Turkey. *Journal of Research on Technology in Education, 54*(sup1), S31-S47. https://doi.org/10.1080/15391523.2021.1920518

Background: Like many international jurisdictions, Turkey has invested heavily over the past two decades to increase access to technology in schools and increase the use of technology in teaching. in the provision of digital infrastructure and digital content. One of the recent initiatives was the Education Information Network (EIN), which was designed to provide digital content from K-12 and digital infrastructure to house and deliver that content. During the pandemic, students and teachers were able to utilize this platform and asynchronous content for the purposes of remote learning. This study was designed to examine that experience and "explore the factors underlying student engagement in K-12 online education and teacher strategies used to support it."

Methods: The authors followed a "phenomenological research design in order to understand student engagement in online learning from the perspective of students and teachers…. [and in that] tradition, participants were purposively selected based on their experience in the phenomenon being investigated." The sample included a total of 22 teachers and 20 students (all of whom were in grades 9 through 12). The data collection method was interviews, which were analyzed using a six-phase inductive thematic approach.

Results/Findings: Students indicated that their motivation, concentration, and active participation were closely related to the teacher's instruction; although there wasn't much direct evidence to indicate how differences in the teacher's instruction impacts these items (beyond individual quotations about the duration or speed of teacher talk, opportunities for interactivity or going over homework synchronously). Both teachers and students indicated that individual student factors impacted the students' level of engagement, and used phrases like goal-oriented, self-regulated, perceived the relevance of instruction to their future goals, personal relationship between the teacher and student, and student well-being to describe those that had positive effects. Additionally, both students and teachers spoke about online instructional practices that were familiar (i.e., consistent with what they were used to in the classroom context) as being welcomed and positively impacted student engagement. Finally, the authors acknowledged the role that the parent played in this pandemic-induced full-time online learning environment. "Parental support in organizing the physical learning space and the availability of technology had an impact on online student engagement."

Recommendations for Practitioners: One of the three research questions was specifically focused upon suggested strategies for teachers to increase engagement in the online learning setting. The

recommendations that the teachers made fell into three categories: instructional, managerial, and affective. “Among the instructional strategies that produced online student engagement were designing and implementing engaging tasks and activities, focusing on familiar topics, and applying interactive teaching techniques…. To manage students’ online learning, teachers monitored students’ participation in synchronous and asynchronous classes, sent messages to remind the time and the content of the lessons, and rewarded students’ contributions…. Finally, teachers invested time in supporting students emotionally by showing genuine concern for and care about their feelings.”

Ladendorf, K., Muehsler, H., Xie, Y., & Hinderliter, H. (2021). Teacher perspectives of self-efficacy and remote learning due to the emergency school closings of 2020. *Educational Media International, 58*(2), 124-144. https://doi.org/10.1080/09523987.2021.1930481

Background: The authors begin the article by discussing the growth of K-12 online learning in recent years, but they situate the study within the context of the remote learning that was used during the early stages of the pandemic. The authors’ stated “purpose of this study was to examine the relationship between teachers’ self-efficacy as measured by [technology, pedagogy, and content knowledge or] TPACK to their perceived success for delivering remote learning during the emergency COVID-19 school closures, and how teachers’ past experiences with remote learning, the grade levels taught, and the content area taught moderate the relationship between their self-efficacy and perceived success.” As such there were individual research questions focused on each of these variables.

Methods: The method of data collection was an online survey, which was distributed on Twitter using hashtags related to online learning and K-12 educator groups and on Facebook in education focused groups. This strategy yielded a total of 100 useable responses. The data were analyzed using regression analysis to determine which variables within the TPACK framework impacted each of the five areas.

Results/Findings: (1) With respect to the teacher’s perceived success and online teaching self-efficacy, “as teachers’ CK [content knowledge] and TPACK increased or PCK [pedagogical content knowledge] decreased, the teachers’ perceived success increased.” (2) With respect to the teacher’s satisfaction and online teaching self-efficacy, “only TPACK [was found to be a statistically significant predictor for teacher satisfaction.” (3) With respect to teacher experiences as a moderating variable, “previously taking an online class did not statistically significantly moderate the relationship among TPACK [constructs and perceived student success.” Additionally, “previously taking an online class did not significantly moderate perceived satisfaction.” (4) With respect to grade level taught as a moderating variable, “grade level taught significantly predicted perceived success in some constructs but did not moderate the TPACK constructs.” More specifically, “teaching high school compared to elementary school significantly improved perceived success” when it came to technological knowledge (TK) and pedagogical knowledge (PK). Similarly, “teaching high school compared to middle school significantly improved perceived success” when it came to CK, PCK, and TCK [technological content knowledge]. “Results showed that depending on the grade level the teachers taught, content knowledge also impacted teachers’ satisfaction differently.” For example, as CK increased the satisfaction of elementary teachers decreased. (5) Finally, there were several

statistically significant findings with respect to the content area taught as a moderator. As TK and CK increased, so did elementary math teachers' perceived success. However, as CK increased there was a decrease in elementary special education teachers perceived success. An increase in TPK resulted in an increase in the perceived success from both elementary math teachers and elementary science teachers. Similarly, there were also several statistically significant results with respect to content area taught moderating online teaching self-efficacy and satisfaction. For example, an increase in the TK of elementary math teachers results in increased teacher satisfaction. Conversely, an increase in the CK of elementary fine arts teachers, elementary English teachers, and elementary science teachers all resulted in a decrease in teacher satisfaction.

Recommendations for Practitioners: The authors recommended "that additional professional development and support are needed for teachers to bring their pedagogical content knowledge to life online." The authors further suggested that "content specialists need specific support that can bridge their content knowledge with online teaching." The authors concluded their recommendations for practitioners by pointing out the reality that schools and districts shouldn't assume that past experience with online learning or just technological knowledge was sufficient for teachers to have a high level of self-efficacy or satisfaction with teaching online. Schools and districts "should invest the time, support and resources into providing teachers with training specific to grade level and content area."

Levin, D. A. (2021). *The state of K-12 cybersecurity: 2020 year in review*. K-12 Cybersecurity Resource Center and the K12 Security Information Exchange. https://static1.squarespace.com/static/5e441b46adfb340b05008fe7/t/620d58f6f14b822a371b8c7b/1645041911977/StateofK12Cybersecurity-2020.pdf

Background: There is no such thing as a completely secure IT system. In education, this has implications for the 50 million children in the U.S. who are in a school and have little actual say in where they go and what information goes into IT systems. The year 2020 was record-breaking in terms of IT breaches in schools in the U.S., which resulted in stolen personal information and increased the potential for students and school employees to be victims of fraud. The compilers of this document felt it was necessary to document these breaches and investigate their cases as near as could be done.

Methods: There was not a full explanation of methods. It seems that information was gathered about security breaches in terms of their causes, the damage done, and in terms of the characteristics of the schools where they occurred.

Results/Findings: Data breaches involving student and staff personal information were the most reported type of incident. In 75 percent of cases, security practices of school vendors and partners providing administrative services to school districts were the root cause. COVID-19's increase in remote instruction led to a new class of cyber threats (class invasion and its variants) and served to magnify the impact of other incidents, including denial-of-service attacks and ransomware. In many cases, these led to class cancellations for up to a week or more. While the absolute number of school districts experiencing ransomware attacks was greater during 2019, the severity of those incidents increased during 2020. Several of the nation's largest school

districts were victimized by ransomware and during their attacks sensitive data on large numbers of current and past students and employees was exfiltrated, which lead to credit fraud and identity theft. Since 2016, the median amount of money stolen in such attacks is $2 million per incident. During 2020, a record-setting $9.8 million was stolen from a single school district. While every school is vulnerable to cybersecurity incidents, larger, urban and suburban school districts serving relatively higher-income communities were disproportionately likely to experience at least one cybersecurity incident from 2016-2020. School districts serving higher numbers of students in poverty also suffered disproportionately more incidents.

Recommendations for Practitioners: The authors of the report recommend that school districts increase resources for vetting the security policies and practices of all their vendors when making contracts and periodically thereafter. Vendors should also take opportunities to focus on meaningful security features since they are often the source of security breaches. School districts often do not have resources and infrastructure in place to implement cybersecurity programs, general federal and/or state cybersecurity guidance; therefore, giving these resources and infrastructure first is important to do before giving a lot of guidelines. However, basic cybersecurity hygiene practices for students, for staff, and for school district vendor staff does have some benefits and these practices can be implemented (e.g., teaching how to notice a phishing email).

Liao, Y. C., Ottenbreit-Leftwich, A., Zhu, M., Jantaraweragul, K., Christie, L., Krothe, K., & Sparks, K. (2021). How can we support online learning for elementary students? Perceptions and experiences of award-winning K-6 teachers. *TechTrends, 65*(6), 939-951. https://doi.org/10.1007/s11528-021-00663-z

Background: Following the Spring 2020 shift to remote learning, the authors recognized that teachers struggled to teach fully online – particularly elementary school teachers. Based on this recognition, and the reality that there was a dearth of K-12 online learning research focused on elementary level, the authors sought "to explore a group of K-6 teachers' perspectives and experiences of online learning" by creating a competitive program focused on designing online learning activities for elementary teachers in Indiana during the Summer of 2020.

Methods: The participants were "seven recipients of an elementary educator award for excellence in technology integration." As awardees, these seven individuals were required to attend monthly meetings where they would engage in "a focus group discussion about effective online learning and co-design activities… [where they created] an online learning module template with their grade-level partners based on the discussions and then shared it with the cohort." The data collection methods included the monthly focus group portion of the meeting, as well as the participants original award application (including all of the accompanying artifacts). The authors used grounded theory as a method of data collection.

Results/Findings: Overall, the "teachers perceived course organization, student engagement, and variants of interaction as essential components in online instruction to support students' online learning at the elementary level." (1) "All participating teachers expressed that having organized online instruction that includes consistent course design and management is essential, especially when facilitating elementary students' learning in a virtual environment. Additionally, the

teachers described the accessibility of course content and resources as the key to establishing students' daily learning routines." (2) "All teachers emphasized that online instruction would not be successful without engaging elementary students in the learning process. From the teachers' experiences, students were more engaged in online learning when teachers integrated (a) authentic learning experiences with choices and (b) age appropriate technology tools and resources." (3) The teachers perceived that interacting through (a) teacher facilitation and support, (b) peers, and (c) parental involvement was essential in online instruction to foster elementary students' online learning." (4) Finally, "the teachers described a need for teacher facilitation to make online learning more effective and interactive for elementary students" (e.g., "recorded videos of modeling and showcasing learning content or activities").

Recommendations for Practitioners: While the authors themselves did not make specific recommendations for practitioners, there are some useful practices suggested by the findings. For example, with respect to the fourth finding the inclusion of video-based instruction that helps students walk through the content or an activity in a step by step fashion where the student can watch a portion, pause the video and try to undertake that step on their own, before starting the video again to see the next step. Similarly the need to involve parents as a partner within the full-time online learning environment for younger students is a practice that has been long practiced. The use of consistent course design and consistent learning routines is another suggestion that is useful throughout the K-12 online learning context, but particularly for elementary level students.

Lindfors, M., & Pettersson, F. (2021). K–12 students' experiences of the synchronous remote teaching and learning environment. *Journal of Online Learning Research, 7*(3), 249-263. https://www.learntechlib.org/primary/p/219864/

Background: Remote learning has been a formal part of the K-12 system in Sweden since about 2015. Government regulations require that "(a) remote teaching must be conducted synchronously, (b) the pupils should be in the physical classroom, and (c) a facilitator must always be in the same room." This article is focused on a remote learning project that provided online modern language courses to eight schools in a largely rural region of the country. In the authors' own words, "the aim of this study is to explore K–12 students' experiences of the synchronous remote teaching learning environment."

Methods: While the data collection occurred in May 2020, it appears that the remote learning program had been in place prior to the pandemic. The data was collected using a survey that included both Likert-style and open-ended questions. The quantitative data was analyzed using descriptive statistics and the qualitative data using thematic analysis. The sample included 177 (out of a possible 192) grade 6-9 students.

Results/Findings: The authors indicated that the data revealed seven main themes. "The first theme, *teachers' overview in class*, highlights the teachers' opportunities to get an overview of what is happening in the actual learning environment and where the students are in their learning" (emphasis in the original in each instance), in particular the challenges that online teachers faced in accomplishing this task in comparison to their brick-and-mortar counterparts. The second theme focused on "the lack of *individual help and support* in the remote learning

environment," which interestingly the students focused more on their inability to show the teacher where they were struggling within their own work (as opposed to the teacher being unable to provide individual support). The third theme explored the problem of "the prevailing climate for communication in class and what consequences unasked questions might have for students' learning in the long run," especially the inability to quietly answer the teacher's questions in the synchronous environment without other students knowing. The fourth theme focused on the students' perception of the teacher as the "sage on the stage" within the synchronous learning environment. The fifth theme centered on the technical aspects of the course, and the necessity in a modern language course for seamless audio and video – something that was not always guaranteed with both the technology and the bandwidth provided by the schools. The sixth theme that students expressed was their understanding, even appreciation, of the fact that for all its challenges the remote learning program was the only way that they would have the opportunity to take these modern language courses from a certified teacher. Finally, in the seventh theme the students spoke about the flexibility provided by the remote learning program, including the ability to continue learning while at home.

Recommendations for Practitioners: Based on their findings, the authors recommended that teachers needed "to make students more involved in their learning [within the synchronous environment,] and at the same time make it easier for teachers to guide students' learning in the desired direction through their teaching choices." This recommendation was likely based on the reality that within most synchronous learning environments, it is easy for the teacher to fall back on methods of direct instruction (e.g., lecturing). The authors also recommended that it was important that remote learning programs include opportunities for students to learn more about how to use and how to learn with the remote learning tools, to ensure that the technology does not become an impediment to the student learning. Finally, one of the interesting comments that the authors made that wasn't taken directly from their findings, but is quite a useful recommendations for practitioners was "the importance of understanding the format from both a teacher and student perspective." Essentially, online teachers need to have an understanding of what it is like to be an online student, particularly an online student within the context that they are teaching.

Love, M. L., & Ewoldt, K. B. (2021). Implementing asynchronous instructional materials for students with learning disabilities. *Intervention in School and Clinic*, *57*(2), 132-137. https://doi.org/10.1177/10534512211001

Background: More students that have been identified as having Learning Disabilities (LD) are using online learning and other types of technology supported learning, or they should have access to such learning with appropriate support. However, there is sometimes confusion in practice about how to frame and document support. The purpose of this article was to propose such a frame.

Methods: Since this is a practitioner article, there was no formal discussion of methods. What the authors do is take the readers through the process of thinking through a list of lesson checkpoints alongside the service plan goals. These checkpoints include: advanced organizers, explicit instruction, chunked content, key concepts, multiple models and examples, immediate feedback, accommodations and modifications, standards alignment). The process a teacher should go

through is to 1. Break down content standard or Individualized Education Program (IEP) goal into discrete learning topics based on your timeline (e.g., unit, lesson level); 2. List each discrete topic. Within the commercially available curriculum, locate where each discrete learning topic is taught; 3. Evaluate the learning targets against the evidence- based practice criteria listed in the lesson check-points column with a Y for yes, N for no, or S for somewhat. 4. For each N or S, decide what resources to include in your curated bank of instructional resources and how.

Results/Findings: The goal of using this systematic process is to ensure that technological resources are aligned with what is known about strong instruction for students, with a specific focus on planning, evaluating, and aligning assessment to instruction within the context of technological features and resources.

Recommendations for Practitioners: The resources and exercise here could make a strong professional learning activity. The authors of the paper give special emphasis to using their work as guidance for asynchronous learning, probably in the context of the remote learning of the pandemic, but this could also be used for synchronous learning opportunities as well.

Martin, F., Ahlgrim-Delzell, L., & Budhrani, K. (2017). Systematic review of two decades (1995 to 2014) of research on synchronous online learning. *American Journal of Distance Education, 31*(1), 3-19. https://doi.org/10.1080/08923647.2017.1264807

Background: Following the significant increase in the use of synchronous online learning during the pandemic, the authors began to explore the literature to support best or promising practices using this delivery modality. While there were able to find several meta-analysis and systematic reviews of distance education and online learning, there was no evidence of this kind of research related to specifically synchronous online instruction. For the purposes of their systematic review, the authors define synchronous online learning as the "(a) permanent separation (of place) of the learner and instructor during planned learning events where (b) instruction occurred in real time such that (c) students were able to communicate with other students and the instructor through text-, audio-, and/or video-based communication of twoway media that facilitated dialogue and interaction."

Methods: The systematic review summarizes research on synchronous online learning from 1995 to 2014. In the authors' own words, "the year 1995 was chosen as a cutoff date because the Internet was commercialized in 1995, when it became widely available to everyone and had a drastic impact on education" and the year 2014 was chosen because it represented two full decades of scholarship. The authors used the process outlined by the Department of Education, which included " (a) identify area for review, (b) formulate the inclusion/exclusion criteria, (c) develop the review protocol, (d) develop the search strategy and identify relevant literature, (e) screen and review articles, (f) extract the data, and (g) analyze and report the findings." From an initial pool of 986 potential articles based on their initial search, the sample for this study included 157 articles that met the inclusion criteria.

Results/Findings: It should be noted that only 20 of the 157 articles (or 12.7% of the sample) focused on the K-12 environment. Unfortunately the results were not broken out among this subset, so the findings discussed include both K-12 and adult populations. While the authors

presented several findings related to the most common journals (which were *Computers & Education*, *British Journal of Educational Technology*, *The International Review of Research in Open and Distributed Learning*, and *Journal of Assisted Learning*) and the most common countries where the participants were located (which were the United States representing over 25% of the sample, followed by United Kingdom, Taiwan, and Canada that all had more than 10, and Sweden and Australia with more than five). Interestingly, the sample included 54 journals that only published 1-2 article and a total of 34 different countries were represented. There were several findings about demographics, instructional settings, data collection procedures, and specific tools that would be less relevant to our audience. The authors did report "that the most common variable studied in synchronous online learning research was perception or attitude followed by interaction. Motivation was the least studied variable."

Recommendations for Practitioners: The potential recommendations for practitioners from this study are limited. Essentially, the only suggestions that can really be drawn is that if teachers are interested in the perceptions or experiences of students in synchronous online learning environments that there is some research to guide them. The same can be said about research focused on opinions of students and teachers about interaction in the synchronous online learning environment. However, if a teacher is interested in issues of motivation in the synchronous online learning environment, there is limited research to guide them.

Miller, K. (2022). Teachers' reflections on supporting social and emotional learning: Desires, practices, and tensions in fostering family-school ties. *Journal of Online Learning Research*, *8*(1), 37-65. https://www.learntechlib.org/p/220634/

Background: Parental support is regarded to be important for success in online learning because the parents typically have opportunities to be more physically proximate to the children during the learning. During the pandemic some schools and teachers were aware of the need to strengthen ties between home and family to recruit parental engagement in online learning. Research questions for this study were: 1. What perceptions did experienced teachers have regarding the value of family-school ties? 2) How did experienced teachers foster family-school ties to support online students' well-being? Did their approaches represent traditional, school-directed parental involvement practices or efforts to build reciprocal family-school relationships? 3) What challenges to fostering family-school ties did they encounter?

Methods: This was a qualitative study of teachers' experiences between Fall 2020 and Spring 2021. The teachers were enrolled in a graduate study course at a university in the southern United States. Across three semesters, the average course enrollment was 22 students. Course participants completed four learning journals per semester with multiple entries and contributed to four peer discussions. All learning journals and peer discussions were downloaded and identifying information was removed prior to analysis at the end of each semester. Data collection resulted in 261 journals with 873 unique entries and 12 discussion forums containing 264 discussion threads. Thematic document analysis was used to identify themes across multiple types of documents. There were two major stages in this analysis, the first looking for broad ideas in all the documents and the second, seeking to connect the ideas and coalesce them into succinct themes.

Results/Findings: The researcher found that the teachers valued the relationship with the parents and developed a deeper understanding of the parental role through the course assignments that asked them to think and reflect on their interactions with them. Also, the teachers seemed to realize that the parents were indispensable in the success of the online teaching effort. They also developed increased appreciation for students' home cultures. A major obstacle to building home-school connections was the teachers' deficit view of the parents and their culture where these views were present. Teachers' also found it difficult to be able to spend the time necessary in some instances to build these connections.

Recommendations for Practitioners: The researcher recommends deliberate interventions with the teachers to shift their thinking about the importance of meaningful school ties. These need to acknowledge and honor the parents, the strengths they bring, and the cultural knowledge within the families. This is different from the typical school narrative of communicating for the purpose of making sure that families know what *school expects of them*. In addition, it seems important to consider shifting these views from a local or context-based frame rather than making general injunctions just to 'appreciate students' home cultures.' Further, there seems to be a need to take seriously the way in which instructional materials could be interwoven into family life in online learning rather than acting as objects outside of family life.

Rehn, N., Maor, D., & McConney, A. (2018). The specific skills required of teachers who deliver K–12 distance education courses by synchronous videoconference: Implications for training and professional development. *Technology,Pedagogy and Education, 27*(4), 417-429. https://doi.org/10.1080/1475939X.2018.1483265

Background: In this pre-pandemic study, the authors examined the practices and reflections of teachers who taught synchronously using a video-conferencing system to distance students in rural and remote locations. Both the teachers and the students were using videoconferencing suites with interactive whiteboards and screen-connecting software. The distance instruction was also supplemented by a learning management system and other distance learning tools (although these asynchronous platforms were not the focus of the study).

Methods: This case study focused on eight teachers in a single Canadian province who were located at five different teaching sites, who taught students that were located in one of 13 different locations. The data collection methods included the observation of one or two synchronous lessons (which included field notes) and then a follow-up interview with each teacher. The data were analyzed using an inductive analysis process.

Results/Findings: The authors succinctly summarized their findings as "(a) successful teaching by videoconference requires teachers to master a complex and distinctive mix of technical, pedagogical and interpersonal skills, including: communicating across a two-dimensional screen, forging relationships with students through technology-mediated interaction, developing teacher presence, championing the technology within the community and designing courses that leverage the affordances of the medium to foster deep inquiry and student engagement; and (b) teachers felt underprepared and untrained for the role of videoconference teacher and would welcome support through teacher action research, professional collaboration and specific pedagogical training."

Recommendations for Practitioners: One of the main takeaways from the findings is that synchronous instruction via videoconferencing "require skills… (that are unique from online and face-to-face teaching in order to teach in a way that they perceive as successful," as such it is necessary for teachers to have access to professional development opportunities – and for schools and districts to consider requiring certain professional learning prior to teaching these alternative mediums. Further, "many of the individual teachers had solutions to other individual teachers' questions," so individual teachers should seek out communities of practice with which to engage (and schools and districts should look to create formal opportunities for this kind of collaboration). While not at the practitioner level, the authors suggested the need for specific standards – beyond those required by the jurisdiction – that addressed teaching at a distance. While the authors referenced the iNACOL standards, they also indicated that those standards were not representative of the local jurisdictional context.

Rice, M. (2018). Supporting literacy with accessibility: Virtual school course designers' planning for students with disabilities. *Online Learning*, *22*(4), 161-179. https://olj.onlinelearningconsortium.org/index.php/olj/article/view/1508

Background: Virtual schools had a long history of low accountability for outcomes like student enrollment equity, persistence, and achievement. Leading up to the pandemic, some states were taking on initiatives to increase evaluation of virtual school outcomes and accountability. One area of accountability focused on teacher knowledge of accessibility, which is sometimes confused with broader notions of access. This study is based on findings from a state that had to undergo an accessibility audit as part of a broader accountability initiative. Teachers were surveyed about their perception of the accessibility of the instructional materials. The research question was: How do virtual school teachers perceive the accessibility of the instructional materials for the courses they teach?

Methods: The data for this study was self-reported via an online survey. The Quality Matters rubric was used to generate items for the survey. Items were developed using a 7-point Likert-like scale that ranged from "strongly agree" to "strongly disagree." This framing based on the level of agreement enabled the researchers to use the words from the rubric verbatim. Standard eight from QM refers to specific knowledge and skills related to usability and accessibility: "The course design reflects a commitment to accessibility and usability for all learners".. Content validity procedures were enacted using 5 trained QM reviewers and 5 state-level stakeholders to rate the items on a scale of 1-3 in terms of their fidelity in reflecting the QM standards. The mean rating per item was 2.9. The survey was sent to administrators at six virtual schools in the state. Administrators were asked to send the survey to both full and part-time certified teaching staff. These teachers were assigned to every subject, including special education. Across all six schools, the responding teachers had an average of five years of experience teaching, but the range of their experience was seven months to 10 years. All survey respondents' personal identifying information was kept anonymous to increase response rates and decrease bias in responding. The survey was released in May of 2020 and closed in June of 2020. Forty-seven teachers completed at least part of the survey out of a possible 111 number of teachers across the six schools resulting in a 42% response rate.

Results/Findings: For all five areas of the standard (course navigation, course readability, accessible text and images, alternative means of access to multimedia content, and vendor accessibility statements) teachers agreed with the statements that instructional materials were accessible, but standard deviation information showed widely dispersed responses. This suggests that teachers as a group were actually not sure what it meant for instructional materials to be accessible.

Recommendations for Practitioners: The researchers recommended that teachers receive specific information about what constitutes accessibility in digital instructional materials. They also recommended additional considerations for accessibility of these materials, including the number of access points in a document to use and interact with it and more specific considerations about issues (e.g., alternative text for visual images, captions, font and background changing capabilities, navigational capabilities).

Sayed, W. S., Noeman, A. M., Abdellatif, A., Abdelrazek, M., Badawy, M. G., Hamed, A., & El-Tantawy, S. (2023). AI-based adaptive personalized content presentation and exercises navigation for an effective and engaging E-learning platform. *Multimedia Tools and Applications*, *82*(3), 3303-3333. https://link.springer.com/article/10.1007/s11042-022-13076-8

Background: Designing personalized learning involves decision making about content presentation, including how and whether to include multimodal elements and strategies like gamification. The APPEAL personalized learning platform based on Moodle was developed to teach 3rd graders mathematics. It has two tracks, a multimodal track (Visual/Aural/Read, Write/Kinesthetic) and a gamified track. The purpose of this study was to learn the following: 1. Does APPEAL improve aggregated-level academic performance and learning effectiveness indicators (pre- and post-test scores, completion time and learning efficiency) and how much improvement is achieved?; 2. Does APPEAL improve the data dispersion for these academic performance and learning effectiveness indicators and how much improvement is achieved?; 3. Does APPEAL improve disaggregated-level academic performance and learning effectiveness indicators for each student on lesson and exercises level?; 4. Does APPEAL achieve good student engagement and satisfaction indicators?

Methods: Students log onto the platform and then take a questionnaire to see if they would prefer the multimodal presentations or the gamified presentation. Then, they are led through the content. Exercises are at Easy-Medium-Hard levels that can be set by the teacher and are also linked to tasks based on Bloom's Taxonomy. An algorithm keeps track of student progress and presentation of content. A simulation with students occurred before actual students used the platform. There were 13 students in each group. No other information was given about the students.

Results/Findings: Most students received higher post-test scores than pre-test scores indicating that learning was occurring. The majority of the students achieved. 61.54% of the multimodal group students achieved higher than 50% and 38.46% of gamification group students achieved higher than 35%. This suggests that the multimodal group achieved more than the gamification

group. The multimodal group also had a higher satisfaction rate with the materials (94% compared to 75%).

Recommendations for Practitioners: Multimodal presentations of material were better for the students who chose it; we do not know what a random assignment would have yielded, particularly we don't know what doing the multimodal work would have done for the gamified group that did worse. We also don't know how doing the games affected the amount of content exposure. We can say that it is unlikely that the two ways to present content are equal–it does make a difference how we present information to students.

Shelton, A., & Gezer, T. (2023). Investigating the educational experiences of students with disabilities during the COVID-19 school disruption: An international perspective. *Large-scale Assessments in Education, 11*(1), 1-26. https://doi.org/10.1186/s40536-023-00183-7

Background: The Responses to Educational Disruption Survey (REDS) was a joint effort by the International Association for the Evaluation of Educational Achievement and United Nations Educational, Scientific and Cultural Organization (UNESCO) as an initiative of the Global Education Coalition, which was founded in March 2020 by UNESCO. Its purpose was to examine "the effect of COVID-19 school disruptions on teaching and learning from an international perspective." REDS was administered in eight countries: Burkina Faso, Denmark, Ethiopia, Kenya, Russia, Slovenia, the United Arab Emirates, and Uzbekistan

Methods: The purpose of this study was to determine the extent to which students with disabilities' perceptions of their educational experiences changed and varied from those of stu-dents without disabilities during school disruptions. Data collection occurred from December 2020 and July 2021. As Russia, Slovenia, and Uzbekistan did not include any students with disabilities in their data, the authors focused this study on the data from the remaining five countries. The final sample for this study included 12,229 students – 3,195 in the students with disabilities cohort and 6,622 in the students without disabilities cohort.

Results/Findings: The authors reports that "in general, the percentage of students with disabilities who reported not needing support in each area decreased during the COVID-19 disruption, indicating that more students with disabilities needed support during this time." Further, students with disabilities reported higher ratings – in varying amounts across the five countries – of teacher support, schoolwork, and learning progress than students without disabilities, which suggested that these students generally had better perceptions of their learning experience than students without disabilities. Overall, students with disabilities reported needing more school support during the COVID-19 school disruption than before the disruption, while at the same time believing that there was an increase in the school support they received.

Recommendations for Practitioners: The authors outlined two specific recommendations. Practitioners should consider "providing students from lower socioeconomic backgrounds additional resources during remote learning"; and (2) "putting policies and structures in place that provide SWDs with ongoing support during remote learning…. [that] aim to (a) increase students' teacher support, while promoting (b) positive perceptions of their schoolwork and (c) positive feelings."

Shively, K., & Geesa, R. L. (2023). An online professional learning series: Preparing P-12 educators to teach in online SEL environments. In R. Rahimi & D. Liston (Eds.), *Exploring Social Emotional Learning in Diverse Academic Settings* (pp. 271-295). IGI Global. https://www.igi-global.com/chapter/an-online-professional-learning-series/321394

Background: Teacher educators at a midwestern United States university created an online professional development program aimed at supporting teachers in developing strategies for providing Social Emotional Learning (SEL) to students. They began in July 2020 during the school building closures that resulted in large-scale use of remote and distance learning and continued to develop the materials presented in the article until 2022. The sources they drew on included: Collaborative for Academic, Social, and Emotional Learning (CASEL; 2022); American School Counselor Association (ASCA; 2021a); University of California San Francisco (UCSF), Healthy Environments and Response to Trauma-Informed Systems (HEARTS) (Dorado et al., 2016; UCSF, 2022a); Learning for Justice (Teaching Tolerance, 2018) Social Justice Standards; and the International Society for Technology in Education (ISTE; 2021) Standards for Educators.The question for their research was: "How and in what ways might we prepare educators to facilitate online social-emotional learning opportunities for P-12 students?"

Methods: This work was design-based research. The o-SEL environments were developed online via a web conference platform (i.e., Zoom) and website (e.g., WordPress) with SEL educators and professionals from Midwestern public elementary schools and high schools. The research team involved in creating this experience consisted of a design thinking team from the graduate program, Emerging Media Design and Development graduate students from another university program, the university Digital Corp, elementary education and educational leadership faculty, and five experts from the P-12 field. The team created and led the brainstorming protocol for the two one-hour synchronous, online sessions. The graduate students asked five SEL educators and professionals questions related to the identified problems from a survey sent prior to the first meeting. Five SEL educators and professionals completed one informal survey and participated in two one-hour brainstorming sessions about challenges and solutions gathered in the informal survey. The ideas shared informed the search and collection of content and digital tools for the series' modules. The creation process required weekly meetings with Digital Corp and graduate students to create prototypes that included interactive graphics, videos, and images. After a draft was completed, the website was reviewed by the educators and professionals from the brainstorming sessions, and faculty invited from the college to review and provide feedback. After revisions were completed, the series was published for the public to access.

Results/Findings: In the design thinking process, a model emerged for creating an online learning environment. The model includes six elements, which suggests these elements are needed to develop understandings of and ways to address the social-emotional needs of P-12 online learners. The elements were: Empower, Engage, Motivate, Include, Collaborate, and Extend.

Recommendations for Practitioners: The researchers would like practitioners to use their model to do professional development along with the resources that they have developed. However,

there are also important ideas about the process of gathering practitioners together and giving them the time and resources to develop their own models for thinking about how to do online teaching in their context. Even if these have redundancies with other models, the process of doing the thinking and learning together might prove fruitful.

Standen, P. J., Brown, D. J., Taheri, M., Galvez Trigo, M. J., Boulton, H., Burton, A., ... & Hortal, E. (2020). An evaluation of an adaptive learning system based on multimodal affect recognition for learners with intellectual disabilities. *British Journal of Educational Technology*, *51*(5), 1748-1765. https://bera-journals.onlinelibrary.wiley.com/doi/pdfdirect/10.1111/bjet.13010

Background: Students who have been identified as having intellectual disabilities are deemed to need additional support in school settings. The support that is needed is deemed burdensome to schools and in the interest of relieving it, tools and technologies such as artificial intelligence are being tested to determine whether there is promise for use as a support. In this study, a program called Managing Affective-learning THrough Intelligent atoms and Smart InteractionS (MaTHiSiS) was used to determine whether a program could monitor affective states and link those states to when learning was happening.

Methods: A within subjects repeated measures design was adopted whereby each participant took part in intervention (A) and control (B) sessions. The intervention (A) was MaTHiSiS used as it was designed: with affect and achievement data driving the presentation of the learning material and (B) where the presentation of the learning material was based on achievement alone. In this design, each participant acted as their own control, thus, controlling for differences between very varied participants; there was flexibility to fit in with teachers' and learners' requirements as session length and timing of sessions can vary to suit classroom and learners' obligations; order effect that comes from one condition always being first or second was reduced; number of testing sessions to minimize effects of any unwanted variations such as time of day or specific learning material was maximized. Participants were recruited from schools at six different sites: Nottingham and London in the UK, Rome, Salerno and Fumane in Italy and Valladolid in Spain. Participants were judged to be below their peers and identified with either intellectual disability or autism, aged between 6 and 18 years, nominated by the teacher for being able to potentially benefit from using the MaTHiSiS system, having parental or guardian consent to participate. There were 67 students in this study. Teachers involved each participant in 12 sessions, half of which would be intervention. To reduce the order effect, teachers alternated sessions between the two conditions in bouts of three, that is, AAA BBB AAA BBB, with half of the participants experiencing a reversed order of the conditions, that is, BBB AAA BBB AAA. Teachers ended the session whenever they thought appropriate for the learner, but to avoid going over 20 minutes. Participants worked through learning graphs considered relevant for them by their teachers. The choice of device on which they interacted with the system (laptop, tablet or NAO robot) was determined by their teacher. The number of A sessions ranged from 1 to 13 (mean 5.3), with 91% of participants taking part in 3 or more A sessions. The number of B sessions ranged from 1 to 11 (mean 4.3), with 75% of participants taking part in 3 or more B sessions. Total time during which the participant was using the system either in A or B sessions ranged from 15 to 413 minutes (mean 113 minutes). About 84% of participants had a total duration of 60 minutes or above.

Results/Findings: The state labeled "lack of boredom" is the state most strongly linked to achievement, whilst those labeled "frustration" and "engagement" are positively related to achievement. Frustration detected by the MaTHiSiS system did not linger, either because the software adjusted to move the learner to a different state (by reducing the level of difficulty or by choosing alternative learning materials) or because the learner adjusted their affect to meet the challenge that led to their frustrated state. The system did increase the time that learners were engaged and boredom decreased. No significant difference in learning achievement was found when adaptation was based on both the affective state and achievement of the learner, compared with achievement alone.

Recommendations for Practitioners: The system showed some promise, but still needed further development. The findings lend legitimacy to the idea that learners experience varying affective states during instruction and they have varying abilities to process and recover from negative ones on their own. It was interesting to label "engagement" and affective state. Also, it is important to understand that frustration may not mean that no learning is happening even though learners do not like to be frustrated and in the case of children, their parents do not like their kids to be frustrated while learning online.

Tysinger, D., Tysinger, J. A., & Diamanduros, T. D. (2016). Crisis events in K-12 online learning: Educator perceptions and preparedness. *National Youth Advocacy and Resilience Journal*, *2*(1), 41-48. https://digitalcommons.georgiasouthern.edu/nyar/vol2/iss1/4/

Background: Periodically, there are crises in the United States and other countries where that cause disruption in schooling and distance and remote strategies, including moving instruction to the online modality are used to preserve continuity. However, such crises often seem to catch schools by surprise. The researchers wanted to know about teachers' perceived levels of preparedness for crises that might disrupt school.

Methods: Participants for the survey were administrators and teachers from a large, public online high school in the western United States. Of the 54 respondents, 41 (all noting their roles as teachers) completed most survey items. Of the participants, 80.48% were female (n = 33) and 19.51% were male (n = 8) with years of teaching experience ranging from 1–15 years (M = 5.46 years). For educational attainment, 11 participants (26.83%) reported training at the Bachelor's level (B.A. or B.S.), 18 participants (43.90%) had a Master's degree (M.A. or M.S), 11 participants (26.83%) said that they had Master's+ or Ed.S. degree, and one participant (2.43%) had a doctoral-level degree in education. Participants responded to the Crisis Event Perception Survey (CEPS). This is a 37-item survey electronically-delivered instrument that was created specifically for use on this research project. The CEPS consisted of five demographic items and 32 items addressing educators' perceptions of the frequency of various crisis situations in the online learning environment as well as their preparedness for responding to each type of crisis.

Results/Findings: The respondents perceived that there were a number of personal and familial crises occurring among their students. These included health issues, abuse, neglect, homicidal and suicide ideation. They felt prepared to address issues of abuse and neglect and less prepared

to address issues of ideation for killing, particularly homicide. The instrument did not ask questions about crises such as mass illness and death from a pandemic.

Recommendations for Practitioners: While the researchers recommend general preparedness for crises in line with their survey items, it is worth noting all of the crises that have happened since that were unforeseen in 2016. The assumption among the researchers that crises by definition do not happen very often is also outmoded in current circumstances where crises are almost more common than non-crises in a school day and among families. Schools–including online schools–should be aware of the fact that many families are experiencing significant stress and professional learning should address specific types of crises (e.g. homicidal ideation) and how to address these.

Yu, H., & Ha, T. (2021). Effective pedagogical practices in synchronous online physical education. *Journal of Physical Education, Recreation & Dance, 92*(9), 63-68. https://doi.org/10.1080/07303084.2021.1979872

Background: While this article was published more than a year and half into the pandemic, the authors situated their commentary within the broader context of the growth of K-12 online learning, the lack of preparation and/or training given to physical education teachers to teach online, and growing use of Zoom as a synchronous online instruction tool. The purpose of the article was to propose 15 pedagogical practices in synchronous online learning, although there was no reference to or citations to support the 15 specific suggestions.

Methods: This journal article was a commentary, as such there were no methods.

Results/Findings: As a commentary there were no traditional results or findings to report (only the suggestions below). However, it is worth noting that the authors organized their suggestions into "three categories of pedagogical aspects, including active lectures [items 1-7], active discussion [items 8-12] and active group activities [items 13-15] that would produce alternative and innovative ways of learning in physical education."

Recommendations for Practitioners: The authors outlined 15 specific suggestions for teachers engaged in synchronous online instruction that included the following.

1. "To keep students engaged, a teacher periodically pauses the lecture to ask for students' participation/opinions using reaction buttons."
2. "By using the 'polls' function on Zoom, a teacher prepares a list of statements for common misconceptions about the health-related topic."
3. "The 'chat' feature on Zoom allows a teacher to send messages to an individual or an entire class during lectures."
4. "After 10–15 min of lecture, students are asked to write up everything they recall. After the recall, they can be separated into breakout rooms to organize their memories within small groups."
5. "A teacher presents PowerPoint slides using "share screen" on Zoom. After three slides, students are randomly selected to interpret what the teacher said in their own words."

6. "During a lecture, students prepare a list of questions that can be applied to their real lives and explain why the questions are important."
7. "Students visualize what they learned using graphic organizers and share the graphics."
8. "A teacher poses a question relevant to students' real lives… The teacher should provide open-ended questions to provoke active/meaningful discussion. Then each student takes some time to think of answers (self-questioning), share the ideas within small groups"
9. "A teacher provides several templates to help students determine their… problems/issues to spark conversation and motivate them to be knowledgeable for themselves. Then students are assigned to breakout rooms to search for information about the presented issue, discuss based on their experiences, and formulate the answers."
10. "A whiteboard feature on Zoom allows the teacher to share the topic and have students annotate their thoughts"
11. "A fishbowl discussion can be used when students need to discuss… topics within a large class. The teacher presents students with a list of open-ended questions to think about. Within breakout rooms, five or so students work on the given questions. After small-group discussions, each group enters the 'fishbowl' together to present their topic as a panel while the rest of the class observes."
12. "A teacher asks all students to take 2 minutes to brainstorm about the discussion topic. Students also take 2 minutes to write down their ideas on a brainstorming board, avoiding any evaluation. Then, they participate in a discussion while looking at the whole brainstorming board."
13. "While students are working in small groups, one student in each group serves as a patrol officer and visits another group to gather additional information as well as report their progress."
14. "A teacher introduces some words to explain new concepts. Students within groups hunt for (i.e., seek, pursue, and capture) additional information/ examples to support the topic. They are able to work on it together… to share their work.
15. "Students in each breakout room learn just one piece of the material/topic After becoming an expert in each group, students are sent to their original groups to synthesize the knowledge/expertise they have learned and create a presentation."

Zayet, T. M., Ismail, M. A., Almadi, S. H., Zawia, J. M. H., & Mohamad Nor, A. (2023). What is needed to build a personalized recommender system for K-12 students' E-Learning? Recommendations for future systems and a conceptual framework. *Education and information technologies*, *28*(6), 7487-7508. https://link.springer.com/article/10.1007/s10639-022-11489-4

Background: With the increased popularity of online learning and so-called personalized programs and applications, the researchers believed that there was a need to conduct a five-year review of what is known about personalization tools. The research questions for this paper were: Q1. What are the "must exist" modules in PRS-ES? 2. What are the personalization features that can be used to ensure personalization?

Methods: The reviewers followed a process where they developed keywords and then performed searches. Inclusion and exclusion criteria focused on recency and alignment with keywords along with being published between 2017 and 2021. A quality analysis was conducted that included the following elements. QA1: Are the study objectives and goals clearly defined? QA2: Does the study clearly state the research methodology? QA3: Are the study contributions and limitations clearly stated? QA4: Are the data collection procedures and results clearly explained? And QA5: Does the study mention how the personalized recommendation system is built? The studies were given scores of 0 to 5 for these elements. Ultimately, 32 studies were high, medium, and low quality, while nine studies were excluded for being low quality. The study created a form to record the data extraction of 23 articles for data collection completeness. Critical elements identified for data extraction included: study ID, types of system modules listed in the study, types of personalization features, students' characteristics, and type of recommended items or context. Content of the remaining studies was carefully reviewed and analyzed.

Results/Findings: The study suggested a personalized conceptual framework to recommend materials to school students based on the proposed recommendations. The framework operates in a semi-automated mode with certain activities requiring human intervention and others being completed automatically. The four primary stages of the framework are student profiling, material gathering, material filtering, and result validation.

Recommendations for Practitioners: The researchers recommend implementing the framework and then gathering more data about it to determine whether it is a good framework. An important recommendation might be to understand that much research about personalization is uncritical about its strengths and limitations. In this framework, there was an attempt to identify characteristics that empirically support a programmer's claim that an application or program is *personalized* but there was no interrogation of any of these features. Practitioners might be helped by these findings in that they can use them as examples of how much thought should go into strong personalization. Moreover, they can use these as examples for how to give language to reasons why students might reject some students and not others.

Zeng, H., & Luo, J. (2023). Effectiveness of synchronous and asynchronous online learning: a meta-analysis. *Interactive Learning Environments*, 1-17. https://doi.org/10.1080/10494820.2023.2197953

Background: The study was situated both within the context of traditional online learning, as well as the rise of remote learning that occurred during the pandemic. One of the rationales that was implied by the authors was due to the fact that the pandemic-induced remote learning tended to focus on synchronous online learning, there was a need to examine the existing literature based on the modality of instruction. While there had been previous meta-analyses conducted on comparing online learning with traditional face-to-face instruction, there had not been any meta-analysis that had compare both asynchronous online learning with traditional face-to-face instruction and synchronous online learning with traditional face-to-face instruction, as well as asynchronous online learning with synchronous online learning.

Methods: The authors began with a possible pool of 3,590 from 2002 to 2022, which resulted in 82 articles being potentially eligible after a review of the titles and abstracts. A full-time

assessment was conducted on these 82 articles, and 13 were eligible for inclusion – with a fourteenth identified from other resources. The final sample included 14 studies with 25 datasets published between 2006 and 2022.

Results/Findings: The findings indicated a small effect size in favor of asynchronous online learning compared to traditional face-to-face instruction. This result was across all areas, but was higher in mathematics (which the authors suggest might make mathematics more suitable for asynchronous online learning). Further, the authors reported that "an asynchronous learning environment was shown to be better in prompting students' learning effects or at least as good as synchronous learning." However, it should be noted that this study did not include any variable that would have determined whether the original data was based on a K-12 or adult population.

Recommendations for Practitioners: While the authors concluded that if face-to-face instruction was not available, that asynchronous online learning would be a suitable replace (in particular for mathematics), they also made some recommendations for things that practitioner needed to be aware of. In their own words, "asynchronous online learning depends on students' motivation to get through the materials on their own. A lack of motivation could result in an accumulation of workload, which may increase learning anxiety and decrease learning effects… Moreover, as synchronous online learning often increases 'personal participation,' which may increase students' commitment and motivation and reduce dropout rates."

Zhang, Y., & Lin, C. H. (2020). Student interaction and the role of the teacher in a state virtual high school: what predicts online learning satisfaction? *Technology, Pedagogy and Education, 29*(1), 57-71. https://doi.org/10.1080/1475939X.2019.1694061

Background: Written about a year before the pandemic, the first line of the authors' own abstract was somewhat prophetic: "As online K–12 education continues to expand, concerns about its quality have taken centre stage." In their own review of the research in the field, the authors make the claim that "thus far, two main lines of research have sought the keys to online learning success: one by studying learner-level characteristics, and the other teacher-level ones." The purpose of this study was to undertake "a more comprehensive examination of factors at different levels that may influence individuals' online learning experiences." In particular, the authors were interested in explore how different types of interaction (i.e., student-student, student-teacher, and student-content) played on student satisfaction, as well as the effects of the teacher's pedagogical, managerial, and social role had on student satisfaction.

Methods: The possible sample included 1593 students enrolled in Chinese, French, German, Japanese, Spanish or Latin from 38 different teachers at a Midwestern state virtual school in the Spring 2014 term. A total of 466 students and 17 teachers completed an online survey, however, only 226 students and 15 teachers were suitable for the hierarchical linear modeling the authors intended to use to analyze the data.

Results/Findings: In their own words, the authors found "that at the student level, learner–content interaction was the only type of interaction that significantly predicted satisfaction; and that at the teacher level, the pedagogical role was a significant and positive predictor of student

satisfaction, whereas the managerial role predicted learning satisfaction significantly and negatively."

Recommendations for Practitioners: Based on their findings, the authors themselves recommended that "K-12 virtual-school teachers, especially those who teach world language classes… should strongly emphasise their pedagogical roles to promote students' satisfaction, and thus their overall learning experience." Additionally, "to promote high levels of learning satisfaction, it is also crucial to ensure a high quality of student interaction with course content. More diverse, engaging and individualised activities are therefore needed, and learning management systems should be made more user-friendly and interactive. In those virtual schools that use ready-made online courses and allow teachers to make few or no changes to course content, teachers should be especially aware of their pedagogical role – and in particular, their sub-roles as profession-inspirers, feedback-givers and interaction-facilitators. In addition, given the negative influence of teachers' managerial role that this study identified, online teachers must balance carefully between the time spent on pedagogical practices and that spent on managerial ones. In part, this will depend on how well they get to know their students."

Appendix D – Author Abstracts

Aguilar, S. J., Galperin, H., Baek, C., & Gonzalez, E. (2022). Live instruction predicts engagement in K–12 remote learning. *Educational Researcher, 51*(1), 81-84. https://doi.org/10.3102/0013189X211056884

How does live instruction relate to student engagement in distance learning? Does the relationship differ across grade levels? This study addresses these questions by examining data from a random sample of families from a large urban school district in southern California. We find a strong correlation between live instruction and student engagement in online learning among elementary school students, with every additional hour of live instruction per week increasing the probability of reporting that students have completed all their schoolwork by 26%. The correlation is also significant though smaller in magnitude for middle and high school students.

Alebaikan, R., Alajlan, H., Almassaad, A., Alshamri, N., & Bain, Y. (2022). Experiences of middle school programming in an online learning environment. *Behavioral Sciences*, *12*(11), 466.

This small-scale qualitative study aimed to explore learning programming through online experiences among middle school students in a school for girls in Saudi Arabia. The low uptake of computing by girls has been a persistent problem in schools and beyond. In Saudi Arabia, there are similar issues in encouraging learners and girls in particular to be interested in computer coding. To explore how to engage learners in coding, an informal online course on programming for learners (age 12) was designed using a community-of-inquiry approach and a gamification process enabled through the use of Thunkable™ and TalentLMS™ to engage learners. An inductive qualitative research approach was used to explore influencing factors for engaging learners in programming. The data comprised three individual interviews, one focus group, a teacher's diary, and a content analysis of the activities recorded in the TalentLMS™ system's student progress reports. Findings highlighted the need to consider digital learning agency in the online learning environment and that learning programming online was best facilitated through student collaboration using live tools with teacher support to develop the online community. Further, findings revealed the rationale for the girls enrolling in the online programming course, which included improving their online learning skills, planning future careers, and developing résumés. These findings may contribute to offering some insight into pedagogy that can encourage greater interest in computer programming in schools.

Alvarado-Alcantar, R., Keeley, R., & Sherrow, B. (2018). Accessibility and usability of preferences in blended learning for students with and without disabilities in high school. *Journal of Online Learning Research*, *4*(2), 173-198. https://www.learntechlib.org/p/181294/

The researchers designed this study to investigate the programmatic needs of students enrolled in blended courses in high school. Students enrolled in a twelfth-grade blended course in a high school in the southwestern United States were surveyed. Based on participant survey results from students with disabilities and without disabilities, researchers found neutral ratings related to the

programmatic needs in course navigation, course layout, advocacy, and accessibility. However, students reported that blended courses were not a preferred means of instruction. More research is needed to determine the underlying reasons that high school students reported negative opinions about blended learning, because the negative opinions of students were not related to course navigation, course layout, advocacy, and accessibility. Areas of future research include investigating the asynchronous and synchronous student-student interactions, teacher-student interactions, student-content interactions, and areas of professional development for teachers.

Alvarado-Alcantar, R., & Keeley, R. (2020). Students with specific learning disabilities' experiences with instructional materials and programs in a blended high school history classroom: A phenomenological study of accessibility. *Journal of Online Learning Research*, *6*(3), 201-220. https://www.learntechlib.org/p/215023/

Students with specific learning disabilities (SLD) who are participating in blended learning courses are a vulnerable population due to the rapid increase in use of online learning environments at the K-12 level. As more classroom teachers begin using a blended learning framework and serving as both the teacher and course designer, it is important to ask how students with SLD in the K-12 blended learning setting experience accessibility in the instructional materials teachers use. Using a phenomenological research design, interviews were conducted with participants identified as having SLD who were also enrolled in a high school, senior level blended history course. Participants provided the researcher with insights related to taking future blended courses, accessibility of course content, and accessibility of the learning management system. Generally, the participants were working to be successful, but found the instructional materials lacking in accessibility features. Information about the perceptions of participants with SLD can be used to help teachers, and course designers, create blended courses that are perceived by participants to be informative, educational, and accessible.

Amundson, A. (2021). *Social presence theory: Creating engaging and strong online learning communities at the K-12 level*. Unpublished doctoral dissertation, Hamline University. https://digitalcommons.hamline.edu/hse_all/4529

Social presence theory is "the degree to which a person is perceived as a real person in mediated communication" (Gunawardena, 1995). Enhancing student's perception of social presence increases instructional effectiveness and learning in an online learning environment. To increase perceived social presence, teachers must use techniques and interaction skills to build an online classroom community. There is not a lot of research on social presence theory in K-12 online learning environments so the purpose of this study was to find tools and strategies that create a strong online learning environments and to find if there is a relation between social presence and academic achievement. The research questions being addressed are: How can K-12 teachers create a synchronous online environment where students have a social presence in the classroom? Did social presence in an online learning environment result in higher academic achievement? 78 teachers filled out a questionnaire in google forms measuring perceived social presence in the classroom and perceived learning. There were four open ended questions at the end where teachers answered questions about the highlights, lowlights, tools, and strategies in how the teachers created an online learning environment with a strong social presence in the classroom. It was found that there is a slight correlation between the perceived social presence

and perceived learning questions. The more a teacher agreed that there is a social presence in their classroom, the more likely they would agree that students are learning and progressing academically in online settings. Also, the more a teacher disagreed that there is social presence in their online classroom, the more likely they would disagree that students are learning nor progressing academically. The open-ended questions found many tools and strategies to create a strong learning community that teachers can use for the following years.

An, H., Mongillo, G., Sung, W. & Fuentes, D. (2022). Factors affecting online learning during the COVID-19 pandemic: The lived experiences of parents, teachers, and administrators in U.S. high-needs K-12 schools. *Journal of Online Learning Research, 8*(2), 203-234. https://www.learntechlib.org/primary/p/220404/

Employing phenomenology as a methodological framework, this study sought to capture and understand, from a first-person point of view, what teachers, administrators, and parents in high-needs U.S. K-12 schools experienced related to online learning during the COVID-19 pandemic. Individual interviews were conducted on the Zoom video conferencing platform to collect in-depth information about participants' lived experiences related to online learning necessitated by the pandemic. Findings from the thematic data analysis highlight four factors that may need to be taken into consideration when planning, designing, and implementing sustainable online learning in other high-needs schools: (a) accessibility: physical and digital; (b) usability: functional use and instructional technology; (c) wellness: physical and mental, social and emotional; and (d) support: home and school. These findings contribute to the knowledge base about K-12 online learning by sharing lived experiences and add to the literature on online education in high-needs schools in general.

An, Y., Kaplan-Rakowski, R., Yang, J., Conan, J., Kinard, W., & Daughrity, L. (2021). Examining K-12 teachers' feelings, experiences, and perspectives regarding online teaching during the early stage of the COVID-19 pandemic. *Educational Technology Research and Development, 69*, 2589-2613. https://doi.org/10.1007/s11423-021-10008-5

This mixed-methods study explored K-12 teachers' feelings, experiences, and perspectives regarding online teaching during the COVID-19 pandemic. The study also examined teachers' perspectives of the "new normal" after COVID-19 and of what should be done to better prepare teachers for future emergencies. Both quantitative and qualitative data were collected from an online survey and follow-up interviews. A total of 107 teachers from 25 different states in the United States completed the online survey, and 13 teachers from 10 different states participated in the follow-up interviews. The results revealed teachers' feelings about online teaching and various strategies and tools they used during the early stage of the COVID-19 pandemic. The major challenges faced by teachers during the pandemic included lack of student participation and engagement (or lack of parental support), students without access to technology, concerns about students' well-being, no face-to-face interactions with students, no work-life balance, and learning new technology. Four major themes emerged regarding how to better prepare teachers for future emergencies: (1) professional development for online learning, (2) technology access, (3) technology training for both teachers and students, and (4) action plans and communication. Regarding teachers' perspectives of the "new normal," five major themes emerged: (1) more

online or blended learning, (2) rethinking normal, (3) hygiene and social distancing, (4) smaller classes and different school schedules, and (5) uncertainty and concerns about the "new normal."

Baliram, N., Koetje, K., & Huff, E. (2021). Virtual learning environments and a needs assessment of K-12 teachers. *AILACTE Journal, 28*, 27-53. https://eric.ed.gov/?id=EJ1340480

During the COVID-19 emergency pivot to virtual learning environments, the researchers sought to understand mentors' and teacher candidates' experiences in K–12 schools so that they could offer improved training and support. We surveyed 60 mentor teachers' and 92 teacher candidates' perceptions of preparedness for a virtual learning environment (VLE), confidence in creating an effective VLE, obstacles involved in a VLE, and strategies for building community in an online environment. The survey was administered in November 2020. Both teacher candidates and mentor teachers were fully immersed in the virtual learning environment. In the fall, participants felt they were much more confident and equipped to handle the VLE technology than when they had been abruptly forced to transition in the spring quarter of the prior school year. However, despite the various strategies used to build community, the participants noted student engagement as the biggest challenge in a VLE.

Beasley, J. G., & Beck, D. E. (2017). Defining differentiation in cyber schools: What online teachers say. *TechTrends*, *61*(6), 550-559. https://doi.org/10.1007/s11528-017-0189-x

Online education has grown over the last ten years and with it has been an increase in diverse learners. In an effort to understand how online teachers meet the needs of diverse learners, researchers surveyed teachers in two cyber schools. 118 participants were asked their definition of differentiation and how differentiation is seen in their practice. After the survey was collected, NVivo qualitative software was used to continually reduce the data through constant comparison. The results from the survey data revealed that online teachers defined differentiation from two distinct perspectives: a) why a student needs differentiation, and b) what a student needs differentiated. Online teachers stated learning styles as their primary reason for differentiation. This result was not only different from findings in face-to-face classrooms, but does not support research on what impacts student achievement. Online teachers also cited when they differentiate, they adjust content, product, and process (63% coverage). Finally, noticeably absent from the data were references to using assessments in the classroom to inform differentiation. Future research should consider how online teachers differentiate in their learning environments and how they make day-to-day decisions as they adjust instruction to meet the needs of their learners.

Beaulieu, L. C. (2022). Synchronous virtual K-12 teachers' use of multimedia principles in electronic slide design. Unpublished doctoral dissertation, Duquesne University. https://www.proquest.com/dissertations-theses/synchronous-virtual-k-12-teachers-use-multimedia/docview/2763254686/se-2

Hundreds of thousands of K-12 children in the United States are enrolled in online K-12 virtual schools that consistently report poor academic outcomes. There is a need to assess how well instructors in a synchronous online environment present new material to learners in a way that

best aligns with how the brain manages and integrates new information into long-term memory. Online K-12 teachers use PowerPoint to design Electronic Slide Presentation (ESP) decks, which are used as their main form of instruction with their students during synchronous classes. The Cognitive Theory of Multimedia Learning (CTML) provides a set of principles which are proven to reduce extraneous cognitive processing, manage essential processing, and foster generative processing for learners. Yet many are concerned that teachers lack the skills and knowledge of best slide deck design practices required to create effective online learning environments.

This research examines online K-12 teachers' perceptions and practices related to designing ESP slides that mitigate extraneous cognitive load. This study establishes a base of knowledge previously unknown about online teacher practices to determine if there is a need for teacher education or professional development materials specific to improving synchronous K-12 virtual classroom learning outcomes in the context of ESP design.

The purpose of the study was to investigate to what extent virtual K-12 teachers design their lesson slides to reduce cognitive overload for their students. A questionnaire was used to measure perceptions and practices of teachers at a large K-12 academy encompassing three schools in the Midwest state of Ohio. A rubric was then used to evaluate sample ESP decks submitted by teachers to assess adherence to the CTML principles known to reduce extraneous cognitive load. Collected demographic information was analyzed with frequencies, means, and standard deviations. Group differences were examined using t-tests and Analyses of Variance (ANOVA) tests. Associations among variables were examined with correlation and multiple linear regression tests. Results of this research might be used to support teacher education and development programs.

Bhuyan, J., Wu, F., Thomas, C., Koong, K., Hur, J. W., & Wang, C. H. (2020). Aerial drone: An effective tool to teach information technology and cybersecurity through project based learning to minority high school students in the US. *TechTrends*, *64*, 899-910. https://doi.org/10.1007/s11528-020-00502-7

This paper describes the design, implementation, and results of an NSF funded Summer Academy from 2016 to 2018, which engaged, on an annual basis, 30 to 60 rising 10th and 11th grade high school science students in an innovative, technology-enriched Project Based Learning (PBL) environment. This Academy emphasized how tech gadgets work and the impact that technology can have on improving communities by immersing students in the exploration of one such device that is a growing phenomenon, the “aerial drone.” In this Academy, the students learned various operations of the drone through Python programming language, and some cybersecurity issues and solutions. The student teams, under the guidance of diverse mentors, comprehensively fortified their STEM problem-solving skills and critical thinking. Both formative and summative evaluations for this Academy showed that it helped students improve their critical thinking ability and motivated them to pursue careers in STEM-related disciplines, specifically in information technology and cybersecurity areas.

Black, E. W., Ferdig, R. E., Fleetwood, A., & Thompson, L. A. (2022). Hospital homebound students and K-12 online schooling. *PLoS ONE, 17*(3), e0264841. https://doi.org/10.1371/journal.pone.0264841

The flexibility afforded by online education may provide opportunities for learners with disability who require absence from traditional learning environments. This study sought to describe how a subset of learners with disability, those with hospital-homebound designation, perform in K-12 online classes, particularly as compared to non-hospital homebound counterparts. A cross-sectional analysis was performed of all Florida Virtual School course enrollments from August 1, 2012 to July 31, 2018. Researchers analyzed 2,534 course enrollments associated with K-12 students who, at the time of their course enrollment, had hospital-homebound designation, and a comparison group of 5,470,591 enrollments from K-12 students without hospital-homebound status. Data analysis showed three important outcomes. First, hospital-homebound designated student academic performance was equivalent to their non-hospital homebound counterparts. Second, however, hospital-homebound course enrollments were 26% more likely to result in a withdrawal prior to grade generation. Third, these withdrawals were potentially mitigated when H/H designated students were enrolled in five or more classes or in classes with five or more students. The results of this study provided evidence that when they can remain enrolled, hospital-homebound learners experience equivalent academic outcomes in online learning environments. These findings suggest that healthcare professionals should be made aware of the potentially equivalent outcomes for their patients. Moreover, virtual schools should seek to identify and create supports for these students.

Boninger, F., Molnar, A., & Saldaña, C. (2020). *Big claims, little evidence, lots of money: The reality behind the Summit Learning program and the push to adopt digital personalized learning programs*. National Education Policy Center. https://eric.ed.gov/?id=ED607124

Virtual learning and personalized learning have been at the forefront of education reform discussions for over a decade. Backed by almost $200 million philanthropic dollars from the Chan-Zuckerberg Initiative, the Gates Foundation, and others, Summit Public Schools has aggressively marketed its Summit Learning Platform to schools across the United States since 2015. As a result, the Summit Learning Program is now one of the most prominent digital personalized learning programs in the United States. Its rapid spread--despite a lack of transparency and the absence of convincing evidence that it can deliver on its promises--provides a powerful example of how policymakers are challenged when faced with a well-financed and self-interested push for schools to adopt digital personalized learning programs. There is now an urgent need for policymakers to move quickly to protect the public interest by establishing oversight and accountability mechanisms related to digital platforms and personalized learning programs. [Seven appendixes as well as the authors' reply to T.L.P. Education's blog response to this research brief are available on the publisher's website.]

Boninger, F., Molnar, A., & Saldaña, C. M. (2019). *Personalized learning and the digital privatization of curriculum and teaching*. National Education Policy Center. https://eric.ed.gov/?id=ED595239

Personalized learning programs are proliferating in schools across the United States, fueled by philanthropic dollars, tech industry lobbying, marketing by third-party vendors, and a policy environment that provides little guidance and few constraints. In this research brief, authors Faith Boninger, Alex Molnar, and Christopher M. Saldaña consider how we got to this point. Beginning with an examination of the history of personalized learning and the key assumptions made by its proponents, they review the research evidence and reflect on the roles and possible impacts of the digital technologies deployed by many programs. Despite many red flags, the pressure to adopt personalized learning continues to mount. The authors thus recommend that schools and policymakers pause in their efforts to promote and implement personalized learning until rigorous review, oversight, and enforcement mechanisms are established.

Bowen, D., Jaurez, J., Jones, N., Reid, W., & Simpson, C. (2022). Cybersecurity educational resources for K-12. *Journal of Cybersecurity Education, Research and Practice*, *2022*(1). https://files.eric.ed.gov/fulltext/EJ1360325.pdf

There are many resources to guide successful K-12 cybersecurity education. The objective of these resources is to prepare skilled and ethical cybersecurity students at the earliest level to meet the demands of higher-level programs. The goal of this article is to provide, as a starting point, a list of as many currently popular K-12 educational resources as possible. The resources provided are broken into five categories: 1) Career Information, 2) Curriculum, 3) Competitions, 4) CyberCamps, and 5) Labs and Gaming. Each resource listed has a link, the K-12 levels that are supported, whether the resource is free or has a cost, and a shortlist of topics or, for camps and competitions, the dates available. There are many teaching and learning resources for K-12 students. However, there are very few sources that combine a variety of these resources into one document. Even though this is not an exhaustive list of resources, it should be a helpful starting point as to what is available for the K-12 levels.

Catalano, A. J., Torff, B., & Anderson, K. S. (2021). Transitioning to online learning during the COVID-19 pandemic: Differences in access and participation among students in disadvantaged school districts. *The International Journal of Information and Learning Technology*, *38*(2), 258-270. https://www.emerald.com/insight/content/doi/10.1108/IJILT-06-2020-0111/full/html

Purpose – The novel coronavirus, COVID-19, which emerged in 2019 and quickly spread to the United States, resulted in widespread closure of PreK-12 schools and universities and a rapid transition to online learning. There are concerns about how students in high-needs school districts will engage with online learning, given the limited access many disadvantaged students have to Internet and computers. Accordingly, the purpose of this study is to determine teacher perceptions of students' access and participation to online learning, as well as concerns about educational outcomes among different groups of learners.

Design/methodology/approach – The authors surveyed 300 K-12 teachers in NY state about the tools and accommodations they employed in their online teaching, whether their students were participating in the online learning and the reasons for their lack of participation.

Findings – Respondents reported that nearly 30% of all of their students were not regularly completing their assignments. Students in high-needs districts were significantly more likely to not complete their work. Teachers reported being very concerned about their students' educational outcomes, particularly students with disabilities (SWDs) and English language learners (ELLs). Respondents also provided suggestions for improving educational access to online learning in the future.

Originality/value – No published research has yet examined student compliance in online learning during an emergency and, in particular, during this unprecedented time of the COVID-19 pandemic and months-long stay-at-home orders.

Chen, C. M., & Wang, J. Y. (2018). Effects of online synchronous instruction with an attention monitoring and alarm mechanism on sustained attention and learning performance. *Interactive Learning Environments, 26*(4), 427-443. https://doi.org/10.1080/10494820.2017.1341938

Many studies have shown that learners' sustained attention strongly affects e-learning performance, particularly during online synchronous instruction. This work thus develops a novel attention monitoring and alarm mechanism (AMAM) based on brainwave signals to improve learning performance via monitoring the attention state of individual learners and helping online instructors or teaching assistants to improve the sustained attention levels of learners with low-attention states as they perform online synchronous instruction activities. Totally, 83 and 65 Grade 7 students were randomly assigned to the experimental and control groups that respectively underwent online synchronous instruction with and without AMAM support. Analytical results reveal that the experimental group of learners exhibited significantly better learning performance and sustained attention than those in the control group, verifying that the AMAM efficiently promotes the learning performance and sustained attention of learners. Moreover, the proposed AMAM was more helpful in improving the learning performance of female learners than those of male learners and improved the sustained attention of both male and female learners. Furthermore, the sustained attention, frequency of attention alarms, and learning performance of the learners in the experimental group were strongly correlated, and the sustained attention and frequency of attention alarms strongly predicted learning performance.

Choi, J., Walters, A., & Hoge, P. (2017). Self-reflection and math performance in an online learning environment. *Online Learning Journal, 21*(4), 79-102. https://doi.org/10.24059/olj.v21i4.1249

According to recent reports, K-12 full-time virtual school students have shown lower performance in math than their counterparts in brick-and-mortar schools. However, research is lacking in what kind of programmatic interventions virtual schools might be particularly well-suited to provide to improve math performance. Engaging students in self-reflection is a potentially promising pedagogical approach for supporting math learning. Nonetheless, it is

unclear how models for math learning in brick and mortar classrooms translate in an online learning environment. The purpose of this study was to (a) analyze assessment data from virtual schools to explore the association between self-reflection and math performance, (b) compare the patterns found in student self-reflection across elementary, middle, and high school levels, and (c) examine whether providing opportunities for self-reflection had positive impact on math performance in an online learning environment.

In this study, the self-reflection assessments were developed and administered multiple times within several math courses during the 2014-15 school year. These assessments included 4-7 questions that asked students to reflect on their understanding of the knowledge and skills they learned in the preceding lessons and units. Using these assessments, multiple constructs and indicators were measured, which included confidence about the topic knowledge/understanding, general feelings towards math, accuracy of self-judgment against actual test performance, and frequency of self-reflection. Through a series of three retrospective studies, data were collected from full-time virtual school students who took three math courses (one elementary, one middle, and one high school math course) in eight virtual schools in the United States during the 2013-14 and 2014-15 school years. The results showed that (a) participation in self-reflection varied by grade, unit test performance level, and course/topic difficulty; (b) more frequent participation in self-reflection and higher self-confidence level were associated with higher final course performance; and (c) self-reflection, as was implemented here, showed limited impact for more difficult topics, higher grade courses, and higher performing students. Implications for future research are provided.

Chiu, T. K. (2023). Student engagement in K-12 online learning amid COVID-19: A qualitative approach from a self-determination theory perspective. *Interactive Learning Environments, 31*(6), 3326-3339. https://doi.org/10.1080/10494820.2021.1926289

During the pandemic, school and university students had to urgently move away from traditional classrooms to online learning in their homes. Student engagement that can be explained by self determination theory (SDT) is important in online learning. Indeed, the founders of SDT recently stated that SDT-based future research should look closely at how to satisfy the basic needs in the theory in technology enhanced learning environments. We also know very little about K-12 student engagement in online learning. Therefore, this qualitative study used the SDT as a framework to understand K-12 school student engagement and disengagement in online learning. It used a thematic analysis to analyse interview data from 36 students and 18 teachers. The findings highlight that (i) online learning environments that supported more autonomy were more likely to engage students cognitively in developing two important lifelong skills of digital literacy and self-regulated learning; and (ii) those environments that lacked emotional attachment, equipment and resources, coupled with perceived digital incompetence and ineffective learning experience of the students suppressed cognitive and emotional engagement. Hence, this study suggests how to satisfy the need for competence and relatedness to prepare and implement online learning.

Cooper, C. M., Przeworski, A., Smith, A. C., Obeid, R., & Short, E. J. (2023). Perceptions of social-emotional learning among K-12 teachers in the USA during the COVID-19 pandemic. *School Mental Health*, *15*(2), 484-497. https://link.springer.com/article/10.1007/s12310-022-09563-w

Social–emotional learning (SEL) is the process of acquiring and applying knowledge, skills, and attitudes to achieve long-term relational and emotional goals. Teachers often implement SEL strategies in the classroom; however, shifting to online schooling during the COVID-19 pandemic may have impacted teachers' perceptions of their abilities to implement SEL. This study was designed to identify whether and how teachers' perceptions of SEL changed since the onset of the COVID-19 pandemic. Teachers ($N = 637$) in the USA completed a demographic questionnaire, the Depression, Anxiety, and Stress Scale (DASS-21), and rated their beliefs about SEL during the pandemic on a modified version of the Comfort and Culture subscales of the Teacher SEL Beliefs Scale. Data were collected between September 2020 and March 2021. Teachers indicated that they felt neutral to comfortable with SEL and that they felt neutral to supported by their school culture for SEL during the pandemic. Lower depression symptoms, greater school poverty, and perceived general support (not specific to SEL) from the administration were associated with higher teacher comfort with SEL. Further, greater general support from the district and colleagues was associated with greater school culture supporting SEL during COVID-19. Results suggest that addressing teachers' internalizing symptoms and fostering a supportive work environment is important in aiding teachers in SEL implementation.

Crouse, T., & Rice, M. (2018). Learning to serve students with disabilities online: Teachers' perspectives. *Journal of Online Learning Research*, *4*(2), 123-145. https://www.learntechlib.org/p/182859/

As K-12 online learning continues to grow for all student populations, so should knowledge of best practices related to teaching with diverse learning needs, including students with disabilities. The absence of a strong literature base provides a unique opportunity to explore issues of identity and agency of teachers in these settings, particularly as they consider their role in the call for highly skilled, high-quality instruction for all students, regardless of disability status. This study explored descriptions of practice from fully online teachers in their instruction of students with disabilities. Data were collected using semi-structured interviews of online teachers across a variety of grade levels. Analysis involved both thematic and theoretical elements to identify concepts for interpretation. Findings were divided into two major concepts: 1) online teachers' learned practices about working with students with disabilities, and 2) teachers' sources of knowledge about "good" teaching practices when working with students with disabilities.

Daftary, A. M. H. (2022). Remotely successful: Telehealth interventions in K-12 schools during a global pandemic. *Clinical Social Work Journal*, *50*(1), 93-101. https://link.springer.com/article/10.1007/s10615-021-00818-8

The K-12 school setting is often considered an ideal environment to provide social emotional programming for children and youths. However, the COVID-19 pandemic caused most K-12 schools to close their physical doors and shift to telehealth approaches to fulfill students' academic and non-academic needs. For the first time, school social workers (SSWs), often

responsible for the social emotional well-being of students, were required to provide social emotional services virtually. Subsequently, this research study explored SSWs' experiences implementing social emotional telehealth services in K-12 public schools during the spring semester of 2020. Twenty SSWs from nine school districts across three states participated in key informant interviews related to their experiences navigating their professional role during distance learning. Data were analyzed using a constant comparative approach. The findings highlight the barriers SSWs encountered when providing social emotional telehealth interventions, including poor attendance resulting in ineffective group interventions, technology-specific barriers, and concerns for students' privacy. Opportunities and potential solutions to strengthen telehealth in schools are discussed.

Douglas, S., Slusser, E., & Felton, M. (2023). Academic discourse and peer collaboration in online high school learning environments. *Journal of Computer Assisted Learning, 39*(5), 1479-1492. https://doi.org/10.1111/jcal.12809

Background - Dialogic engagement is instrumental in promoting higher-order thinking, motivation, and learning. Despite their dramatic uptake in the US in the past decade, there is limited evidence that online high school courses offer sufficient opportunities for students to communicate and collaborate with teachers and peers.

Objectives - This two-part study explores teacher perspectives and the experiences of students in online learning environments to determine if, how, and why students engage in two forms of dialogic engagement–academic discourse and peer collaboration.

Methods - To identify the extent to which teachers perceive academic discourse and peer collaboration to be valuable and feasible in online learning environments, Study 1 surveyed educators and advisors of online learning programs (n = 49). To determine whether these perspectives align with student experiences, Study 2 included a series of over-the-shoulder observations of five high school students engaging in their online coursework.

Results and Conclusions - Findings reveal a disconnect between best practices in education and reality. Online teachers report that academic discourse is valuable and feasible, but also detail several challenges to successful implementation in online coursework. At the same time, direct observations of high school students indicate that they rarely, if ever, engage in peer collaboration and academic discourse activities.

Major Takeaways - Although valued as a means to improve educational outcomes, opportunities for dialogic engagement are not translating to online learning environments. The solution is to develop curriculum, policies, and procedures that centre on meaningful integration of dialogic activities, motivating students to engage.

ElSayary, A., Mohebi, L., & Meda, L. (2022). The impact of the relationship of social/emotional, cognitive, and behavioral engagements on developing preservice teachers' digital competencies. *Journal of Information Technology Education: Research, 21*, 269-295. https://doi.org/10.28945/4982

Aim/Purpose - This study investigates the impact of the relationship between social/emotional, cognitive, and behavioral engagements on developing preservice teachers' digital competencies. The social/emotional engagement can be illustrated with actions associated with learning, such as excitement, interest, and motivation. Cognitive engagement is the active process of learning and is the most essential form of learning. Finally, behavioral engagement is the physical behavior associated with doing the work and following the rules.

Background - Teachers' digital competencies are essential in creating an active e-learning environment that ensures students' engagements and reduces learners' sense of isolation. Due to the lockdown of COVID-19 in March 2020, schools and universities shifted toward e-learning, where higher education in the United Arab Emirates (UAE) experienced a digital transformation. Many questions have been raised about life after COVID-19, competencies needed for the new demands of jobs that do not yet exist, social/emotional development of students, and their engagements in online classes.

Methodology - An explanatory sequential mixed-method approach was utilized, using a quantitative data method followed by a qualitative data method. An online survey was used to collect the quantitative data from participants. The convenient research population is female preservice teachers who are considered learners enrolled in semesters 3-8 and learning online. Focus group discussions were used to collect the qualitative data from selected participants.

Contribution - The findings of the study contribute toward a deeper understanding of the relationship between social/emotional, cognitive, and behavioral engagements and their positive impact on developing learners' digital competencies. The results can be leveraged during or after the pandemic to design strategies and pedagogies that enhance learners' engagements and develop their digital competencies based on the conceptual framework of the study.

Findings - The study's results reveal a significant positive correlation between social/emotional, cognitive, and behavioral engagements that lead to the development of preservice teachers' digital competency. The relationship between social/emotional and cognitive engagements is stronger than between cognitive and behavioral engagements, while the relationship between social/emotional and behavioral engagements is balanced.

Recommendations for Practitioners - Instructors need to consider students' well-being and avoid the sense of isolation among students through designing strategies and pedagogies using the framework of the study that enhance learners' engagements. More focus is needed on training instructors and educators in using different interactive applications that enhance learners' and educators' digital competency.

Recommendations for Researchers - The findings provide theoretical evidence of the impact of the relationship between social/emotional, cognitive, and behavioral engagements on developing

learners' digital competencies. However, this study was conducted in an early childhood education program in higher education where all the participants were females. It is highly recommended that future research repeats the study with male and female participants, as well as implement the study with different age groups from k-12 students.

Impact on Society - This research highlights the importance of considering the social/emotional, cognitive, and behavioral engagements in developing learners' digital competencies. It is interestingly important to reinforce the teaching, cognitive and social presence among all instructors and teachers due to the positive impact on students' online learning.

Future Research - Future research on measuring the impact of transforming students' design thinking mindset after using interactive technology is recommended. In addition, it is highly recommended to consider measuring how the students' learning is influenced by the teaching presence of their instructors. Also, it is recommended that future research considers measuring the instructors' digital competencies and their impact on planning instructional activities.

Fees, R. E., Da Rosa, J. A., Durkin, S. S., Murray, M. M., & Moran, A. L. (2018). Unplugged cybersecurity: An approach for bringing computer science into the classroom. *International Journal of Computer Science Education in Schools*, *2*(1), 3-13. https://doi.org/10.21585/ijcses.v2i1.21

The United States Naval Academy (USNA) STEM Center for Education and Outreach addresses an urgent Navy and national need for more young people to pursue careers in STEM fields through world-wide outreach to 17,000 students and 900 teachers per year. To achieve this mission, the STEM Center has developed a hands-on and inquiry-based methodology to be used with K-12 educators at professional development workshops and with students through camps, festivals and fairs, and STEM days. According to recent data, math and computer science (CS) are the fastest growing fields among STEM careers (US Bureau of Labor Statistics, 2016). The Computer Science for All initiative (2016) urges communities to bring more computer science education into the classroom to meet the rapidly rising need for more CS graduates. As a result, the USNA STEM Center has developed a number of unplugged (without a computer) cybersecurity modules to promote engagement and increase awareness. Topic areas include encryption, networking and social media, viruses and malware, programming, hardware components, authentication and authorization, and hacking. This article describes the methodology for developing unplugged computer science activities and adapting computer science undergraduate curriculum for K-12 educators and students as an introduction to complex computer science topics.

Frazier, D. K., & Tolbert, J. B. (2023). Long-term educator professional development in online instruction and assessment during pandemic teaching. *The Teacher Educator, 58*(1), 91-108. https://doi.org/10.1080/08878730.2022.2145402

Educators were forced into emergency remote teaching due to COVID-19. Educational grants through the Governor's Emergency Education Relief (GEER) fund provided assistance. A regional university partnered with a local educational service center to use GEER funds to prioritize P-12 teacher professional development in online instruction. The partnership revamped

a 12-credit hour four-course graduate certificate program in online learning and assessment, cotaught by university faculty and K-12 community partners, enrolling 58 local educators across 42 school districts in free graduate courses during the 2020-2021 academic year. With a 95% completion rate, this long-term professional development met educators' needs, including how to simultaneously teach face-to-face and at-home students in changing school environments. This descriptive study gathered educator perceptions regarding how the courses impacted their ability to learn and use best practices in technology integration with their students, and support colleagues as they created district-specific professional development and developed into technology leaders.

Greer, B. J. (2020). *The effect of purposeful targeted synchronous instruction on high-stakes test scores in a K-12 online setting: A quantitative pretest-posttest design*. Unpublished doctoral dissertation, Northcentral University. https://www.proquest.com/dissertations-theses/effect-purposeful-targeted-synchronous/docview/2418082132/se-2

High stakes tests show that full-time online K-12 students are learning less on average than students in traditional brick-and-mortar public school settings (Carpenter, Kafer, Reeser, & Shafer, 2015; Gulosino & Miron, 2017). This study queried if providing nonproficient online K-12 students with additional instructional minutes in targeted small group instructional general education core curriculum sessions and small group Response to Intervention sessions would statistically significantly increase Smarter Balanced Assessment Consortium high-stakes test scores. Students who participated in targeted small group instructional general education core curriculum sessions and small group Response to Intervention sessions showed inconsistent results in increasing Smarter Balanced Assessment Consortium high-stakes test scores in math and English language arts, as has been shown in brick-and-mortar settings (Mandel, Süssmuth, & Sunder, 2018; Zohar & Alboher Agmon, 2018). Using archived data for a California online K-12 charter school, high-stakes test scores for the 2017-18 school year and the 2018-19 school year were reviewed (dependent variable), and attendance minutes in targeted small group instructional general education core curriculum sessions and small group Response to Intervention sessions were identified and incremented in groups labeled zero, low, medium, and high attendance by grade, subject, and topic (independent variable). While no math topics scored statistically significantly better in the 2018-19 school year than the 2017-18 school year with the addition of targeted small group instructional general education core curriculum sessions and small group Response to Intervention sessions except for the fourth-grade, English language arts scored statistically significantly higher in nearly all areas, with the exception of the eighth-grade. Further research is needed to review data over an extended period; collect multiple types of assessment data and add high school data to better determine student progress without the artificial testing environment of high-stakes testing; gather learning management system data to identify student engagement and self-regulatory abilities and triangulate with the effect of small group synchronous instructional minutes effects, and review high-stakes testing environments to determine if school policies can be changed to make students less anxious in an unfamiliar testing environment.

Gresse Von Wangenheim, C., Alves, N. D. C., Rauber, M. F., Hauck, J. C., & Yeter, I. H. (2022). A proposal for performance-based assessment of the learning of machine learning concepts and practices in K-12. *Informatics in Education*, *21*(3), 479-500. https://doi.org/10.15388/infedu.2022.18

Although Machine Learning (ML) is used already in our daily lives, few are familiar with the technology. This poses new challenges for students to understand ML, its potential, and limitations as well as to empower them to become creators of intelligent solutions. To effectively guide the learning of ML, this article proposes a scoring rubric for the performance-based assessment of the learning of concepts and practices regarding image classification with artificial neural networks in K-12. The assessment is based on the examination of student-created artifacts as a part of open-ended applications on the use stage of the Use-Modify-Create cycle. An initial evaluation of the scoring rubric through an expert panel demonstrates its internal consistency as well as its correctness and relevance. Providing a first step for the assessment of concepts on image recognition, the results may support the progress of learning ML by providing feedback to students and teachers.

Harris, L., Dargusch, J., Ames, K., & Bloomfield, C. (2022). Catering for 'very different kids': distance education teachers' understandings of and strategies for student engagement. *International Journal of Inclusive Education, 26*(8), 848-864. https://doi.org/10.1080/13603116.2020.1735543

Compulsory distance education has always sought to be inclusive, providing educational opportunities for K-12 students unable to attend mainstream, face-to-face schools for medical, geographical, or personal reasons. However, how to effectively engage these diverse learners has remained a perpetual challenge, with a need for further investigation into the nature of student engagement with compulsory school distance contexts and how teachers can best support it. This qualitative study used focus groups (n = 2 groups, n = 16 participants) to examine teacher definitions and student engagement strategies within eKindy-12 distance education in Queensland, Australia. Categorical analysis was conducted using a priori codes for definitions, focusing on four previously established engagement types (i.e. behavioural, emotional, cognitive, and agentic engagement), and in vivo codes for strategies. Teacher definitions focused strongly on behavioural engagement, but most also contained elements of emotional and cognitive engagement; agentic engagement was only occasionally evidenced via practice descriptions. Teachers described engaging students by: building relationships, creating a safe classroom environment through differentiation, using inclusive technological tools to facilitate interaction and monitor progress, making learning fun and relevant, drawing on school-wide pedagogical frameworks and teaching strategies, and encourage self-regulation. Findings suggest distance education teachers face unique challenges around evidencing engagement and supporting student agency.

Holstein, K., McLaren, B. M., & Aleven, V. (2019). Co-designing a real-time classroom orchestration tool to support teacher-AI complementarity. *Journal of Learning Analytics, 6*(2), 27-52. https://doi.org/10.18608/jla.2019.62.3

Involving stakeholders throughout the creation of new educational technologies can help ensure their usefulness and usability in real-world contexts. However, given the complexity of learning analytics (LA) systems, it can be challenging to meaningfully involve non-technical stakeholders throughout their design and development. This article reports on the iterative co-design, development, and classroom evaluation of Lumilo, a wearable, real-time awareness tool for teachers working in AI-enhanced K-12 classrooms. In the process, we argue that the co-design of LA systems requires "new kinds of prototyping methods." We introduce one of our own prototyping methods, REs, to address unique challenges of co-prototyping LA tools. This work presents the first end-to-end demonstration of how non-technical stakeholders can participate throughout the whole design process for a complex LA system – from early generative phases to the selection and tuning of analytics to evaluation in real-world contexts. We conclude by providing methodological recommendations for future LA co-design efforts.

Howley, D. (2022). Experiences of teaching and learning in K-12 physical education during COVID-19: An international comparative case study. *Physical Education and Sport Pedagogy, 27*(6), 608-625. https://doi.org/10.1080/17408989.2021.1922658

Background: The COVID-19 pandemic has led to widespread adaptations and unprecedented realities in the way teaching and learning in physical education (PE) is currently being implemented and experienced globally. Understanding the similarities and differing realities of some of these experiences across contexts and countries can help to inform formal responses going forward to further enhance teaching, learning, and professional development during and beyond this period of time.

Purpose: The purpose of this study was to explore teachers' experiences of teaching and learning in K-12 PE settings during COVID-19 across countries. Three research questions guided the study: (1) What realities has the event of COVID-19 brought for teaching and learning for these K-12 PE teachers?, (2) In what ways have these teachers similarly responded to and addressed these realities in their local practice?, and (3) What support mechanisms have these teachers experienced and what additional support do they feel is required?

Research design: This qualitative study utilized an international comparative case study design; 10K-12 PE teachers working in a variety of public, private, and alternative education settings in eight countries (Australia, Brazil, China, Ireland, Mexico, New Zealand, South Korea, and the USA) agreed to participate using photovoice and interviews. The Miles and Huberman Framework for Qualitative Data Analysis (1994) was implemented, involving a three/four-step process including data reduction, data display and drawing and verifying conclusions before presenting findings thematically.

Findings/discussion: The following thematic findings were constructed from data analysis: figuring out (in)flexibility; personal connection; social and emotional support; looking forward; and unearthing inequity. The initial impact of COVID-19 led to these teachers across countries

collectively transitioning to online remote learning as the standard operating procedure for teaching and learning. The possibility for uniform experiences to occur across contexts was hindered by issues around inequity. Many of the realities and inequities spoken about previously existed such as issues around flexibility in implementing curricula and assessment; narrow and traditional pedagogical approaches to teaching and learning in PE emphasizing physical activity and exercise; establishing a personal connection; a lack of social and emotional support for students; and equitable access. Additionally, the need to provide continued professional development for teachers on how to utilize remote online blended learning and technology is apparent.

Conclusion: This study demonstrates how traditional and conventional approaches to teaching and learning in PE fell short while others were adopted, adapted, and enhanced. Further opportunities for teachers to reflect on their experiences of teaching and learning during this time are needed in order to better understand how this period has impacted PE classrooms and what this means for the subject going forward.

Hrastinski, S., Stenbom, S., Benjaminsson, S., & Jansson, M. (2021). Identifying and exploring the effects of different types of tutor questions in individual online synchronous tutoring in mathematics. *Interactive Learning Environments, 29*(3), 510-522. https://doi.org/10.1080/10494820.2019.1583674

Although we know that asking questions is an essential aspect of online tutoring, there is limited research on this topic. The aim of this paper was to identify commonly used direct question types and explore the effects of using these question types on conversation intensity, approach to tutoring, perceived satisfaction and perceived learning. The research setting was individual online synchronous tutoring in mathematics. The empirical data was based on 13,317 logged conversations and a questionnaire. The tutors used a mix of open, more student-centred questions, and closed, more teacher-centred questions. In contrast to previous research, this study provides a more positive account indicating that it is indeed possible to train tutors to focus on asking questions, rather than delivering content. Frequent use of many of the question types contributed to increased conversation intensity. However, there were few question types that were associated with statistically significant effects on perceived satisfaction or learning. There are no silver bullet question types that by themselves led to positive effects on perceived satisfaction and learning. The question types could be used by teachers and teacher students when reflecting on what types of questions they are asking, and what kind of questions they could be asking.

Hu, Y., Wu, B., & Gu, X. (2017). Learning analysis of K-12 students' online problem solving: A three-stage assessment approach. *Interactive Learning Environments, 25*(2), 262-279. https://doi.org/10.1080/10494820.2016.1276080

Problem solving is considered a fundamental human skill. However, largescale assessment of problem solving in K-12 education remains a challenging task. Researchers have argued for the development of an enhanced assessment approach through joint effort from multiple disciplines. In this study, a three-stage approach based on an evidence centered design framework is proposed to analyze problem-solving behavior, abilities, and performance. The approach is

applied to assess the online problem solving of 554 students in a Shanghai primary school. The study reveals four clusters with distinctive problem-solving behavior, abilities, and performance. The findings of this approach also corroborate the results of the Programme for International Student Assessment of Shanghai students' problem-solving performance. The implications and limitations of this study are also discussed.

Jimoyiannis, A., Koukis, N., & Tsiotakis, P. (2021). Shifting to emergency remote teaching due to the COVID-19 pandemic: An investigation of Greek teachers' beliefs and experiences. In *Technology and Innovation in Learning, Teaching and Education: Second International Conference, TECH-EDU 2020, Vila Real, Portugal, December 2–4, 2020, Proceedings 2* (pp. 320-329). Springer International Publishing. https://doi.org/10.1007/978-3-030-73988-1_25

During schools' closure, due to the pandemic of COVID-19, teachers around the globe were forced to transfer their instruction on-line. They were facing a range of barriers and difficulties to plan and provide online remote teaching to their students. This paper reports on a study exploring Greek primary and secondary education teachers' views about emergency remote teaching and e-learning. The survey conducted in May 2020, just after schools' reopening in Greece. A total of 694 K-12 teachers responded to an online questionnaire. The preliminary findings of data analysis showed that the majority of the participants perceived the pandemic as a turning point with regards to the role of digital technologies and e-learning in the schools. On the other hand, we identified teachers' needs for professional development and support, in terms of learning design abilities necessary to integrate synchronous and asynchronous learning in both, online and physical, classrooms.

Jones, K. D., & Figueiredo-Brown, R. (2018). Finding the customers: Challenges and experiences marketing K-12 full-time virtual schools. *American Journal of Distance Education*, *32*(2), 96-112. https://doi.org/10.1080/08923647.2018.1440463

Full-time virtual schooling is a growing alternative to traditional schools, although it is an option still unknown to many students. The ability to inform students through marketing is thus foundational to the success of virtual schools. Using a qualitative case study methodology, this article examines marketing patterns for nonprofit virtual schools, including how students find out about virtual schools; the ways in which school leaders market their schools; and changes reported in schools' marketing and recruitment needs and strategies. This analysis suggests that students find out about virtual schools in many ways, including being referred, rejected, and urged by their local schools. Implications include issues around socioeconomic equity, especially in terms of school access, funding, and educational quality.

Katz, D., Huggins-Manley, & Leite, W. (2022). Personalized online learning, Test fairness, and educational measurement: Considering differential content exposure prior to a high stakes end of course exam. *Applied Measurement in Education* 35(1), 1-16. https://doi.org/10.1080/08957347.2022.2034824

According to the Standards for Educational and Psychological Testing (2014), one aspect of test fairness concerns examinees having comparable opportunities to learn prior to taking tests.

Meanwhile, many researchers are developing platforms enhanced by artificial intelligence (AI) that can personalize curriculum to individual student needs. This leads to a larger overarching question: When personalized learning leads to students having differential exposure to curriculum throughout the K-12 school year, how might this affect test fairness with respect to summative, end-of-year high stakes tests? As a first step, we traced the differences in content exposure associated with personalized learning and more traditional learning paths. To better understand the implications of differences in content coverage, we conducted a simulation study to evaluate the degree to which curriculum exposure varied across students in a particular AI-enhanced learning platform for Algebra instruction with high-school students. Results indicate that AI-enhanced personalized learning may pose threats to test fairness as opportunity-to-learn on K-12 summative high-stakes tests. We discuss the implications given different perspectives of the role of testing in education.

Khazanchi, D., Bernsteiner, R., Dilger, T., Groth, A., Mirski, P. J., Ploder, C., ... & Spieß, T. (2022). Strategies and best practices for effective eLearning: Lessons from theory and experience. *Journal of Information Technology Case and Application Research, 24*(3), 153-165. https://doi.org/10.1080/15228053.2022.2118992

No author abstract.

Ko, E. G., Joo, S. H., Lim, K. Y., Resta, P. E., & Jang, E. K. (2022). How Korean K-12 educators adapted to online teaching and promoted digital equity during COVID-19: A mixed-method study on practices and perceptions. *Journal of Education and Training Studies, 10*(1), 59-80. https://doi.org/10.11114/jets.v10i1.5422

The abrupt transitions to online teaching during COVID-19 have exacerbated educational discrepancies worldwide. South Korean schools faced similar challenges primarily due to the insufficient infrastructure and pedagogical guidelines for online teaching. This mixed-method case study investigated how Korean K-12 teachers and administrators converted to online teaching and addressed related digital equity issues during their first semester of online teaching in response to the pandemic. Interviews, as well as survey responses at the beginning and end of the semester, were analyzed through Activity Theory (AT) and Technological Pedagogical Content Knowledge (TPACK) frameworks. The study's key insights were that the digital equity issue is related to quality teaching issues beyond infrastructural problems and that teachers took various strategies to maximize the effectiveness of their blended teaching. We aim to shed light on supporting equitable online learning and sustaining positive changes in the post-COVID era.

Kurt, G., Atay, D., & Öztürk, H. A. (2022). Student engagement in K12 online education during the pandemic: The case of Turkey. *Journal of Research on Technology in Education, 54*(sup1), S31-S47. https://doi.org/10.1080/15391523.2021.1920518

Student engagement has become a challenge for K-12 students and teachers in online education during the COVID-19 pandemic. This study explored the factors underlying student engagement and the strategies teachers developed to engage students. Thematically analyzed interview data coming from 22 teachers and 20 students of public high schools revealed teachers' and students' similar perceptions of the factors affecting student engagement. The four themes identified were

instructional and student related factors along with those related to the learning environment and policies. The teacher strategies for the facilitation of student engagement were instructional, managerial, and affective. Teachers also discussed which of these strategies were helpful in fostering student engagement.

Ladendorf, K., Muehsler, H., Xie, Y., & Hinderliter, H. (2021). Teacher perspectives of self-efficacy and remote learning due to the emergency school closings of 2020. *Educational Media International, 58*(2), 124-144. https://doi.org/10.1080/09523987.2021.1930481

The K-12 Spring 2020 COVID-19 school closures saw teachers move into an online learning environment, and use their knowledge of technology, pedagogy, and content (TPACK) to develop online learning for the remainder of the school year. The purpose of this study was to examine the relationship between teachers' self-efficacy as measured by TPACK and their perceived success and satisfaction for delivering online learning during the emergency COVID-19 school closures. A web-based survey was conducted of in-service K-12 teachers instructing remotely. While teachers felt competent in technology integration and felt successful with the remote instruction in Spring 2020, teachers were not always satisfied with their online experience. Furthermore, content area proved to be a factor in predicting both success and satisfaction with online instruction. Teachers with a stronger understanding of their content area and instructional strategies related to the content did not feel their students were successful nor did they feel satisfied with their work online. Results from this study suggests additional support is needed for teachers to bring their teaching to an online platform. School districts should invest in the support and resources needed to provide teachers with professional development specific to grade level and content.

Levin, D. A. (2021). *The state of K-12 cybersecurity: 2020 year in review*. K-12 Cybersecurity Resource Center and the K12 Security Information Exchange. https://static1.squarespace.com/static/5e441b46adfb340b05008fe7/t/620d58f6f14b822a371b8c7b/1645041911977/StateofK12Cybersecurity-2020.pdf

This report—the latest in The State of K-12 Cybersecurity: Year in Review series—aims to help remedy an information gap on the risks from school cybersecurity incidents. By cataloging and analyzing data from every publicly-disclosed cybersecurity incident affecting public elementary and secondary education agencies across the U.S. in the prior calendar year, the series is intended to spur greater attention to the challenges of securing the K-12 IT ecosystem and suggest ways that policymakers and school district leaders might effectively respond.

Li, C., Xing, W., & Leite, W. (2022). Using fair AI to predict students' math learning outcomes in an online platform. *Interactive Learning Environments*, 1-20. https://doi.org/10.1080/10494820.2022.2115076

As instruction shifts away from traditional approaches, online learning has grown in popularity in K-12 and higher education. Artificial intelligence (AI) and learning analytics methods such as machine learning have been used by educational scholars to support online learners on a large scale. However, the fairness of AI prediction in educational contexts has received insufficient attention, which can increase educational inequality. This study aims to fill this gap by proposing

a fair logistic regression (Fair-LR) algorithm. Specifically, we developed Fair-LR and compared it with fairness-unaware AI models (Logistic Regression, Support Vector Machine, and Random Forest). We evaluated fairness with equalized odds that caters to statistical type I and II errors in predictions across demographic subgroups. The results showed that the Fair-LR could generate desirable predictive accuracy while achieving better fairness. The findings implied that the educational community could adopt a methodological shift to achieve accurate and fair AI to support learning and reduce bias.

Liao, Y. C., Ottenbreit-Leftwich, A., Zhu, M., Jantaraweragul, K., Christie, L., Krothe, K., & Sparks, K. (2021). How can we support online learning for elementary students? Perceptions and experiences of award-winning K-6 teachers. *TechTrends, 65*(6), 939-951. https://doi.org/10.1007/s11528-021-00663-z

K-12 online learning can be advantageous in a variety of circumstances, including inclement weather days and emergency remote teaching. With the lessons learned from the COVID-19 pandemic, many K-12 districts may consider ways to incorporate online learning into their regular school plans after they resume face-to-face instruction. However, the most challenges to online learning seemed to take place at the elementary level. This brings up an important question: What should elementary online teaching and learning look like? We examined six award-winning K-6 teachers' perspectives on and experiences with online instruction and practices for elementary students. The teachers suggested that online instruction to support elementary students' learning should be (a) organized, (b) engaging, and (c) interactive. Teachers also suggested that developmentally appropriate use of technology and parental involvement may foster elementary students' online learning experiences.

Lindfors, M., & Pettersson, F. (2021). K–12 students' experiences of the synchronous remote teaching and learning environment. *Journal of Online Learning Research, 7*(3), 249-263. https://www.learntechlib.org/primary/p/219864/

The use of online, distance, and remote teaching is a growing phenomenon in the K–12 context. The aim of this pilot study was to explore K–12 students' experiences of the synchronous (real-time) remote teaching and learning environment. The following research questions were posed: (1) What possibilities and challenges can be identified from the perspective of students? (2) What development needs can be discerned for unexperienced teachers and students in synchronous remote teaching and learning environments? Data were collected from 177 students, using a quantitative instrument with questions in four dimensions: teacher support, involvement, cooperation, and autonomy support. Findings reveal both possibilities and challenges experienced by students in the synchronous remote teaching environment.

Love, M. L., & Ewoldt, K. B. (2021). Implementing asynchronous instructional materials for students with learning disabilities. *Intervention in School and Clinic*, *57*(2), 132-137. https://doi.org/10.1177/10534512211001

Online learning continues to be an increasingly popular option in K–12 and postsecondary settings As this trend continues, it is important that the developers of online instructional environments and materials proactively consider the needs of all students. This includes

determining how special education and specially designed instruction can be provided in online environments. For students with learning disabilities (LD), a systematic process for determining whether available learning materials address academic standards and specific student needs is key. To support practitioner lesson planning, this column provides guidance for aligning asynchronous learning materials to academic standards and the needs of students with LD. Guidance for supplementing and augmenting available materials is also provided.

Luo, T., Hibbard, L., Franklin, T., & Moore, D. (2017). Preparing teacher candidates for virtual field placements via an exposure to K-12 online teaching. *Journal of Information Technology Education: Research, 16*, 1-14. https://doi.org/10.28945/3626

Aim/Purpose The goal of this project was to determine what effects exposure to online K-12 teaching and learning activities had on teacher candidates' perceptions of K-12 online learning, how the exposure allowed teacher candidates to reach greater understanding of online pedagogy, and what effect such exposure had on teacher candidates' aspirations to complete virtual field experiences.

Background With an increasing number of K-12 students learning online within full-time online schools and in blended learning environments, universities must prepare future educators to teach in virtual environments including clinical practice. Before engaging in online field placement, preservice teachers must be oriented to online K-12 teaching and learning.

Methodology Using a design-based, mixed-method research methodology, this study drew samples from four sections of a hybrid technology integration course. Preservice teachers' papers detailing their perceptions, focus groups, and surveys were used to gauge changes in perceptions of online learning after participating in online teaching and learning activities.

Contribution The study demonstrated that an exposure to online K-12 classrooms stimulated preservice teachers' interest in online teaching as they began to feel that online education could be equivalent to traditional education.

Findings Students' perceptions positively improved the equivalency of online learning to traditional schooling, the possibility of positive relationships between teachers and students, and the ability to create interactive learning. Students also reported being more knowledgeable and showed increased interest in participating in virtual field experiences.

Future Research Future research may continue to examine if the exposure course, combined with a short-term clinical experiences and long-term online apprenticeships may serve to prepare graduates with the skills necessary to teach in classrooms of the future.

Ma, Y., Zuo, M., Yan, Y., Wang, K., & Luo, H. (2022). How do K–12 students' perceptions of online learning environments affect their online learning engagement? Evidence from China's COVID-19 school closure period. *Sustainability, 14*(23), 15691. https://doi.org/10.3390/su142315691

A learning environment's quality has crucial influence on a student's engagement. In this study, we utilized a structural equation modeling approach to explore the structural relationships between students' perceptions of an online learning environment and their online learning engagement during China's COVID-19 school closure period by focusing on an online learning environment and the specific features that facilitate student engagement. The online learning environment was conceptualized as a multidimensional structure consisting of four elements: pedagogy, social interaction, technology, and the consideration of home learning conditions. Student engagement was conceptualized as a multifaceted construct comprising behavioral, emotional, and cognitive engagement. The results showed that teaching presence significantly predicted deep behavioral engagement ($\beta = 0.246$), emotional engagement ($\beta = 0.110$), and cognitive engagement ($\beta = 0.180$). Social presence significantly positively predicted cognitive engagement ($\beta = 0.298$) and emotional engagement ($\beta = 0.480$), whereas its effect on behavioral engagement was not significant. The perceived ease of technology use significantly predicted only emotional engagement ($\beta = 0.324$), and the family learning presence significantly predicted only behavioral engagement ($\beta = 0.108$). The results also indicated that emotional and cognitive engagement had indirect effects on the predictive power of the online learning environment for behavioral engagement. These findings provide valuable guidelines and effective strategies for teachers and parents to design suitable online learning environments to enhance K–12 student engagement.

Martin, F., Ahlgrim-Delzell, L., & Budhrani, K. (2017). Systematic review of two decades (1995 to 2014) of research on synchronous online learning. *American Journal of Distance Education, 31*(1), 3-19. https://doi.org/10.1080/08923647.2017.1264807

Systematic reviews of literature are studies that strategically search for published research on a specific topic in order to synthesize what is known about the topic. This systematic review describes 157 articles on synchronous online learning (SOL) from thirty-four different countries on instructional setting, content areas, participant demographics, research designs, independent and dependent variables, SOL technologies, and data-collection tools.

Middleton, K. V. (2020). The longer-term impact of COVID-19 on K–12 student learning and assessment. *Educational Measurement: Issues and Practice, 39*(3), 41-44. https://doi.org/10.1111/emip.12368

Due to the precipitous onset of the coronavirus disease, teachers and students across the nation were thrust into a new environment, and the impact of this new experience will be felt both shorter and longer term. This academic year saw "test pollution" with the switch to online instruction, and student learning was significantly impacted by stress, anxiety, illness, being forced to learn in a vastly different method than previously experienced, and the increased potential to fall behind due to lack of access to materials. Classroom assessment, teaching and learning, and measurement and interpretation of student growth are among the numerous areas

that have been affected by the sudden switch of schools to online instruction that will require much thought in order to examine the impact of the significant deviation from the classroom norms on which much of previous research has been based. Educators, educational researchers, and policymakers have been presented with a challenge that does not have a definitive answer. There are many unknowns that remain as schools plan to move forward with instruction. However, through collaboration, the knowledge that each of these professionals can contribute ensures that adequate decisions will be made that will benefit all students equitably.

Miller, K. (2022). Teachers' reflections on supporting social and emotional learning: Desires, practices, and tensions in fostering family-school ties. *Journal of Online Learning Research*, *8*(1), 37-65. https://www.learntechlib.org/p/220634/

This study explores how schools communicated and engaged with families in online/blended learning environments to support students' social-emotional well-being. In the form of reflective learning journals and asynchronous peer discussions, documents were collected during Spring 2020, Fall 2020, and Spring 2021 from a graduate course for experienced K-12 teachers at a 4-year comprehensive university in the Southern United States. Guided by the CASEL framework for social and emotional learning (SEL), thematic document analysis gave form to the data. The following three themes emerged: 1) teachers perceived family-school ties to be more important than ever amid remote/online learning, 2) they amended their practices by acknowledging and empathizing with parents' increased instructional responsibilities, seeking increased knowledge of students' home lives, and offering support to parents through frequent communication, and 3) deficit thinking, time demands, and mounting frustrations with some parents' unresponsiveness were obstacles to building family-school connections. Findings suggest that while experienced teachers hold parental relationships in high regard, efforts to foster two-way, reciprocal partnerships with parents of online learners may be difficult to sustain, particularly when teachers navigate multiple learning contexts simultaneously. The article concludes with implications for schools.

Ouherrou, N., Elhammoumi, O., Benmarrakchi, F., & El Kafi, J. (2019). Comparative study on emotions analysis from facial expressions in children with and without learning disabilities in virtual learning environment. *Education and Information Technologies*, *24*(2), 1777-1792. https://doi.org/10.1007/s10639-018-09852-5

Children with Learning Disabilities (LDs) show some emotional difficulties and behavioral problems in the classroom compared with their peers without LDs. Emotions constitute an important part of the learning process. Recent evidence suggests that the use of Information and Communication Technology (ICT) in special education permits to remove barriers in learning for the target children. Besides, it offers a learning environment for a diversity of emotional experiences. In this present study, we explored the benefits of ICT use to identify the ways in which emotions are involved during the learning process in Virtual Learning Environments (VLE). We conducted a user study with 42 children divided into two groups; experimental group ($n = 14$) and age matched control group ($n = 28$) to compare their emotional experiences in VLE. We used advances in Artificial Intelligence (AI) to detect children's emotions through their facial expressions by analyzing seven basic facial emotion expressions (angry, disgust, fear, happy, sad, surprise and neutral) while playing an educational game. The initial results indicate

that emotions are present in VLE and they appear to suggest that children with LDs experience the same emotions as their peers without LDs in VLE. Besides, they show that children with LDs experience less negative emotions compared to literature evidence about the presence of a higher level of negative emotions in classroom.

Park, Y., & Shin, Y. (2021). Tooee: A novel scratch extension for K-12 big data and artificial intelligence education using text-based visual blocks. *IEEE Access*, *9*, 149630-149646. https://doi.org/10.1109/ACCESS.2021.3125060

Many approaches have been proposed to teach the basic concepts of big data and artificial intelligence to K-12 students based on block-based programming languages, such as Scratch. Using these approaches, young students can easily experience big data and artificial intelligence through a drag-and-drop approach. However, it remains difficult for them to perform more complex tasks, such as directly collecting data from the web or exploiting custom-made machine learning algorithms. In this paper, we propose a novel Scratch extension that allows Scratch to communicate with text-based programming languages such as Python and JavaScript using WebSockets. Unlike other Scratch extensions, our extension greatly enhances the extensibility of Scratch given its use of "text-based visual blocks" so that messages can be freely exchanged through a minimum number of blocks. In order for students to use these blocks easily, the blocks are designed such that they can be used as if talking with a friend named "Tooee." In order to show how this extension can help students create big data and artificial intelligence programs, we present eight example applications that students can easily implement. These are (1) Weather Forecast, (2) Top 5 Movies in Theaters, (3) COVID-19 Dashboard, (4) Saving Quiz Results to a CSV File, (5) Facial Image Classification, (6) Color Classification, (7) Object Classification, and (8) Handwriting Recognition. Our analyses and experimental results show that Tooee has several advantages over other educational environments.

Pelaez, A., Jacobson, A., Trias, K., & Winston, E. (2022). The Turing teacher: Identifying core attributes for AI learning in K-12. *Frontiers in Artificial Intelligence*, *5*, 1031450. https://doi.org/10.3389/frai.2022.1031450

Introduction: Artificial intelligence in the educational domain has many uses; however, using AI specifically to enhance education and teaching in a K-12 environment poses the most significant challenges to its use. Beyond usage and application, the quality of the education is made even more arduous due to the dynamics of teaching primary and secondary school children, whose needs far exceed mere fact recollection. Utilizing prior research using AI in education and online education in the K-12 space, we explore some of the hurdles that AI applications face in K-12 teaching and provide core attributes for a "Turing Teacher," i.e., an AI powered technology for learning, specifically targeting the K-12 space.

Methods: Using a survey, which included qualitative responses during the implementation of online learning during the Covid Pandemic, we analyze the results using univariate and multivariate tests and analyzed the qualitative responses to create core attributes needed for AI powered teaching technology.

Results: The results present the challenges faced by any technology in an education setting and show that AI technology must help overcome negative feelings about technology in education. Further, the core attributes identified in the research must be addressed from the three stakeholder perspectives of teachers, parents and students.

Discussion: We present our findings and lay the groundwork for future research in the area of AI powered education. The Turing Teacher must be able to adapt and collaborate with real teachers and address the varying needs of students. In addition, we explore the use of AI technology as a means to close the digital divide in traditionally disadvantaged communities.

Rajendram, S., Burton, J., & Wong, W. (2022). Online translanguaging and multiliteracies strategies to support K-12 multilingual learners: Identity texts, linguistic landscapes, and photovoice. *TESOL Journal, 13*(4), e685. https://doi.org/10.1002/tesj.685

The COVID-19 pandemic has given rise to the burgeoning of online, blended, and hybrid classrooms. The transition to virtual learning has been a challenge for many teachers and learners, but for multilingual learners (MLs) who have to navigate the virtual learning environment in a new language, online learning can be particularly difficult. Translanguaging (García et al., 2017) and multiliteracies (Cope & Kalantzis, 2015) theories call for teachers to support MLs by activating their prior knowledge, connecting to their lives, integrating their home languages and cultures, and engaging them in learning through multiple modalities. This theory-based practice article discusses three pedagogical strategies based on translanguaging and multiliteracies theories which are designed for multilingual K-12 classrooms with an online learning component: (1) digital identity texts, (2) linguistic landscapes, and (3) photovoice. The examples presented in the article were developed through the authors' collaborative and reflective engagement with each other, and drawn from their respective work with K-12 MLs and the preservice teachers preparing to teach MLs in mainstream classrooms in Ontario, Canada. The authors offer suggestions for how the proposed translanguaging and multilingual strategies can challenge monolingual practices, develop critical language awareness, and expand students' diverse language and literacies practices.

Rehn, N., Maor, D., & McConney, A. (2018). The specific skills required of teachers who deliver K–12 distance education courses by synchronous videoconference: Implications for training and professional development. *Technology, Pedagogy and Education, 27*(4), 417-429. https://doi.org/10.1080/1475939X.2018.1483265

The purpose of this research is to identify the specific skills required of videoconference teachers who teach K–12 distance education courses. Many schools and educational districts worldwide are using videoconference technology to deliver courses to students as an economic solution when they cannot afford specialised teachers at remote locations. However, teachers are rarely trained to use this instructional technology and must therefore translate their experience in face-to-face and/or online teaching to this alternative medium. The collective case study used observations and interviews of eight teachers across five schools to identify the specific skills required to teach in a way that they perceived as successful in a videoconference class. It was found that teachers are largely under-prepared with strategies to project presence, develop relationships, foster interaction, manage the course and teach content across a distance when the

screen is the main tool of connection. The authors offer a path to improvement that involves supporting teacher action research, creating communities of inquiry and developing teaching quality standards specific to videoconference.

Reinhart, R. V., & Banister, S. (2018). Developing and implementing instrumentation for digital high school curricula: A regional study of a rubric for instructional quality. *Athens Journal of Education, 5*(4), 361-373. https://doi.org/10.30958/aje.5-4-2

As our world has continued to become more dependent on digital communication and collaboration, online learning environments have become more sophisticated. Demand for online and/or hybrid learning materials has increased, not only in higher education arenas, but in elementary and secondary schools, as well. This study describes the development and implementation of an evaluative rubric for high school digital curricula created for a United States regional consortium of school districts, charged with expanding quality digital learning environments for their students. Digital instructional units for ten high school courses were created by collaborative teacher design teams, with each team consisting of 4-7 teachers. With the goal of creating 1/3 of a year's curriculum, teams developed 2-4 units per course in the first year. A total of 30 units were developed and evaluated. In collaboration with project partners, developed the NWOi3 Evaluation Rubric for Digital Curriculum that was used to assess curriculum units and consisted of 36 criteria organized by eight areas: 1) Overview, 2) Learning Targets, 3) Instructor Support, 4) Accessibility, 5) Instructional Materials, 6) Learner Interaction and Engagement, 7) Technology, and 8) Assessment. A variety of sources contributed to rubric development: Quality Matters K-12 Secondary Rubric (Quality Matters, 2017), Blended Course Peer Review Form (Blended Learning Toolkit, 2014), and the National Standards for Quality Online Programs (International Association for K-12 Online Learning [iNACOL], 2011). The evaluation process utilized a team of reviewers: five content experts, and three curriculum/ technology experts. A third evaluator then summarized the two reviews for every unit, providing a score for each criterion along with detailed comments and feedback. The process of how rubric results were analyzed and reported is described along with the challenges encountered.

Rice, M. (2018). Supporting literacy with accessibility: Virtual school course designers' planning for students with disabilities. *Online Learning*, *22*(4), 161-179. https://olj.onlinelearningconsortium.org/index.php/olj/article/view/1508

As more K-12 students with disabilities enroll in online courses, virtual schools and programs are working to make courses accessible through stronger course design. When course designers approach the issue of accessibility, they must comply with legal requirements and mitigate the challenges many students with disabilities face for literacy and learning. These challenges include a lack of vocabulary support and complex text in online course materials. This study describes qualitative research that sought to uncover strategies course designers used to meet accessibility standards and promote literacies online for all students, especially students with disabilities. Three strategies emerged as findings: (1) composing clear articulations of learning objectives, (2) promoting personalized and contextualized learning, and (3) planning for visual and audio representation of concepts. While the course designers displayed emerging understandings of accessibility, they were less adept at addressing the interplay between literacies that promote access and accessibility features that promote literacies.

Rice, M. & Deshler, D. (2018). Too many words, too little support: Vocabulary instruction in online earth science courses. *International Journal of Web-Based Learning and Teaching Technologies*, *13*(2), 46-61. https://doi.org/10.4018/IJWLTT.2018040104

As online coursework becomes more popular, students with disabilities that need vocabulary support for reading comprehension will be among the increase in cyber school students. Researchers have some evidence that certain types of vocabulary support strategies are more efficacious for students with disabilities. The purpose of this article is determining if what was known about strategies for supporting vocabulary was being applied to online learning coursework. A content analysis of types of vocabulary and types of support strategies was performed on science courses from three online course vendors. The results of this study indicate a need for online course vendors to pay more explicit attention to the types of words supported and the strategies they use to do so and for those who support online learners (teachers, parents) to be more proactive about vocabulary support deficiencies that are likely to be present in the courses.

Rice, M. & Ortiz, K. (2020). Perceptions of accessibility in online course materials: A survey of teachers from six virtual schools. *Journal of Online Learning Research*, *6*(3), 245-264. https://eric.ed.gov/?id=EJ1290781

Ensuring accessibility is an important concern for students with disabilities in online learning environments, including virtual schools. Previous research suggests that there is widespread confusion about what constitutes accessibility when designing instructional materials and who should be in charge of ensuring materials are accessible. Also, accessibility is often conflated with concepts like personalization, aesthetic appeal, and engagement. Accessibility is a critical issue as state educational agencies enable fully asynchronous classes with low levels of interaction between learners and teachers. As virtual schools come under corrective action failing to provide appropriate services to students with disabilities, learning about accessibility in those contexts is particularly vital. Moreover, states may begin to consider policies they made many years ago and determine their efficacy. In this study, 111 teachers from six virtual schools that were facing corrective action due to low graduation rates participated in a survey about their perceptions of the accessibility of the instructional materials for their online courses. The survey yielded a 42% response rate. Responding teachers perceived that their instructional materials were "somewhat" accessible with a wide dispersion of response data. Implications for these findings in light of previous research and in light of their corrective action status are offered. The study also stands as an example of a state reconsidering policies made before there was sufficient research to support a decision and the implications for critical data points like graduation rate.

Rice, M. F., & Ortiz, K. R. (2021). Evaluating digital instructional materials for K-12 online and blended learning. *TechTrends*, *65*(6), 977-992. https://doi.org/10.1007/s11528-021-00671-z

With the large increase in online instruction, including remote instruction with online materials during the COVID-19 pandemic, there also was an increase in the use of instructional materials that were made to be displayed online or were digitized for online use. However, teachers have

not had access to guidance about how to select and evaluate online instructional materials for classroom use. The lack of guidance has the potential to harm historically excluded populations of students and could frustrate teachers as they learn to teach with digital materials. The purpose of this paper is to share the 4A Framework for evaluating online instructional materials. The framework is organized around the premise that quality online instructional materials are accessible, promote active engagement, advocate for inclusion, and are accountable for their relationships to standards and data privacy. Each feature is discussed and examples of teacher work in applying the framework are shared.

Sayed, W. S., Noeman, A. M., Abdellatif, A., Abdelrazek, M., Badawy, M. G., Hamed, A., & El-Tantawy, S. (2023). AI-based adaptive personalized content presentation and exercises navigation for an effective and engaging E-learning platform. *Multimedia Tools and Applications*, *82*(3), 3303-3333. https://link.springer.com/article/10.1007/s11042-022-13076-8

Effective and engaging E-learning becomes necessary in unusual conditions such as COVID-19 pandemic, especially for the early stages of K-12 education. This paper proposes an adaptive personalized E-learning platform with a novel combination of Visual/Aural/Read, Write/Kinesthetic (VARK) presentation or gamification and exercises difficulty scaffolding through skipping/hiding/ reattempting. Cognitive, behavior and affective adaptation means are included in developing a dynamic learner model, which detects and corrects each student's learning style and cognitive level. As adaptation targets, the platform provides adaptive content presentation in two groups (VARK and gamification), adaptive exercises navigation and adaptive feedback. To achieve its goal, the platform utilizes a Deep Q-Network Reinforcement Learning (DQN-RL) and an online rule-based decision making implementation. The platform interfaces front-end dedicated website and back-end adaptation algorithms. An improvement in learning effectiveness is achieved comparing the post-test to the pre-test in a pilot experiment for grade 3 mathematics curriculum. Both groups witnessed academic performance and satisfaction level improvements, most importantly, for the students who started the experiment with a relatively low performance. VARK group witnessed a slightly more improvement and higher satisfaction level, since interactive activities and games in the kinesthetic presentation can provide engagement, while keeping other presentation styles available, when needed.

Shelton, A., & Gezer, T. (2023). Investigating the educational experiences of students with disabilities during the COVID-19 school disruption: An international perspective. *Large-scale Assessments in Education, 11*(1), 1-26. https://doi.org/10.1186/s40536-023-00183-7

Students with disabilities generally experience educational inequities around the world. The coronavirus 2019 (COVID-19) pandemic likely exacerbated these inequities in access, resources, and support as schools shut down to mitigate the spread of the disease. Although some research has explored disparities between students with and without disabilities during the pandemic, limited research has explored this issue from the perspective of students across multiple countries. Therefore, we conducted a secondary analysis of the UNESCO Responses to Educational Disruption Survey student questionnaire administered to eighth graders in five countries to investigate changes in the educational experiences of students with disabilities during COVID-19 school disruptions and differences between these experiences and the

experiences of students without disabilities during these disruptions. Specifically, we aimed to understand how students with disabilities' perceptions of their educational experiences changed during disruptions and varied from those of students without disabilities. Contrary to previous research, our findings revealed that students with disabilities generally reported positive experiences to a greater extent than students without disabilities. We discuss the implications of these findings and areas for future research beyond the COVID-19 pandemic.

Shively, K., & Geesa, R. L. (2023). An online professional learning series: Preparing P-12 educators to teach in online SEL environments. In R. Rahimi & D. Liston (Eds.), *Exploring Social Emotional Learning in Diverse Academic Settings* (pp. 271-295). IGI Global. https://www.igi-global.com/chapter/an-online-professional-learning-series/321394

This chapter describes an online professional learning series (OPLS) focused on supporting educators in designing P-12 online social-emotional learning (o-SEL) environments. The authors argue there is a need for o-SEL professional learning, which can serve as an ongoing, flexible resource educators can reference as they design their online learning environments (i.e., online classrooms). To participate fully in this OPLS, P-12 educators are situated to participate in professional exercises, guided by design thinking, to identify problems and possible solutions specifically related to their individual online learning environments. Through this process, educators draw upon the content, resources, and online teaching strategies to brainstorm practical solutions to better serve their learners' needs in online learning environments. To earn credit for completing the professional learning modules, educators submit solutions for peer review and professional evaluation. Upon receipt of the feedback, they may revise and resubmit, if needed, to demonstrate their new skills and competencies.

Smith, S. & Harvey, E. (2014). K-12 online lesson alignment to the principles of universal design for learning: the Khan Academy. *Open Learning: The Journal of Open, Distance and E-Learning*, *29*(3), 222-242. https://doi.org/10.1080/02680513.2014.992402

The field of K-12 education is being transformed, with an influx of students, including those with identified disabilities, engaging in blended and fully online learning. While online learning shows promise for students with disabilities through flexible content and personalised instruction, concerns regarding accessibility and appropriateness of online learning for this population still exist. In order to examine this concern, researchers developed and used a Universal Design for Learning (UDL) Scan Tool to measure lesson content and alignment with UDL principles, guidelines and checkpoints. Four hundred and seventy-eight math, science and world history Khan Academy lessons were randomly selected and evaluated for this study. The paper highlights the results of the study, in terms of the lessons' alignment with UDL principles and guidelines, as well as a discussion on limitations and future research.

Solyst, J., Nkrumah, T., Stewart, A., Buddemeyer, A., Walker, E., & Ogan, A. (2022). Running an online synchronous culturally responsive computing camp for middle school girls. In *Proceedings of the 27th ACM Conference on Innovation and Technology in Computer Science Education Vol. 1* (pp. 158-164). https://doi.org/10.1145/3502718.3524747

Computing education is important for K-12 learners, but not all learners resonate with common educational practices. Culturally responsive computing initiatives center and empower learners from diverse and historically excluded backgrounds. Recently, a number of educational programs have been developed and curated for an online experience. In this paper, we describe an online synchronous culturally responsive computing (CRC) camp for middle school girls (ages 11-14 years old) and report on challenges and successes from running the camp curriculum four times over the course of a year. We also describe core iterative changes we made between our runs. We then discuss lessons learned related to building rapport and connection among learners, centering learners of different backgrounds in an online synchronous environment, and facilitating reflection on power and identity aimed at positioning learners as techno-social change agents. Lastly, we offer recommendations for running online CRC experiences.

Song, D. (2017). Designing a teachable agent system for mathematics learning. *Contemporary Educational Technology*, *8*(2), 176-190. https://files.eric.ed.gov/fulltext/EJ1137860.pdf

Learning-by-teaching has been identified as one of the more effective approaches to learning. Recently, educational researchers have investigated virtual environments in order to utilize the learning-by-teaching pedagogy. In a face-to-face learning-by-teaching situation, the role of the learners is to teach their peers or instructors. In virtual environments, learners take an active role by teaching a computer agent, which is referred to as Teachable Agent (TA). Although the current TA systems have shown their effectiveness on students' learning, there are some challenges associated with learner-computer interaction methods. One of the most popular interaction methods between the learner and the system is a concept map approach. The learner teaches TA by creating information structures by drawing and editing their concept map. However, the learner can teach TA rather constrained topics, such as concept-related materials or causal effects. It is difficult for TA systems to be utilized in different types of learning along with concept-related areas. Therefore, new approaches or methods for communication between a human learner and TA systems are required. This project aims to suggest a virtual learning-by-teaching environment. A communication method (i.e., a symbol manipulation approach) was adopted in this system. The method facilitates the interaction between the learner and the computer agent, specifically for K-12 students' mathematics learning. The design and development process is described, and future research areas are discussed.

Standen, P. J., Brown, D. J., Taheri, M., Galvez Trigo, M. J., Boulton, H., Burton, A., ... & Hortal, E. (2020). An evaluation of an adaptive learning system based on multimodal affect recognition for learners with intellectual disabilities. *British Journal of Educational Technology*, *51*(5), 1748-1765. https://bera-journals.onlinelibrary.wiley.com/doi/pdfdirect/10.1111/bjet.13010

Artificial intelligence tools for education (AIEd) have been used to automate the provision of learning support to mainstream learners. One of the most innovative approaches in this field is

the use of data and machine learning for the detection of a student's affective state, to move them out of negative states that inhibit learning, into positive states such as engagement. In spite of their obvious potential to provide the personalisation that would give extra support for learners with intellectual disabilities, little work on AIEd systems that utilise affect recognition currently addresses this group. Our system used multimodal sensor data and machine learning to first identify three affective states linked to learning (engagement, frustration, boredom) and second determine the presentation of learning content so that the learner is maintained in an optimal affective state and rate of learning is maximised. To evaluate this adaptive learning system, 67 participants aged between 6 and 18 years acting as their own control took part in a series of sessions using the system. Sessions alternated between using the system with both affect detection and learning achievement to drive the selection of learning content (intervention) and using learning achievement alone (control) to drive the selection of learning content. Lack of boredom was the state with the strongest link to achievement, with both frustration and engagement positively related to achievement. There was significantly more engagement and less boredom in intervention than control sessions, but no significant difference in achievement. These results suggest that engagement does increase when activities are tailored to the personal needs and emotional state of the learner and that the system was promoting affective states that in turn promote learning. However, longer exposure is necessary to determine the effect on learning.

Tan, J. P. L., Koh, E., Jonathan, C., & Yang, S. (2017). Learner dashboards a double-edged sword? Students' sense-making of a collaborative critical reading and learning analytics environment for fostering 21st-century literacies. *Journal of Learning Analytics, 4*(1), 117-140. https://doi.org/10.18608/jla.2017.41.7

The affordances of learning analytics (LA) tools and solutions are being increasingly harnessed for enhancing 21st century pedagogical and learning strategies and outcomes. However, use cases and empirical understandings of students' experiences with LA tools and environments aimed at fostering 21st century literacies, especially in the K-12 schooling sector and in Asian education contexts remain relatively scarce in the field. Our paper addresses this knowledge gap in two ways. First, we present a first iteration design of a computer-supported collaborative critical reading and LA environment, WiREAD, and its 16-week implementation in a Singapore high school. Second, we foreground students' evaluative accounts of the benefits and drawbacks associated with this techno-pedagogical innovation. Our analysis of students' collective sense-making pointed to a number of potentialities and perils associated with the design and use of LA dashboards. Positives included (1) fostering greater self-awareness, reflective and self-regulatory learning dispositions, (2) enhancing learning motivation and engagement, and (3) nurturing connective literacy among students. The motivational value of peer-referenced LA visualisations for stimulating healthy competition and game-like learning was identified, alongside the perils of these serving to demoralise, pressurise and trigger complacency in learners. By focusing on students' experiences and interpretations of how the LA dashboard visualizations impacted their learning motivation and outcomes, this paper aims to shed insights into the pedagogical complexities of designing LA that considers the voices of learners as a critical stakeholder group.

Tate, T., & Warschauer, M. (2022). Equity in online learning. *Educational Psychologist*, *57*(3), 192-206. https://doi.org/10.1080/00461520.2022.2062597

Online learning outcomes have indicated both a gap between online and face-to-face learning and the amplification of this gap for low-income and minority learners. Evidence from studies across K–16 reveals equity issues regarding access to online courses; student attendance and achievement; and, most recently, the impact of the pandemic. This article uses Warschauer's conceptual framework of resources that shape digital inclusion—physical, human, and social—to conceptualize the equity concerns that arose during the pandemic-induced shift to emergency distance learning. This framework reveals equity issues across all three areas from abruptly moving millions into online learning environments without: requisite access to up-to-date computers and broadband internet access, the skills needed to succeed in less structured online classes, or teachers trained to effectively conduct classes online. Finally, we leverage Warschauer's framework to discuss ways to address these concerns and increase equity in online learning, as well as directions for research.

Tysinger, D., Tysinger, J. A., & Diamanduros, T. D. (2016). Crisis events in K-12 online learning: Educator perceptions and preparedness. *National Youth Advocacy and Resilience Journal*, *2*(1), 41-48. https://digitalcommons.georgiasouthern.edu/nyar/vol2/iss1/4/

Although K–12 online learning institutions may be protected from certain school safety concerns (i.e., physical violence on a student or a teacher), physical distance does not offer protection from all potential crises that may impact individual students or the online school environment. The current survey research explored educators' perceptions of and preparedness for the following crisis frequencies in the online learning environment: suspected child/adolescent neglect, suspected child/adolescent abuse, suspected student suicidal ideation, suspected student homicidal ideation, unexpected death of a student, unexpected death of a teacher, emotional aftermath of natural disasters, and emotional aftermath of terrorist incidents. Across the sample, the crisis events were noted as occurring at least one to two times per year by some participants. Even more striking, 80–95% of participants noted having no training for recognizing the warning signs of the various crisis events in online content, and at least 1 in 4 participants in every category indicated that they felt somewhat unprepared or very unprepared to respond based on their school's current crisis plan.

Vladimirovna, S. O., Andreevna, P. N., Mikhaylovna, B. N., Yuryevna, K. G., & Vladimirovna, P. J. (2020). Development of digital intelligence among participants of inclusive educational process. *Propósitos y Representaciones, 8*(SPE2), e675-e675. https://files.eric.ed.gov/fulltext/EJ1271807.pdf

The article analyzes the problem of the development of digital intelligence among participants of inclusive educational process in the context of the global digitalization of modern society. The level of development of this problem is described. A brief analytical review of scientific research of digital educational environments and digitalization of education is presented. The features and advantages of this innovative approach are demonstrated. The risks for the mental and personal development of students in the transition of modern education to digital format are listed. The

results of a pilot research of the development of the main components of digital intelligence among participants in an inclusive educational process (teachers, students and their parents) are presented. A model of the targeted development of digital intelligence in the practice of an inclusive educational organization is proposed.

Wang, M., Muthu, B., & Sivaparthipan, C. B. (2022). Smart assistance to dyslexia students using artificial intelligence based augmentative alternative communication. *International Journal of Speech Technology, 25*, 343–353. https://doi.org/10.1007/s10772-021-09921-0

Dyslexia students frequently deal with multiple difficulties in daily life, involving social interactions throughout their lives. Sometimes they are quickly refused the chance to indulge in social events since they suffer difficulty in learning, reading, understanding, etc. AAC seems to be a vital communication aid for dyslexia students by providing an augmented reality (AR) paradigm to effective learning. This paper enhances the existing learning assistance technologies with innovative Artificial Intelligence (AI) to reinvigorate the Augmentative Alternative Communication (A^2C) model for dyslexia children. The AI-based Augmentative Alternative Communication Approach has been developed to enhance learning skills with dyslexia by adapting to practices, and learning models are cognitively considered. The work on the academic skills of dyslexia students has been improved through the AI-based alternative communication paradigm for the improvement of the students with reading and learning. The AI-based AAC (AI–A^2C) integrates the hybrid AI classifier in AAC to classify unique questions and provide users with the most appropriate pictograms. In contrast to the standard application, the proposed classifier decreased the effort and time taken to interact by 36.56% and 66.34%. Furthermore, the proposed model's performance is evaluated by its accuracy and efficiency of the hybrid AI classifier and compared with other AI classifiers.

Yu, H., & Ha, T. (2021). Effective pedagogical practices in synchronous online physical education. *Journal of Physical Education, Recreation & Dance, 92*(9), 63-68. https://doi.org/10.1080/07303084.2021.1979872

The purpose of this article is to propose 15 pedagogical practices in a synchronous class environment through Zoom Video Communications, which is one of the most widely used video conferencing software across the U.S. The practices will be discussed within three categories of pedagogical aspects, including active lectures, active discussion, and active group activities that would produce alternative and innovative ways of learning in physical education.

Yue, M., Jong, M. S. Y., & Dai, Y. (2022). Pedagogical design of K-12 artificial intelligence education: A systematic review. *Sustainability*, *14*(23), 15620. https://doi.org/10.1016/j.caeai.2023.100145

In response to the growing popularity of artificial intelligence (AI) usage in daily life, AI education is increasingly being provided at the K-12 level, with relevant initiatives being launched worldwide. Examining how these programs have been implemented and summarizing useful experiences is thus imperative. Although prior reviews have described the characteristics of AI education programs in publications, the papers reviewed were mostly nonempirical reports, and the analysis typically only involved a descriptive summary. The current review focuses on

the most recent empirical studies on AI teaching programs in K-12 contexts through a systematic search of the Web of Science database from 2010 to 2022. To provide a comprehensive overview of the status of AI teaching and learning (T&L), 32 empirical studies were analyzed both descriptively and thematically. We analyzed (1) the research status, (2) the pedagogical design, and (3) the assessments and outcomes of the AI teaching programs. An increasing number of studies have focused on AI education at the K-12 stage, but most of them have a small sample size. Moreover, the data were mostly collected through interviews and self-reports. We reviewed the pedagogical design of AI teaching programs by using Gerlach and Ely's pedagogical design model. The results comprehensively delineated current AI teaching programs through nine dimensions: learning theory, pedagogical approach, T&L activities, learning content, scale, teaching resources, prior knowledge prerequisite, aims and objectives, assessment, and learning outcome. The results highlighted the positive impact of current AI teaching programs on students' motivation, engagement, and attitude. However, we observed a lack of sufficient research objectively measuring students' knowledge acquisition as learning outcomes. Overall, in this paper, we discussed relevant findings in terms of research trends, learning content, teaching units, characteristics of the pedagogical design, and assessment and evaluation by providing illustrations of exemplary designs; we also discussed future directions for research and practice in AI education in the K-12 context.

Zayet, T. M., Ismail, M. A., Almadi, S. H., Zawia, J. M. H., & Mohamad Nor, A. (2023). What is needed to build a personalized recommender system for K-12 students' E-Learning? Recommendations for future systems and a conceptual framework. *Education and information technologies*, *28*(6), 7487-7508. https://link.springer.com/article/10.1007/s10639-022-11489-4

Online learning has significantly expanded along with the spread of the coronavirus disease (COVID-19). Personalization becomes an essential component of learning systems due to students' different learning styles and abilities. Recommending materials that meet the needs and are tailored to learners' styles and abilities is necessary to ensure a personalized learning system. The study conducted a systematic literature review (SLR) of papers on recommendation systems for e-learning in the K12 setting published between 2017 and 2021 and aims to identify the most important component of a personalized recommender system for school students' e-learning. Recommendations for later studies were proposed based on the identified components, namely a personalized conceptual framework for providing materials to school students. The proposed framework comprised four stages: student profiling, material collection, material filtering, and validation.

Zeng, H., & Luo, J. (2023). Effectiveness of synchronous and asynchronous online learning: a meta-analysis. *Interactive Learning Environments*, 1-17. https://doi.org/10.1080/10494820.2023.2197953

Distance learning and online learning have become the new educational paradigm. Based on synchronicity, online learning environments can be classified into synchronous and asynchronous online learning. However, previous evidence demonstrating the effects of these two online learning modalities on students' academic achievement has been contradictory. The current meta-analysis study pooled the observed effect sizes from previous research and

addressed the following two research questions: (1) Which online learning format (synchronous or asynchronous) generates stronger learning effects? (2) Do the effects vary by the disciplinary field and educational level in which the learning is carried out? A systematic search of studies published between 2002 and 2022 was conducted. A total of 14 studies with 1,098 participants for the synchronous learning condition and 804 participants for the asynchronous learning condition met the study selection criteria. The results showed that asynchronous learning was more effective in promoting student knowledge than synchronous online learning, but the effect was trivial in size. The overall effect size was largely invariant across educational levels and disciplines. The implications of this study are also discussed.

Zhang, Y., & Lin, C. H. (2020). Student interaction and the role of the teacher in a state virtual high school: what predicts online learning satisfaction? *Technology, Pedagogy and Education, 29*(1), 57-71. https://doi.org/10.1080/1475939X.2019.1694061

As online K–12 education continues to expand, concerns about its quality have taken centre stage. This study utilised online learning satisfaction as an outcome indicator for the success of online learning, and investigated student- and teacher-level factors that affected it among 226 high school students taking online world language courses from 15 teachers at a Midwestern virtual school in the US. Hierarchical linear modelling revealed that, at the student level, learner–content interaction was the only significant predictor of satisfaction; while at the teacher level, satisfaction was positively and significantly correlated with teachers' adoption of pedagogical roles, but negatively predicted by their adoption of managerial ones. The findings particularly highlight the importance of content-based teaching and learning in the context of K–12 world language learning.

Appendix E – Both Author Abstracts and Research Annotations for Annotated Sample

Aguilar, S. J., Galperin, H., Baek, C., & Gonzalez, E. (2022). Live instruction predicts engagement in K–12 remote learning. *Educational Researcher, 51*(1), 81-84. https://doi.org/10.3102/0013189X211056884

Author Abstract: How does live instruction relate to student engagement in distance learning? Does the relationship differ across grade levels? This study addresses these questions by examining data from a random sample of families from a large urban school district in southern California. We find a strong correlation between live instruction and student engagement in online learning among elementary school students, with every additional hour of live instruction per week increasing the probability of reporting that students have completed all their schoolwork by 26%. The correlation is also significant though smaller in magnitude for middle and high school students.

Annotation

Background: This study was conducted within the context of the rapid transition to remote learning in the Spring 2020. It was designed investigate the barriers to distance learning faced by low-income K–12 students, and whether there was a relationship between reported participation in live instruction and reported student engagement during the remote learning provided from March to June 2020.

Methods: Participants were randomly selected from 1,181 families with children enrolled in 19 high-need K–12 public schools located in a large urban district in southern California. The data collection included telephone surveys conducted in both English and Spanish by the non-profit organization that managed the school, which were undertaken following the conclusion of 2019-20 school year. A total of 3,473 calls were made with a final response rate of 34% (although it was unclear if it was 34% of the 1,181 families or 34% of the 3,473 telephone call). The sample was 95.2% Hispanic, which the authors indicated was reflective of the broader district-wide demographics. The data were analyzed using regression analysis that compared the responses from the telephone survey with school data such as language proficiency, grade point average in the previous grading period, and special education status.

Results/Findings: The authors found that synchronous class activities positively predicted engagement with distance learning as measured by homework completion. At the elementary level, for every additional hour of live instruction per week there was a 26% increase in the probability of reporting that students have completed all their schoolwork (as opposed to "some" or "none"). At the middle and high school level, every hour of live instruction increasing the probability of reporting completion of "all" schoolwork by about 12%.

Recommendations for Practitioners: Within the context of this study, the authors recommended live online instruction to increase students' engagement through connectedness with teacher and peers, which was particularly important in earlier grades where students typically have not developed the required abilities for independent learning. Additionally, schools need to address

disparities in digital readiness among households, as live instruction will not enhance learning unless students can meaningfully take advantage of synchronous activities offered by teachers.

Amundson, A. (2021). *Social presence theory: Creating engaging and strong online learning communities at the K-12 level*. Unpublished doctoral dissertation, Hamline University. https://digitalcommons.hamline.edu/hse_all/4529

Author Abstract: Social presence theory is "the degree to which a person is perceived as a real person in mediated communication" (Gunawardena, 1995). Enhancing student's perception of social presence increases instructional effectiveness and learning in an online learning environment. To increase perceived social presence, teachers must use techniques and interaction skills to build an online classroom community. There is not a lot of research on social presence theory in K-12 online learning environments so the purpose of this study was to find tools and strategies that create a strong online learning environments and to find if there is a relation between social presence and academic achievement. The research questions being addressed are: How can K-12 teachers create a synchronous online environment where students have a social presence in the classroom? Did social presence in an online learning environment result in higher academic achievement? 78 teachers filled out a questionnaire in google forms measuring perceived social presence in the classroom and perceived learning. There were four open ended questions at the end where teachers answered questions about the highlights, lowlights, tools, and strategies in how the teachers created an online learning environment with a strong social presence in the classroom. It was found that there is a slight correlation between the perceived social presence and perceived learning questions. The more a teacher agreed that there is a social presence in their classroom, the more likely they would agree that students are learning and progressing academically in online settings. Also, the more a teacher disagreed that there is social presence in their online classroom, the more likely they would disagree that students are learning nor progressing academically. The open-ended questions found many tools and strategies to create a strong learning community that teachers can use for the following years.

Annotation

Background: The setting was a full-time online school that was created by a school district in Minnesota, which was created for the 2020-21 school year in response to a demand within the district for this option in light of the pandemic. The author indicated that the purpose of the dissertation study was to explore online teaching communities and how it related to achieved learning in order to discover best teaching practices in creating strong relationship based online communities with student-student collaborative learning activities, which was undertaken through the lens of social presence. In her own words, "I am investigating social presence in online synchronous K-12 classrooms because I want to find out the effect it has on engagement in the classroom and whether social presence yields higher academic achievement."

Methods: The data collection was based on a survey that included both Likert-style questions (consistent with instruments utilized by Richardson [2003] and Gunawardena [1997]) and open-ended questions focused on culturally responsive teaching (modelled after Lawrence [2020]). A total of 78 of the 225 teacher who taught 100% online completed the survey. The quantitative data was analyzed for reliability, as well as using descriptive statistics and a correlation analysis

to measure perceived social presence and perceived learning. The qualitative data was analyzed using an unnamed thematic analysis.

Results/Findings: The author reported that there was a weaker correlation between the variables, which in her own words meant that "the more a teacher agreed that there was a social presence in their classroom, the more likely they would agree that students were learning and progressing academically in online settings. Also, the more a teacher disagreed that there was social presence in their online classroom, the more likely they would disagree that students were learning nor progressing academically." It should be noted that these findings were based on the teacher's own perception of social presence in their online teaching, and not any objective or third party measure.

Recommendations for Practitioners: The author suggested a total of five recommendations for practice. The first was the need for an attendance policy to ensure that students were consistency in their involvement/participation in both the synchronous and asynchronous aspects of the online course. The second was to seek opportunities for student-student interaction, particularly without the presence of the teacher. The third was to ensure that students knew both how to use the technology (i.e., to avoid some of the basic troubleshooting issues) and how to use the technology within the context of learning (i.e., how to learn online). The fourth was for teachers to incorporate strategies that made students feel more comfortable in the online environment (e.g., using additional wait time, being more patient with students, providing more anonymous ways to interact initially, incorporating more planned opportunities for social interactions, etc.). The fifth and final recommendation was that teachers needed to be more collaborative with the sharing of strategies and resources, particularly those that they found to be more useful.

Baliram, N., Koetje, K., & Huff, E. (2021). Virtual learning environments and a needs assessment of K-12 teachers. *AILACTE Journal, 28*, 27-53. https://eric.ed.gov/?id=EJ1340480

Author Abstract: During the COVID-19 emergency pivot to virtual learning environments, the researchers sought to understand mentors' and teacher candidates' experiences in K–12 schools so that they could offer improved training and support. We surveyed 60 mentor teachers' and 92 teacher candidates' perceptions of preparedness for a virtual learning environment (VLE), confidence in creating an effective VLE, obstacles involved in a VLE, and strategies for building community in an online environment. The survey was administered in November 2020. Both teacher candidates and mentor teachers were fully immersed in the virtual learning environment. In the fall, participants felt they were much more confident and equipped to handle the VLE technology than when they had been abruptly forced to transition in the spring quarter of the prior school year. However, despite the various strategies used to build community, the participants noted student engagement as the biggest challenge in a VLE.

Annotation

Background: In the author's own words, "The purpose of this study was to examine the level of support teacher candidates and mentor teachers received at the start of the 2020-21 school year as they transitioned to a virtual learning environment. The researchers sought to identify any

obstacles teacher candidates and mentor teachers encountered as they attempted to build an online community. Additionally, the investigators wanted to better understand what tools teachers were using and how the faculty and university supervisors in the teacher education program might modify their program offerings to further support them."

Methods: The sample included 92 of 98 pre-service teacher candidates and 60 of 140 mentor teachers from a single university teacher preparation program in Washington. The data collection included a survey that consisted of 21 multiple choice questions and 5 free responses, which was administered to the teacher candidate after they had completed two months of virtual student teaching and to the mentor teachers at the end of the quarter. The quantitative data was analyzed using descriptive statistics and the qualitative data was analyzed using an unnamed thematic analysis.

Results/Findings: The authors indicated that both the pre-service teacher candidates and the mentor teachers generally felt supported by their administration, and even more supported by their own specific teams. In retrospect (i.e., near the end of the Fall 2020 semester), approximately half of respondents felt confident about their ability to teach in a virtual context during the Spring 2020 based on the training they had received prior to the pandemic. Although, those who felt extremely unconfident about their ability to teach online prior to the school closures reported that they had gained confidence by the time the survey was administered in late Fall 2020 (and the authors noted there was a pattern with these participants also rating the level of support they received as unsatisfactory – but did not indicate the statistical nature of that pattern). The three main obstacles that respondents face were (1) being able to use breakout rooms, (2) policies around student camera use (particularly those that did not require it), and (3) the flexibility given to choose their own location for teaching (i.e., on site or remotely). Finally, the authors summarized their findings around the respondents ability to build community online by quoting the response of one of the mentor teachers: "authenticity + intentionality + time."

Recommendations for Practitioners: The authors recommended that teacher preparation programs focus on training candidates for technology fluency and encourage a mindset of creativity and flexibility rather than prioritizing certain tools. The authors recognized that school systems have their own adopted tools, as such teacher preparation programs should encourage attendance by their teacher candidates at district trainings on their specific tools and integrate these trainings into program requirements. The authors also recommended that teachers should explore "strategies for increasing student camera usage during synchronous classes," but did not consider any of the privacy or compliance issues of this practice within their article.

Black, E. W., Ferdig, R. E., Fleetwood, A., & Thompson, L. A. (2022). Hospital homebound students and K-12 online schooling. *PLoS ONE, 17*(3), e0264841. https://doi.org/10.1371/journal.pone.0264841

Author Abstract: The flexibility afforded by online education may provide opportunities for learners with disability who require absence from traditional learning environments. This study sought to describe how a subset of learners with disability, those with hospital-homebound designation, perform in K-12 online classes, particularly as compared to non-hospital homebound counterparts. A cross-sectional analysis was performed of all Florida Virtual School

course enrollments from August 1, 2012 to July 31, 2018. Researchers analyzed 2,534 course enrollments associated with K-12 students who, at the time of their course enrollment, had hospital-homebound designation, and a comparison group of 5,470,591 enrollments from K-12 students without hospital-homebound status. Data analysis showed three important outcomes. First, hospital-homebound designated student academic performance was equivalent to their non-hospital homebound counterparts. Second, however, hospital-homebound course enrollments were 26% more likely to result in a withdrawal prior to grade generation. Third, these withdrawals were potentially mitigated when H/H designated students were enrolled in five or more classes or in classes with five or more students. The results of this study provided evidence that when they can remain enrolled, hospital-homebound learners experience equivalent academic outcomes in online learning environments. These findings suggest that healthcare professionals should be made aware of the potentially equivalent outcomes for their patients. Moreover, virtual schools should seek to identify and create supports for these students.

Annotation

Background: The advances in healthcare mean that more children are surviving illness and disability, which has also resulted in a small but significant number of students with chronic illnesses or disabilities may not be healthy enough to attend school in a traditional environment. Online learning is often seen as a viable alternative for hospitalized or homebound students. The goal of this study was to analyze how students with hospitalized or homebound designation performed in K-12 online classes compared to non- hospitalized or homebound counterparts.

Methods: The data comprised of deidentified student data over a period of six years from the Florida Virtual School (FLVS) itself, and was divided into two cohorts: (1) FLVS students who were classified as hospitalized or homebound (n=375), and (2) all non hospitalized or homebound students enrolled in FLVS (n= 1,191,508). The authors used chi-square tests were used to explore student outcomes and Z-tests determine whether two cohorts differed significantly, as well as descriptive statistics for any variables that did not have a defined set of categories (e.g., pass/fail, specific letter or number grade, male/female, etc.).

Results/Findings: The authors reports three main findings. First, students designated as hospitalized or homebound performed similarly to non-hospitalized or homebound designated counterparts across core content areas. Second, Student course enrollments resulting in a grade were significantly different between hospitalized or homebound students and non-hospitalized or homebound students. Third, hospitalized or homebound student completion rates were positively correlated with two important aspects of enrollment.

Recommendations for Practitioners: The main recommendation was at the administrative level, where the authors suggested that the low enrollments here may point to a lack of awareness of the opportunity that online schooling can provide – particularly for this population of students. The authors suggested that “data findings suggest that practicing pediatric healthcare professionals should be made aware of the positive potential outcomes for their patients.”

Boninger, F., Molnar, A., & Saldaña, C. (2020). *Big claims, little evidence, lots of money: The reality behind the Summit Learning program and the push to adopt digital personalized learning programs*. National Education Policy Center. https://eric.ed.gov/?id=ED607124

Author Abstract: Virtual learning and personalized learning have been at the forefront of education reform discussions for over a decade. Backed by almost $200 million philanthropic dollars from the Chan-Zuckerberg Initiative, the Gates Foundation, and others, Summit Public Schools has aggressively marketed its Summit Learning Platform to schools across the United States since 2015. As a result, the Summit Learning Program is now one of the most prominent digital personalized learning programs in the United States. Its rapid spread--despite a lack of transparency and the absence of convincing evidence that it can deliver on its promises--provides a powerful example of how policymakers are challenged when faced with a well-financed and self-interested push for schools to adopt digital personalized learning programs. There is now an urgent need for policymakers to move quickly to protect the public interest by establishing oversight and accountability mechanisms related to digital platforms and personalized learning programs. [Seven appendixes as well as the authors' reply to T.L.P. Education's blog response to this research brief are available on the publisher's website.]

Annotation

Background: Summit Schools was an 11-school charter school network with ties to the Chan Zuckerberg Foundation operating in the state of California leading up to the pandemic. The network marketed promises of personalized learning experiences, despite the fact that there had not been any independent evidence evaluation of these claims. Researchers at the National Education Policy Center in Boulder, Colorado conducted a review of partner school contracts to learn about the potential for privacy risks.

Methods: Researchers requested a number of records about achievement from the network and they were not granted access. Therefore, they were only able to examine publicly available records, which included graduation rates, test scores from national groups (e.g., AP, I-BAC, Smarter Balance), California State test scores, and information from partner groups and states like Washington state and Stanford University. Information from these data were then laid against claims made by the group.

Results/Findings: The researchers determined that Summit Public Schools Group had *little to no basis* in the available data on which they could base claims to success and achievement at their schools. Instead, researchers found that Summit Public Schools collected an enormous amount of data from students (personal information and user data) and the uses of it were unclear.

Recommendations for Practitioners: The researchers recommended that all personalized learning programs be regularly reviewed to evaluate their claims of success. They also recommended that programs for algorithms be evaluated regularly for biases. Finally, the researchers recommended that schools that gather data and personal information from students online develop a standard data protection agreement that includes information about how and when they will de-identify data and articulates how data will be used.

Boninger, F., Molnar, A., & Saldaña, C. M. (2019). *Personalized learning and the digital privatization of curriculum and teaching*. National Education Policy Center. https://eric.ed.gov/?id=ED595239

Author Abstract: Personalized learning programs are proliferating in schools across the United States, fueled by philanthropic dollars, tech industry lobbying, marketing by third-party vendors, and a policy environment that provides little guidance and few constraints. In this research brief, authors Faith Boninger, Alex Molnar, and Christopher M. Saldaña consider how we got to this point. Beginning with an examination of the history of personalized learning and the key assumptions made by its proponents, they review the research evidence and reflect on the roles and possible impacts of the digital technologies deployed by many programs. Despite many red flags, the pressure to adopt personalized learning continues to mount. The authors thus recommend that schools and policymakers pause in their efforts to promote and implement personalized learning until rigorous review, oversight, and enforcement mechanisms are established.

Annotation

Background: Corporate entities such as the Bill and Melinda Gates Foundation and the Chan Zuckerberg Foundation have spent large amounts of money developing so-called personalized learning initiatives. These are supposed to result in customized learning for children and are built on the premise that algorithms will choose lessons at the appropriate level of challenge. Researchers at the National Center for Education Policy in Boulder, CO evaluated the evidence on the effectiveness of personalized learning.

Methods: The researchers used a combination of traditional literature review and policy analysis techniques, although these were vaguely described.

Results/Findings: The researchers found only weak support for personalized learning as an effective educational tool. There was much more evidence suggesting that personalization as a restricted, data-centric, hyper-rational approach to curriculum and pedagogy that limits students' agency, narrows what can be learned in school, and limits the ability of schools to respond effectively to a diverse array of students. For-profit entities seemed to be promoting a multitude of personalized learning offerings that privatize consequential educational decision-making, compromise children and teachers' privacy, and distort pedagogy in ways that stifle students' learning and their ability to grow as people and as participants in a democratic system.

Recommendations for Practitioners: Researchers recommend external review of personalized educational programs and products. They also recommend that algorithms be tested for biases and assessments be evaluated for both reliability and validity. Finally, they recommended that data agreements be developed for students that make the entity collecting the data legally responsible for collecting it, that outline the data being collected about them and discuss when it will be deidentified and how the data will be used.

Catalano, A. J., Torff, B., & Anderson, K. S. (2021). Transitioning to online learning during the COVID-19 pandemic: Differences in access and participation among students in disadvantaged school districts. *The International Journal of Information and Learning Technology*, *38*(2), 258-270. https://www.emerald.com/insight/content/doi/10.1108/IJILT-06-2020-0111/full/html

Author Abstract: Purpose – The novel coronavirus, COVID-19, which emerged in 2019 and quickly spread to the United States, resulted in widespread closure of PreK-12 schools and universities and a rapid transition to online learning. There are concerns about how students in high-needs school districts will engage with online learning, given the limited access many disadvantaged students have to Internet and computers. Accordingly, the purpose of this study is to determine teacher perceptions of students' access and participation to online learning, as well as concerns about educational outcomes among different groups of learners.
Design/methodology/approach – The authors surveyed 300 K-12 teachers in NY state about the tools and accommodations they employed in their online teaching, whether their students were participating in the online learning and the reasons for their lack of participation.
Findings – Respondents reported that nearly 30% of all of their students were not regularly completing their assignments. Students in high-needs districts were significantly more likely to not complete their work. Teachers reported being very concerned about their students' educational outcomes, particularly students with disabilities (SWDs) and English language learners (ELLs). Respondents also provided suggestions for improving educational access to online learning in the future.
Originality/value – No published research has yet examined student compliance in online learning during an emergency and, in particular, during this unprecedented time of the COVID-19 pandemic and months-long stay-at-home orders.

Annotation

Background: The study took place during 2020 when school buildings were closing in New York state and other locations around the world due to the COVID-19 pandemic. During the spring of this year, public K-12 teachers–most of whom had never had previous experience or instruction in how to teach online–were required to deliver instruction through online and distance modalities. Due to a concern about the participation rates for English learners and students with disabilities, researchers conducted a survey to find out whether these populations were able to participate.

Methods: Researchers surveyed 300 K-12 teachers in NY state about the tools and accommodations they were using in their online teaching practices as well as whether their students were participating in the online learning and the reasons for their lack of participation. The teachers who took the survey were graduate students at a large university in New York state. The survey was also posted to several listservs and Facebook pages for local school districts. Questions were asked in a variety of formats including multiple answers, fill in and Likert-type. Fill-in answers were coded where possible. One question asked for an extended response about what a school district could do to improve online learning in the future. Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 25. Most teachers who responded to the survey taught on the secondary level. There were 119 high school teachers

(39.4%), 100 middle school teachers (33.1%), 71 elementary teachers (K-5) (23.5%) and seven prekindergarten teachers (2.3%). Three respondents taught special education in grades K-12. The respondents taught a diversity of subjects, including science (n=61), social studies (n =50), elementary grades (n =39), special education in either elementary or middle school (n =34) and ELA (n=32). Most participants taught in general education settings (n =236; 78.1%), with 54 (17.9%) working in special education and 10 (3%) employed teaching English learners. A large majority of respondents indicated that they have English learners in their classes, but only 10 respondents (3%) were certified to do so.

Results/Findings: Most respondents reported supporting SWD one-on-one via phone or video conferencing (53%; n=159); 46% reported providing different levels of learning materials (n=126) and 38% provided learning materials in different modalities (n=115). Teachers also reported giving SWD more time to complete their assignments and were in frequent communication with these students and their parents. Many teachers reported that SWD were also supported by a resource-room teacher or special education co-teacher. Others reported that the IEP goals separately via video conferencing or telephone or reading assignments aloud via video conferencing using closed captions. Nine percent (n=28) stated that they were not employing any accommodations. Several teachers responded that they were very overwhelmed creating content. Respondents reported that distance-learning assignments had not been completed by 29.59% of students overall, including 28.14% of general-education students, 30.18% of SWDs and 30.45% of ELLs. Assignments had not been completed by 27.2% of elementary students, 31.05% of middle school students and 25.25% percent of high school students. Respondents in high-needs districts reported noncompliance in 36.35% of their students. Teachers stated that the reasons students were not turning things in included a lack of parental supervision, lack of ability to understand the task, laziness, lack of motivation, and a sense they were on vacation.

Recommendations for Practitioners: The researchers suggest more communication with parents and more resources for teachers. It might also be useful to talk directly with teachers about topics like bias against students who are poor, multilingual and/or have learning differences as these teachers seemed very eager to position the children in deficit for what was a very difficult situation. Professional learning for stronger instructional practices also seems necessary, rather than becoming frustrated that their parents are unable to teach them at home.

Cooper, C. M., Przeworski, A., Smith, A. C., Obeid, R., & Short, E. J. (2023). Perceptions of social-emotional learning among K-12 teachers in the USA during the COVID-19 pandemic. *School Mental Health*, *15*(2), 484-497. https://link.springer.com/article/10.1007/s12310-022-09563-w

Author Abstract: Social–emotional learning (SEL) is the process of acquiring and applying knowledge, skills, and attitudes to achieve long-term relational and emotional goals. Teachers often implement SEL strategies in the classroom; however, shifting to online schooling during the COVID-19 pandemic may have impacted teachers' perceptions of their abilities to implement SEL. This study was designed to identify whether and how teachers' perceptions of SEL changed since the onset of the COVID-19 pandemic. Teachers ($N = 637$) in the USA completed a demographic questionnaire, the Depression, Anxiety, and Stress Scale (DASS-21), and rated

their beliefs about SEL during the pandemic on a modified version of the Comfort and Culture subscales of the Teacher SEL Beliefs Scale. Data were collected between September 2020 and March 2021. Teachers indicated that they felt neutral to comfortable with SEL and that they felt neutral to supported by their school culture for SEL during the pandemic. Lower depression symptoms, greater school poverty, and perceived general support (not specific to SEL) from the administration were associated with higher teacher comfort with SEL. Further, greater general support from the district and colleagues was associated with greater school culture supporting SEL during COVID-19. Results suggest that addressing teachers' internalizing symptoms and fostering a supportive work environment is important in aiding teachers in SEL implementation.

Annotation

Background: Social-emotional learning (SEL) has received increased attention in schools leading up to and during the COVID-19 pandemic. Previous research suggested that when teachers are under more distress and in more economically distressed schools they are less likely to implement SEL practices for students. At the onset of the pandemic, the researchers hypothesized that the stress of the pandemic and the school building closures would produce the high stress scenario that would lead to less SEL teaching.

Methods: A total of 637 K-12 teachers from 49 states were recruited using social media sites, emails to administrators with requests to email teachers, and direct emails to teachers using emails found on school websites. Most teachers identified as female, earned a Bachelor's or Master's degree, identified as White, and taught in public schools. Geographic setting of the school was balanced (i.e., 30.2% urban, 39.6% suburban, 29.5% rural), as was union membership (i.e., 50.1% union member, 49.9% nonunion). Teachers taught grades K through 3 (17.6%), 4 through 6 (12.7%), 7 and 8 (12.7%), 9 through 12 (35.4%), "other" grades (e.g., special education; 1.0%), and a combination of grade levels (20.5%). Differences based on race and ethnicity could not be calculated due to small samples of teachers who identified as Black/African American, Hispanic/Latinx, Asian/Asian American, Native Hawaiian/Pacific Islander, First Nations/Indigenous/Native American, and multiracial. The Teacher SEL Beliefs Scale is a 12-item scale that assesses teachers' comfort with, commitment to, and school culture surrounding SEL. The scale consisted of three subscales: Comfort, Commitment, and Culture. In the current study, the four-item Commitment subscale was not administered. Because there were survey items taken out, tests were re-done to ensure internal validity.

Results/Findings: The predictor variables of whether the teacher was using SEL practices were: teacher and school, school poverty level, perception of collegial and district support, and internalizing symptoms–or their own state of social and emotional health. These variables generally aligned with findings from previous research. One surprising finding was the high correlation between the perception of support, particularly at the administrative level for doing SEL and the teachers' willingness to do the practices. Unfortunately, most of the predictors around levels of personal mental health and the poverty of the school cannot be alleviated quickly by specific interventions at the school level.

Recommendations for Practitioners: The most promising strategy that school officials can do something about is ensure that administrators are able to convey a sense of support for SEL in

schools. They might do this by building time into the school schedule or by providing curriculum resources, compensation, or other tools. For those factors which cannot be addressed adequately or at all by school interventions, it might be important to help teachers take stronger interest in the strengths of themselves and their communities and in allowing teachers as much agency as possible to be decision making agents for making plans to support children in communities that have economic challenges.

Crouse, T., & Rice, M. (2018). Learning to serve students with disabilities online: Teachers' perspectives. *Journal of Online Learning Research*, *4*(2), 123-145. https://www.learntechlib.org/p/182859/

Author Abstract: As K-12 online learning continues to grow for all student populations, so should knowledge of best practices related to teaching with diverse learning needs, including students with disabilities. The absence of a strong literature base provides a unique opportunity to explore issues of identity and agency of teachers in these settings, particularly as they consider their role in the call for highly skilled, high-quality instruction for all students, regardless of disability status. This study explored descriptions of practice from fully online teachers in their instruction of students with disabilities. Data were collected using semi-structured interviews of online teachers across a variety of grade levels. Analysis involved both thematic and theoretical elements to identify concepts for interpretation. Findings were divided into two major concepts: 1) online teachers' learned practices about working with students with disabilities, and 2) teachers' sources of knowledge about "good" teaching practices when working with students with disabilities.

Annotation

Background: Although parents and children who have been identified with disabilities had been showing increased interest in online schools and programs leading up to the pandemic, there were few opportunities for teachers to learn instructional strategies for supporting this population for a few reasons. First, there were few models in general for online teacher preparation, and second, online learning was historically considered a highly restrictive setting for students identified with disabilities that special education did not like to place children into. The researchers conducting this study wanted to find out what teachers who were working with students identified with disabilities were able to learn to do for these students in terms of instructional practices. Research questions were 1. What do online teachers know about working with students with
disabilities in a virtual school setting? And 2. What do these teachers credit for their acquired knowledge?

Methods: Six teachers from four states participated in interviews where they discussed their teaching background and qualifications as well as their teaching practices. The data from these interviews were analyzed by two researchers engaging in cycles of repeated re-reading, note taking, comparisons, and theme-making across several sessions. Four major themes emerged from these cycles of analysis.

Results/Findings: The major themes around teacher knowledge for question 1 were: curriculum (e.g., lesson planning, monitoring progress), instructional grouping (e.g., one-on-one, small group based on practice needs), parent communication (e.g., multiple types of communication, and ability to explain concepts to parents), and technological support (e.g., text-to-speech, chatrooms, pointer tools). In terms of where the teachers learned these, the most common place was from their experience teaching offline before becoming online teachers. They also learned from their experiences working with the children and some from their preservice experiences and from their professional learning.

Recommendations for Practitioners: The researchers recommended making space for online teachers to discuss ways to repurpose their offline experiences for online teaching. These might be formal or informal professional learning. It was also important for teachers to feel some sense of agency in their teaching in order for them to be motivated to learn to do new instructional moves for students, so providing maximum opportunities for teacher decision making was also an important recommendation.

Daftary, A. M. H. (2022). Remotely successful: Telehealth interventions in K-12 schools during a global pandemic. *Clinical Social Work Journal*, *50*(1), 93-101. https://link.springer.com/article/10.1007/s10615-021-00818-8

Author Abstract: The K-12 school setting is often considered an ideal environment to provide social emotional programming for children and youths. However, the COVID-19 pandemic caused most K-12 schools to close their physical doors and shift to telehealth approaches to fulfill students' academic and non-academic needs. For the first time, school social workers (SSWs), often responsible for the social emotional well-being of students, were required to provide social emotional services virtually. Subsequently, this research study explored SSWs' experiences implementing social emotional telehealth services in K-12 public schools during the spring semester of 2020. Twenty SSWs from nine school districts across three states participated in key informant interviews related to their experiences navigating their professional role during distance learning. Data were analyzed using a constant comparative approach. The findings highlight the barriers SSWs encountered when providing social emotional telehealth interventions, including poor attendance resulting in ineffective group interventions, technology-specific barriers, and concerns for students' privacy. Opportunities and potential solutions to strengthen telehealth in schools are discussed.

Annotation

Background: Schools perform services to students and have patrol roles in communities beyond providing instruction. One of those services is access to social service workers. During the school building closures associated with the COVID-19 pandemic, students may have needed additional mental health support but they would have also been cut off from these services. The solution in some schools was to try to provide these services through telepresence. The research question for this study was: What were the challenges that SSWs experienced, and what are potential solutions, as they relate to the implementation of social emotional telehealth services for students during the spring semester of 2020?"

Methods: The research design was exploratory qualitative. Purposive and snowball sampling methods were used to identify social service workers employed in K-12 public schools during the spring of 2020 and to invite them to participate in the study. Researchers found participants through professional networks in Nevada, Colorado, and Minnesota.Twenty SSWs completed 1 to 2 hour semi structured interviews between May 4 and June 17, 2020, via video conference. Interviews had two parts: a semistructured interview that was audio recorded and a demographic form. Interview questions focused on describing school social work practice before and during during the spring semester of 2020). Examples of the questions included: (1) What has been your experience as an SSW during the COVID-19 health crisis?; (2) Can you describe your typical day as an SSW since the COVID health crisis?; (3) Since COVID-19, what are your biggest concerns or challenges as an SSW? How have you addressed them?; and (4) What has been the most helpful for you in this crisis? Three cycles of coding were used to analyze the data: holistic coding, linguistic frequency coding, and focused coding.

Results/Findings: There were several barriers to providing social work support to students through telepresence. The first was that students would miss their appointments. The second was that there were numerous technology barriers. The third was that student privacy was an issue both in keeping bad actors from coming online and breaking through barriers and in finding private places to do teletherapy in homes and other spaces.

*Recommendations for Practitioner*s: The researchers recommend building rapport with students and in finding creative ways to make the appointment model less relevant, such as holding drop in times. They acknowledged that there was little that could be done by telepractitioners to address internet issues. However, any school that is promising these types of services should consider what digital connectivity is available and what privacy they can guarantee before advertising these services to families.

Frazier, D. K., & Tolbert, J. B. (2023). Long-term educator professional development in online instruction and assessment during pandemic teaching. *The Teacher Educator, 58*(1), 91-108. https://doi.org/10.1080/08878730.2022.2145402

Author Abstract: Educators were forced into emergency remote teaching due to COVID-19. Educational grants through the Governor's Emergency Education Relief (GEER) fund provided assistance. A regional university partnered with a local educational service center to use GEER funds to prioritize P-12 teacher professional development in online instruction. The partnership revamped a 12-credit hour four-course graduate certificate program in online learning and assessment, cotaught by university faculty and K-12 community partners, enrolling 58 local educators across 42 school districts in free graduate courses during the 2020-2021 academic year. With a 95% completion rate, this long-term professional development met educators' needs, including how to simultaneously teach face-to-face and at-home students in changing school environments. This descriptive study gathered educator perceptions regarding how the courses impacted their ability to learn and use best practices in technology integration with their students, and support colleagues as they created district-specific professional development and developed into technology leaders.

Annotation

Background: In response to the pandemic, the Governor of a Midwestern state made emergency education relief grants available to educational institutions in the state. One regional university secured one of these grants to revive a graduate certificate in online learning and assessment program that had previously existed, but had been closed around 2013. As the grant was secured in conjunction with one of the local educational service centers, the revived version of the certificate saw all courses being co-taught by one university faculty member and one K-12 professional from the service center. The grant provided funding that allowed a total of 58 educators to enroll in the graduate certificate free of charge (and 55 completed all four courses needed for the certificate).

Methods: The study was designed to explore the experiences of the 58 educators in this revived certificate program. The sample for this study was taken from the 58 educators who enrolled in one or more courses in the certificate program. The data collection includes surveys at the end of each of the courses, which had a range of 20-31 participants, and two focus group interviews with three of the educators. The quantitative data were analyzed using descriptive statistics and correlation, while the qualitative data were analyzed using inductive analysis.

Results/Findings: The authors grouped their findings into three broader categories. The first broad category was the reasons why the educators enrolled in the certificate programs, which included the immediate issue of providing educational opportunities during the pandemic, a way to earn four courses towards an eventual graduate degree for free, or the educator was selected by an administrator of personally asked to enroll. The second broad category focused on the educators' level of satisfaction with the content and what they still wanted to learn, which revealed that the educators were largely satisfied with the content. Some of the exceptions were instances where the content focused on tools or functions of the tool that were unavailable to the educator in their professional context or for educators outside of the core subject areas who indicated that there were few – if any – examples reflective of their context. The final broad category focused on the educators' own professional development, which was actually the culminating experience in the final certificate course (i.e., to create a professional development opportunity for their colleagues). The authors reported that the educators' tended to focus their professional development on more access to tools, opportunities for direct experience with the tools or strategies in their own contexts, or avenues for collaboration or exchange between professionals.

Recommendations for Practitioners: The recommendations for practitioners were primarily focused on teacher preparation. For example, the authors indicated that a strength of the certificate was that courses co-planned and co-taught by both university faculty who could provide the academic and research background and K-12 community school partners who were able to relate content to the actual experience in the educators' own classrooms. The authors also recommended that universities could better support their K-12 partners by assisting with planning, implementing, and measuring the impact of technology-related professional development and allowing researchers the opportunity to study best practices in technology-related professional development.

Harris, L., Dargusch, J., Ames, K., & Bloomfield, C. (2022). Catering for 'very different kids': distance education teachers' understandings of and strategies for student engagement. *International Journal of Inclusive Education, 26*(8), 848-864. https://doi.org/10.1080/13603116.2020.1735543

Author Abstract: Compulsory distance education has always sought to be inclusive, providing educational opportunities for K-12 students unable to attend mainstream, face-to-face schools for medical, geographical, or personal reasons. However, how to effectively engage these diverse learners has remained a perpetual challenge, with a need for further investigation into the nature of student engagement with compulsory school distance contexts and how teachers can best support it. This qualitative study used focus groups (n = 2 groups, n = 16 participants) to examine teacher definitions and student engagement strategies within eKindy-12 distance education in Queensland, Australia. Categorical analysis was conducted using a priori codes for definitions, focusing on four previously established engagement types (i.e. behavioural, emotional, cognitive, and agentic engagement), and in vivo codes for strategies. Teacher definitions focused strongly on behavioural engagement, but most also contained elements of emotional and cognitive engagement; agentic engagement was only occasionally evidenced via practice descriptions. Teachers described engaging students by: building relationships, creating a safe classroom environment through differentiation, using inclusive technological tools to facilitate interaction and monitor progress, making learning fun and relevant, drawing on school-wide pedagogical frameworks and teaching strategies, and encourage self-regulation. Findings suggest distance education teachers face unique challenges around evidencing engagement and supporting student agency.

Annotation

Background: The study occurred in a distance learning school in Australia with two regional campuses that collectively served the range of students from K-12. The instructional model relied upon asynchronous instruction and coursework with scheduled, but optional synchronous sessions. From 2013 to 2017 the distance learning school experienced significant growth, yet the outcomes for these distance learning students lagged behind their brock-and-mortar counterparts. The authors sought to explore how teachers at this distance learning school understood and attempted to enact student engagement in their teaching.

Methods: The samples included 16 teachers who participated in two focus groups as a means of data collection. The researchers utilized a categorical analysis of the transcripts from the focus groups as a method of data analysis. While the article was published in 2022, it appears that the data was collected around 2017 (as the description and data of the distance learning school and its context are all based on information from that year). However, this is an assessment on the part of the annotator, as the authors do not indicate exactly when the data was collected.

Results/Findings: The authors reported that teachers had difficult defining student engagement in a distance context, and when they did their descriptions tended to focus on aspects of behavioral engagement and, to a lesser extent, emotional and cognitive engagement. The authors indicated that there were few references to agentic engagement or what North American practitioner might describe as personalization.

Recommendations for Practitioners: While it was technically part of the findings, the authors explored with the teachers specific strategies that could be used in the distance learning environment to encourage student engagement. In response to this line of inquiry, the teachers recommended six strategies: (1) build relationships, (2) create a safe classroom environment through differentiation, (3) use technological tools to facilitate interaction and monitor progress, (4) make learning fun and relevant, (5) draw on school-wide pedagogical frameworks and teaching strategies, and (6) encourage self-regulation.

Hu, Y., Wu, B., & Gu, X. (2017). Learning analysis of K-12 students' online problem solving: A three-stage assessment approach. *Interactive Learning Environments, 25*(2), 262-279. https://doi.org/10.1080/10494820.2016.1276080

Author Abstract: Problem solving is considered a fundamental human skill. However, largescale assessment of problem solving in K-12 education remains a challenging task. Researchers have argued for the development of an enhanced assessment approach through joint effort from multiple disciplines. In this study, a three-stage approach based on an evidence centered design framework is proposed to analyze problem-solving behavior, abilities, and performance. The approach is applied to assess the online problem solving of 554 students in a Shanghai primary school. The study reveals four clusters with distinctive problem-solving behavior, abilities, and performance. The findings of this approach also corroborate the results of the Programme for International Student Assessment of Shanghai students' problem-solving performance. The implications and limitations of this study are also discussed.

Annotation

Background: The study in this article was part of a larger project known as the Evidence-Centered Problem-solving Assessment Design (EsCaPADE). For the purposes of this study, the authors created an online problem solving assessment system that presented students with three different cases. Each case included a "problem description panel, interactive problem-solving panel, simulation display panel, and question panel," and students had to complete each case within a 45-minute window. Students were required to access the online problem solving assessment system in a lab that hosted 40 students at a time.

Methods: The sample included 554 randomly selected grade three to five students from a single elementary school in Shanghai. The authors utilized a three-stage approach using the learning analytics generated by the online problem solving assessment system. "First, [they] clustered students into several groups based on certain general problem-solving summary variables. Second, cognitive diagnostic assessment (CDA) was used to investigate the cognitive attributes of students in each cluster in alignment with the testing problems. Third, sequential data mining was conducted to analyze the problem-solving behavior patterns for each cluster."

Results/Findings: The authors found that the students who exhibited the highest level of performance in problem solving tended to have higher scores in cognition, metacognition, and efficiency. The authors described these students as the "thinking before leaping" type or students who thought through their options before acting. A second group was found to also have a high

level of performance in problem solving, but this group of students had lower metacognitive scores and were thus less efficient and more impulsive in their approach. A third group who were found to have a middle level of performance in problem solving had similar trends to the first two groups, but these tended to be younger students who the authors speculated may have less experience with problem solving or the specific online system. The final group were described as having a low level of problem solving ability. The authors indicated that this group was characterized as only understanding the problems at a superficial level and their main approach to solving the problem was through trial and error.

Recommendations for Practitioners: The implications for practice from a K-12 distance, online, and blended learning context are limited. This is a good example of a study that wasn't focused on the distance, online, and/or blended environment… The data collection just happened to take place in an online system as the students were engaged in a blended setting. The study was solely focused on characteristics of problem solving. With that in mind, the authors did provide one specific recommendation from their findings. The authors reported that "when students spent more time on knowledge acquisition (i.e. understanding the underlying system structure), their problem-solving performance improved, whereas if they spent more time on knowledge application (i.e. actively working on a solution to the problem), their overall problem-solving performance worsened," which provides useful guidance to teachers who wish to incorporate or model problem solving in their own classrooms.

Katz, D., Huggins-Manley, & Leite, W. (2022). Personalized online learning, Test fairness, and educational measurement: Considering differential content exposure prior to a high stakes end of course exam. *Applied Measurement in Education* 35(1), 1-16. https://doi.org/10.1080/08957347.2022.2034824

Author Abstract: According to the Standards for Educational and Psychological Testing (2014), one aspect of test fairness concerns examinees having comparable opportunities to learn prior to taking tests. Meanwhile, many researchers are developing platforms enhanced by artificial intelligence (AI) that can personalize curriculum to individual student needs. This leads to a larger overarching question: When personalized learning leads to students having differential exposure to curriculum throughout the K-12 school year, how might this affect test fairness with respect to summative, end-of-year high stakes tests? As a first step, we traced the differences in content exposure associated with personalized learning and more traditional learning paths. To better understand the implications of differences in content coverage, we conducted a simulation study to evaluate the degree to which curriculum exposure varied across students in a particular AI-enhanced learning platform for Algebra instruction with high-school students. Results indicate that AI-enhanced personalized learning may pose threats to test fairness as opportunity-to-learn on K-12 summative high-stakes tests. We discuss the implications given different perspectives of the role of testing in education.

Annotation

Background: When learners have so-called personalized experiences in a course, there are questions when they come to the assessment as to whether all the students were able to gain access to the content needed in order to have an equitable chance of doing well. The purpose of

this simulation study was to determine whether hypothetical learners would have equitable or approximately so chances to see all the major concepts and learn them before a test in a personalized learning program called Algebra Nation, which is part of Math Nation. The overarching research question of our simulation was: After engaging in the AI-enhanced curriculum for a full school year, what are the Algebra 1 content exposure differences amongst students who have received personalized instruction as well as students who have received non-personalized instruction?

Methods: The simulation study was intended to mimic the actual operation of the personalization
system as designed. Researchers created and compared three groups of hypothetical students.
(1) Personalized growth group: Students who received topic and video recommendations and whose CYU trait scores grew within each section each time they say a new topic.
(2) Personalized non-growth group: Students who received topic and video recommendations but did not grow in CYU trait scores within each section.
(3) Control group: Students who did not receive topic or video recommendations but simply advanced through the system linearly, moving from one topic to the next in order of their presentation in AN, which aligns with the state algebra standards progression.

The hypothetical students were generated by defining 20 clusters of students that represented peer trait score groups. These clusters were generated such that cluster 1 had the lowest average trait score estimate and cluster 20 had the highest average student trait score estimate. In each cluster, student abilities were generated from normal distributions with the mean and standard deviation equal to the cluster mean and standard deviation. These clustered "peer" students were used to create average abilities for each topic within each section. Researchers drew 100 students randomly, generated from a normal distribution with the specific cluster parameters describing the distribution from which to be drawn from each cluster. The trait score drawn for the student was subsequently treated as the true trait score of the student, with the exception that in the "growth group" this true trait score was increased by .1 logits within a given section for each new topic that was presented.Each students was sent through the recommender system in the program. Since the recommender system only estimates a student's trait score level based on three items, researchers generated item responses on the pretest for each section based on individual student true abilities. Probability scores were then estimated. The full process occurred whenever a simulated student was exposed to a new topic under the personalized recommender system. For control group students, no trait scores were needed as they did not play a role in their path through the system. Researchers kept track of what the students accepted as recommendations and how they interacted with the materials. Then they charted the student paths through the courses.

Results/Findings: In most instances, the median proportion of a section covered from the control group – the group that moved sequentially with no recommendation system – was higher than the recommendation system students. In some cases, the control group had only a few combinations of data for proportion covered. In the other sections, the range of the control group is often much smaller than the recommendation groups. However, for the recommender groups, the minimum and maximum content exposure in some sections was between 0% and 100% since the recommender can recommend within and outside the current section to maximize student

mastery. To understand student peer clusters on content exposure, it seems like students in the highest cluster are more likely to be sent backwards since slightly more students, based on the 25th percentile lines in the box plots are likely not to have exposure to certain sections. The logic of mastery within the personalization system – moving forward, or at least seeing videos associated with later (and more advanced) topics, is not necessarily viewed as beneficial for high trait score students, meaning that cluster coverage does not seem to increase across sections as trait score increases.

Recommendations for Practitioners: Researchers recommended that measurement fairness needs to be a broader topic within personalized learning. There also needs to be more transparency from vendors about how students are routed through lessons and under what logics. For students where they are under legal requirement to have access to curriculum on par with peers and at grade level, there are serious implications when 'non-learners' and 'learners' in these environments may have uneven access to content coverage.

Khazanchi, D., Bernsteiner, R., Dilger, T., Groth, A., Mirski, P. J., Ploder, C., ... & Spieß, T. (2022). Strategies and best practices for effective eLearning: Lessons from theory and experience. *Journal of Information Technology Case and Application Research, 24*(3), 153-165. https://doi.org/10.1080/15228053.2022.2118992

No author abstract.

Annotation

Background: The authors begin this article with a statement about the impact of the pandemic and the rapid shift to eLearning on education is still being understood. However, based on their experience and understanding of the field of distance learning, that both the challenges and best practices in the eLearning environment were not new, and could be described based on what was known from the existing literature.

Methods: The article was a commentary piece, which was in keeping with many of the articles published by this journal that focused on cases and application. The suggest that were made tended to be fairly well grounded in either academic literature or examples from popular media – often both.

Results/Findings: As this article was not a research study, there were no findings as such. To use the authors' own words, "drawing upon more than two decades of research on distance learning and virtual teams, this paper provides practical guidance for being effective at eLearning."

Recommendations for Practitioners: In the concluding portion of the article, the authors summarized the 10 recommendations that they had developed throughout their commentary as:

"(1) have a clear and well-communicated syllabus;
(2) use a stable and robust eLearning platform;
(3) use multimode learning which combines online synchronous and synchronous face-to-face (F2F) class sessions. We believe that in a post-Covid-19 era, traditional F2F classes will still exist, but hybrid models that include F2F components will be part of

the future of postsecondary education around the world. For example, in the USA alone according to a 2021 survey over a 70% of postsecondary students prefer taking at least one online class;
(4) being effective at building good eLearning experiences is hard and substantively more work than a traditional face-to-face class, particularly for instructors and even more so for the learners;
(5) choice of pedagogical approaches needs to be aligned with multiple learner styles, and intentionally empathetic – it is important to place yourself in the shoes of the learner.
(6) communicate early, clearly, and often – establish a "rhythm" or heartbeat for all class interactions (small groups, discussions, breakouts, office hours, assignments). Use a bundle of technology capabilities for communication (e.g., Skype, Discord, Slack, e-mail, eLearning platform messaging, text, phone, etc.) and predefine their purpose in collaboration with learners;
(7) breakup your online class into small sub-sessions with lots of interactions;
(8) where viable, instead of lectures, use a flipped classroom or other strategies to share expository information. Follow that up with discussions and reflections;
(9) remember that pedagogical-informed strategies must empower all eLearning; and
(10) be "available" and "present" online for your students."

Ko, E. G., Joo, S. H., Lim, K. Y., Resta, P. E., & Jang, E. K. (2022). How Korean K-12 educators adapted to online teaching and promoted digital equity during COVID-19: A mixed-method study on practices and perceptions. *Journal of Education and Training Studies, 10*(1), 59-80. https://doi.org/10.11114/jets.v10i1.5422

Author Abstract: The abrupt transitions to online teaching during COVID-19 have exacerbated educational discrepancies worldwide. South Korean schools faced similar challenges primarily due to the insufficient infrastructure and pedagogical guidelines for online teaching. This mixed-method case study investigated how Korean K-12 teachers and administrators converted to online teaching and addressed related digital equity issues during their first semester of online teaching in response to the pandemic. Interviews, as well as survey responses at the beginning and end of the semester, were analyzed through Activity Theory (AT) and Technological Pedagogical Content Knowledge (TPACK) frameworks. The study's key insights were that the digital equity issue is related to quality teaching issues beyond infrastructural problems and that teachers took various strategies to maximize the effectiveness of their blended teaching. We aim to shed light on supporting equitable online learning and sustaining positive changes in the post-COVID era.

Annotation

Background: When the pandemic hit in Spring 2020, South Korea already had a 30+ year history with K-12 distance learning. Investment by successive governments meant that the technical infrastructure, the instructional content, and much of the pedagogical knowledge was already in place when schools closed and learning transitioned to a remote context in April 2020. As the severity of the pandemic began to decrease there was a partial re-opening of schools in June 2020 using a blended model of instruction. Six months after the initial closure of schools, the

authors sought “to understand and record how the South Korean K-12 administrators and teachers converted to online teaching and addressed related digital equity problems.”

Methods: Participants in the study included approximately 150 K-12 school teachers. The authors utilized three methods of data collection: (1) online teaching readiness survey, (2) online teaching reflection survey, and (3) interviews. All three instruments were based on the Korean Ministry of Education’s online teaching guideline, which “suggested the three methods of online learning: (a) one-way task-oriented lesson, which assigns quizzes or self-directed tasks asynchronously; (b) one-way content-oriented lesson, which uses teachers-created lectures or external resources to deliver the lesson contents asynchronously; and (c) real-time interactive lesson through which a teacher and students interact synchronously via video-conferencing tools.” Quantitative data were analyzed using descriptive statistics, while qualitative data was analyzed used a thematic analysis through the lens of the Technological Pedagogical Content Knowledge (TPACK) framework.

Results/Findings: Most teachers reported digital inequity primarily in the form of differing levels of student digital literacy, while most administrators reported digital inequity in the form of student access to digital devices. Both teachers and administrators also reported facing technical and pedagogical challenges during the rapid transition to online teaching (specifically in areas that fell into the technological pedagogical content knowledge portion of the TPACK framework). Interestingly, there was one statement made by the authors was likely true of both online and face-to-face learning during and prior to the pandemic: “While students with self-directed learning skills, parental support, access to private tutoring and appropriate devices successfully executed online learning, marginalized students experienced difficulties without adequate support from guardians or teachers.” In a predictable fashion, the authors reported that teachers felt most confident with teaching methods that were consistent with their classroom-based practices, which they also felt were more effective. These methods tended to focus on the provision of content, followed by task-focused activities. Interactive activities were the least used, but interestingly viewed as the most effective.

Recommendations for Practitioners: One of the most striking aspects of this study was the reality that in one of the most connected jurisdictions (which has historically prided itself on the citizenry’s access to broadband and devices), the first set of findings that the authors reported related to a lack of student access and a lack of student knowledge. This is a lesson for teachers to make sure that during non-emergent times they prepare their students to know how to learn in a digital environment. It is also a lesson for administrators to ensure that access to devices means access to specific device that is both capable of and has the facility to run the tools needed to learn online. Finally, the author’s finding that both teachers and administrators were challenged by a lack of technological pedagogical content knowledge – especially given the pre-pandemic access to online learning tools, content, and teacher professional development – underscores the reality that there is a significant gap between a teacher knowing simply how to use an online teaching tool and a teacher being able to effectively teach using that online teaching tool.

Kurt, G., Atay, D., & Öztürk, H. A. (2022). Student engagement in K12 online education during the pandemic: The case of Turkey. *Journal of Research on Technology in Education, 54*(sup1), S31-S47. https://doi.org/10.1080/15391523.2021.1920518

Author Abstract: Student engagement has become a challenge for K-12 students and teachers in online education during the COVID-19 pandemic. This study explored the factors underlying student engagement and the strategies teachers developed to engage students. Thematically analyzed interview data coming from 22 teachers and 20 students of public high schools revealed teachers' and students' similar perceptions of the factors affecting student engagement. The four themes identified were instructional and student related factors along with those related to the learning environment and policies. The teacher strategies for the facilitation of student engagement were instructional, managerial, and affective. Teachers also discussed which of these strategies were helpful in fostering student engagement.

Annotation

Background: Like many international jurisdictions, Turkey has invested heavily over the past two decades to increase access to technology in schools and increase the use of technology in teaching. in the provision of digital infrastructure and digital content. One of the recent initiatives was the Education Information Network (EIN), which was designed to provide digital content from K-12 and digital infrastructure to house and deliver that content. During the pandemic, students and teachers were able to utilize this platform and asynchronous content for the purposes of remote learning. This study was designed to examine that experience and "explore the factors underlying student engagement in K-12 online education and teacher strategies used to support it."

Methods: The authors followed a "phenomenological research design in order to understand student engagement in online learning from the perspective of students and teachers…. [and in that] tradition, participants were purposively selected based on their experience in the phenomenon being investigated." The sample included a total of 22 teachers and 20 students (all of whom were in grades 9 through 12). The data collection method was interviews, which were analyzed using a six-phase inductive thematic approach.

Results/Findings: Students indicated that their motivation, concentration, and active participation were closely related to the teacher's instruction; although there wasn't much direct evidence to indicate how differences in the teacher's instruction impacts these items (beyond individual quotations about the duration or speed of teacher talk, opportunities for interactivity or going over homework synchronously). Both teachers and students indicated that individual student factors impacted the students' level of engagement, and used phrases like goal-oriented, self-regulated, perceived the relevance of instruction to their future goals, personal relationship between the teacher and student, and student well-being to describe those that had positive effects. Additionally, both students and teachers spoke about online instructional practices that were familiar (i.e., consistent with what they were used to in the classroom context) as being welcomed and positively impacted student engagement. Finally, the authors acknowledged the role that the parent played in this pandemic-induced full-time online learning environment.

"Parental support in organizing the physical learning space and the availability of technology had an impact on online student engagement."

Recommendations for Practitioners: One of the three research questions was specifically focused upon suggested strategies for teachers to increase engagement in the online learning setting. The recommendations that the teachers made fell into three categories: instructional, managerial, and affective. "Among the instructional strategies that produced online student engagement were designing and implementing engaging tasks and activities, focusing on familiar topics, and applying interactive teaching techniques…. To manage students' online learning, teachers monitored students' participation in synchronous and asynchronous classes, sent messages to remind the time and the content of the lessons, and rewarded students' contributions…. Finally, teachers invested time in supporting students emotionally by showing genuine concern for and care about their feelings."

Ladendorf, K., Muehsler, H., Xie, Y., & Hinderliter, H. (2021). Teacher perspectives of self-efficacy and remote learning due to the emergency school closings of 2020. *Educational Media International, 58*(2), 124-144. https://doi.org/10.1080/09523987.2021.1930481

Author Abstract: The K-12 Spring 2020 COVID-19 school closures saw teachers move into an online learning environment, and use their knowledge of technology, pedagogy, and content (TPACK) to develop online learning for the remainder of the school year. The purpose of this study was to examine the relationship between teachers' self-efficacy as measured by TPACK and their perceived success and satisfaction for delivering online learning during the emergency COVID-19 school closures. A web-based survey was conducted of in-service K-12 teachers instructing remotely. While teachers felt competent in technology integration and felt successful with the remote instruction in Spring 2020, teachers were not always satisfied with their online experience. Furthermore, content area proved to be a factor in predicting both success and satisfaction with online instruction. Teachers with a stronger understanding of their content area and instructional strategies related to the content did not feel their students were successful nor did they feel satisfied with their work online. Results from this study suggests additional support is needed for teachers to bring their teaching to an online platform. School districts should invest in the support and resources needed to provide teachers with professional development specific to grade level and content.

Annotation

Background: The authors begin the article by discussing the growth of K-12 online learning in recent years, but they situate the study within the context of the remote learning that was used during the early stages of the pandemic. The authors' stated "purpose of this study was to examine the relationship between teachers' self-efficacy as measured by [technology, pedagogy, and content knowledge or] TPACK to their perceived success for delivering remote learning during the emergency COVID-19 school closures, and how teachers' past experiences with remote learning, the grade levels taught, and the content area taught moderate the relationship between their self-efficacy and perceived success." As such there were individual research questions focused on each of these variables.

Methods: The method of data collection was an online survey, which was distributed on Twitter using hashtags related to online learning and K-12 educator groups and on Facebook in education focused groups. This strategy yielded a total of 100 useable responses. The data were analyzed using regression analysis to determine which variables within the TPACK framework impacted each of the five areas.

Results/Findings: (1) With respect to the teacher's perceived success and online teaching self-efficacy, "as teachers' CK [content knowledge] and TPACK increased or PCK [pedagogical content knowledge] decreased, the teachers' perceived success increased." (2) With respect to the teacher's satisfaction and online teaching self-efficacy, "only TPACK [was found to be a statistically significant predictor for teacher satisfaction." (3) With respect to teacher experiences as a moderating variable, "previously taking an online class did not statistically significantly moderate the relationship among TPACK [constructs and perceived student success." Additionally, "previously taking an online class did not significantly moderate perceived satisfaction." (4) With respect to grade level taught as a moderating variable, "grade level taught significantly predicted perceived success in some constructs but did not moderate the TPACK constructs." More specifically, "teaching high school compared to elementary school significantly improved perceived success" when it came to technological knowledge (TK) and pedagogical knowledge (PK). Similarly, "teaching high school compared to middle school significantly improved perceived success" when it came to CK, PCK, and TCK [technological content knowledge]. "Results showed that depending on the grade level the teachers taught, content knowledge also impacted teachers' satisfaction differently." For example, as CK increased the satisfaction of elementary teachers decreased. (5) Finally, there were several statistically significant findings with respect to content area taught as a moderator. As TK and CK increased, so did elementary math teachers perceived success. However. as CK increased there was a decrease in elementary special education teachers perceived success. An increase in TPK resulted in an increase in the perceived success from both elementary math teachers and elementary science teachers. Similarly, there were also several statistically significant results with respect to content area taught moderating online teaching self-efficacy and satisfaction. For example, an increase in the TK of elementary math teachers results in increased teacher satisfaction. Conversely, an increase in the CK of elementary fine arts teachers, elementary English teachers, and elementary science teachers all resulted in a decrease in teacher satisfaction.

Recommendations for Practitioners: The authors recommended "that additional professional development and support are needed for teachers to bring their pedagogical content knowledge to life online." The authors further suggested that "content specialists need specific support that can bridge their content knowledge with online teaching." The authors concluded their recommendations for practitioners by point out the reality that schools and districts shouldn't assume that past experience with online learning or just technological knowledge was sufficient for teachers to have a high level of self-efficacy or satisfaction with teaching online. Schools and districts "should invest the time, support and resources into providing teachers with training specific to grade level and content area."

Levin, D. A. (2021). *The state of K-12 cybersecurity: 2020 year in review*. K-12 Cybersecurity Resource Center and the K12 Security Information Exchange. https://static1.squarespace.com/static/5e441b46adfb340b05008fe7/t/620d58f6f14b822a371b8c7b/1645041911977/StateofK12Cybersecurity-2020.pdf

Author Abstract: This report—the latest in The State of K-12 Cybersecurity: Year in Review series—aims to help remedy an information gap on the risks from school cybersecurity incidents. By cataloging and analyzing data from every publicly-disclosed cybersecurity incident affecting public elementary and secondary education agencies across the U.S. in the prior calendar year, the series is intended to spur greater attention to the challenges of securing the K-12 IT ecosystem and suggest ways that policymakers and school district leaders might effectively respond.

Annotation

Background: There is no such thing as a completely secure IT system. In education, this has implications for the 50 million children in the U.S. who are in a school and have little actual say in where they go and what information goes into IT systems. The year 2020 was record-breaking in terms of IT breaches in schools in the U.S., which resulted in stolen personal information and increased the potential for students and school employees to be victims of fraud. The compilers of this document felt it was necessary to document these breaches and investigate their cases as near as could be done.

Methods: There was not a full explanation of methods. It seems that information was gathered about security breaches in terms of their causes, the damage done, and in terms of the characteristics of the schools where they occurred.

Results/Findings: Data breaches involving student and staff personal information were the most reported type of incident. In 75 percent of cases, security practices of school vendors and partners providing administrative services to school districts were the root cause. COVID-19's increase in remote instruction led to a new class of cyber threats (class invasion and its variants) and served to magnify the impact of other incidents, including denial-of-service attacks and ransomware. In many cases, these led to class cancellations for up to a week or more. While the absolute number of school districts experiencing ransomware attacks was greater during 2019, the severity of those incidents increased during 2020. Several of the nation's largest school districts were victimized by ransomware and during their attacks sensitive data on large numbers of current and past students and employees was exfiltrated, which lead to credit fraud and identity theft. Since 2016, the median amount of money stolen in such attacks is $2 million per incident. During 2020, a record-setting $9.8 million was stolen from a single school district. While every school is vulnerable to cybersecurity incidents, larger, urban and suburban school districts serving relatively higher-income communities were disproportionately likely to experience at least one cybersecurity incident from 2016-2020. School districts serving higher numbers of students in poverty also suffered disproportionately more incidents.

Recommendations for Practitioners: The authors of the report recommend that school districts increase resources for vetting the security policies and practices of all their vendors when making

contracts and periodically thereafter. Vendors should also take opportunities to focus on meaningful security features since they are often the source of security breaches. School districts often do not have resources and infrastructure in place to implement cybersecurity programs, general federal and/or state cybersecurity guidance; therefore, giving these resources and infrastructure first is important to do before giving a lot of guidelines. However, basic cybersecurity hygiene practices for students, for staff, and for school district vendor staff does have some benefits and these practices can be implemented (e.g., teaching how to notice a phishing email).

Liao, Y. C., Ottenbreit-Leftwich, A., Zhu, M., Jantaraweragul, K., Christie, L., Krothe, K., & Sparks, K. (2021). How can we support online learning for elementary students? Perceptions and experiences of award-winning K-6 teachers. *TechTrends, 65*(6), 939-951. https://doi.org/10.1007/s11528-021-00663-z

Author Abstract: K-12 online learning can be advantageous in a variety of circumstances, including inclement weather days and emergency remote teaching. With the lessons learned from the COVID-19 pandemic, many K-12 districts may consider ways to incorporate online learning into their regular school plans after they resume face-to-face instruction. However, the most challenges to online learning seemed to take place at the elementary level. This brings up an important question: What should elementary online teaching and learning look like? We examined six award-winning K-6 teachers' perspectives on and experiences with online instruction and practices for elementary students. The teachers suggested that online instruction to support elementary students' learning should be (a) organized, (b) engaging, and (c) interactive. Teachers also suggested that developmentally appropriate use of technology and parental involvement may foster elementary students' online learning experiences.

Annotation

Background: Following the Spring 2020 shift to remote learning, the authors recognized that teachers struggled to teach fully online – particularly elementary school teachers. Based on this recognition, and the reality that there was a dearth of K-12 online learning research focused on elementary level, the authors sought "to explore a group of K-6 teachers' perspectives and experiences of online learning" by creating a competitive program focused on designing online learning activities for elementary teachers in Indiana during the Summer of 2020.

Methods: The participants were "seven recipients of an elementary educator award for excellence in technology integration." As awardees, these seven individuals were required to attend monthly meetings where they would engage in "a focus group discussion about effective online learning and co-design activities… [where they created] an online learning module template with their grade-level partners based on the discussions and then shared it with the cohort." The data collection methods included the monthly focus group portion of the meeting, as well as the participants original award application (including all of the accompanying artifacts). The authors used grounded theory as a method of data collection.

Results/Findings: Overall, the "teachers perceived course organization, student engagement, and variants of interaction as essential components in online instruction to support students' online

learning at the elementary level." (1) "All participating teachers expressed that having organized online instruction that includes consistent course design and management is essential, especially when facilitating elementary students' learning in a virtual environment. Additionally, the teachers described the accessibility of course content and resources as the key to establishing students' daily learning routines." (2) "All teachers emphasized that online instruction would not be successful without engaging elementary students in the learning process. From the teachers' experiences, students were more engaged in online learning when teachers integrated (a) authentic learning experiences with choices and (b) age appropriate technology tools and resources." (3) The teachers perceived that interacting through (a) teacher facilitation and support, (b) peers, and (c) parental involvement was essential in online instruction to foster elementary students' online learning." (4) Finally, "the teachers described a need for teacher facilitation to make online learning more effective and interactive for elementary students" (e.g., "recorded videos of modeling and showcasing learning content or activities").

Recommendations for Practitioners: While the authors themselves did not make specific recommendations for practitioners, there are some useful practices suggested by the findings. For example, with respect to the fourth finding the inclusion of video-based instruction that helps students walk through the content or an activity in a step by step fashion where the student can watch a portion, pause the video and try to undertake that step on their own, before starting the video again to see the next step. Similarly the need to involve parents as a partner within the full-time online learning environment for younger students is a practice that has been long practiced. The use of consistent course design and consistent learning routines is another suggestion that is useful throughout the K-12 online learning context, but particularly for elementary level students.

Lindfors, M., & Pettersson, F. (2021). K–12 students' experiences of the synchronous remote teaching and learning environment. *Journal of Online Learning Research, 7*(3), 249-263. https://www.learntechlib.org/primary/p/219864/

Author Abstract: The use of online, distance, and remote teaching is a growing phenomenon in the K–12 context. The aim of this pilot study was to explore K–12 students' experiences of the synchronous (real-time) remote teaching and learning environment. The following research questions were posed: (1) What possibilities and challenges can be identified from the perspective of students? (2) What development needs can be discerned for unexperienced teachers and students in synchronous remote teaching and learning environments? Data were collected from 177 students, using a quantitative instrument with questions in four dimensions: teacher support, involvement, cooperation, and autonomy support. Findings reveal both possibilities and challenges experienced by students in the synchronous remote teaching environment.

Annotation

Background: Remote learning has been a formal part of the K-12 system in Sweden since about 2015. Government regulations require that "(a) remote teaching must be conducted synchronously, (b) the pupils should be in the physical classroom, and (c) a facilitator must always be in the same room." This article is focused on a remote learning project that provided

online modern language courses to eight schools in a largely rural region of the country. In the authors' own words, "the aim of this study is to explore K–12 students' experiences of the synchronous remote teaching learning environment."

Methods: While the data collection occurred in May 2020, it appears that the remote learning program had been in place prior to the pandemic. The data was collected using a survey that included both Likert-style and open-ended questions. The quantitative data was analyzed using descriptive statistics and the qualitative data using thematic analysis. The sample included 177 (out of a possible 192) grade 6-9 students.

Results/Findings: The authors indicated that the data revealed seven main themes. "The first theme, *teachers' overview in class*, highlights the teachers' opportunities to get an overview of what is happening in the actual learning environment and where the students are in their learning" (emphasis in the original in each instance), in particular the challenges that online teachers faced in accomplishing this task in comparison to their brick-and-mortar counterparts. The second theme focused on "the lack of *individual help and support* in the remote learning environment," which interesting the students focused more on their inability to show the teacher where they were struggling within their own work (as opposed to the teacher being unable to provide individual support). The third theme explored the problem of "the prevailing climate for communication in class and what consequences unasked questions might have for students' learning in the long run," especially the inability to quietly to the teacher questions in the synchronous environment without other students knowing. The fourth theme focused on the students' perception of the teacher as the "sage on the stage" within the synchronous learning environment. The fifth theme centered on the technical aspects of the course, and the necessity in a modern language course for seamless audio and video – something that was not always guaranteed with both the technology and the bandwidth provided by the schools. The sixth theme that students expressed was their understanding, even appreciation, of the fact that for all its challenges the remote learning program was the only way that they would have the opportunity to take these modern language courses from a certified teacher. Finally, in the seventh theme the students spoke about the flexibility provided by the remote learning program, including the ability to continue learning while at home.

Recommendations for Practitioners: Based on their findings, the authors recommended that teachers needed "to make students more involved in their learning [within the synchronous environment,] and at the same time make it easier for teachers to guide students' learning in the desired direction through their teaching choices." This recommendation was likely based on the reality that within most synchronous learning environments, it is easy for the teacher to fall back on methods of direct instruction (e.g., lecturing). The authors also recommended that it was important that remote learning programs include opportunities for students to learn more about how to use and how to learn with the remote learning tools, to ensure that the technology does not become an impediment to the student learning. Finally, one of the interesting comments that the authors made that wasn't taken directly from their findings, but is quite a useful recommendations for practitioners was "the importance of understanding the format from both a teacher and student perspective." Essentially, online teachers need to have an understanding of what it is like to be an online student, particularly an online student within the context that they are teaching.

Love, M. L., & Ewoldt, K. B. (2021). Implementing asynchronous instructional materials for students with learning disabilities. *Intervention in School and Clinic*, *57*(2), 132-137. https://doi.org/10.1177/10534512211001

Author Abstract: Online learning continues to be an increasingly popular option in K–12 and postsecondary settings As this trend continues, it is important that the developers of online instructional environments and materials proactively consider the needs of all students. This includes determining how special education and specially designed instruction can be provided in online environments. For students with learning disabilities (LD), a systematic process for determining whether available learning materials address academic standards and specific student needs is key. To support practitioner lesson planning, this column provides guidance for aligning asynchronous learning materials to academic standards and the needs of students with LD. Guidance for supplementing and augmenting available materials is also provided.

Annotation

Background: More students that have been identified as having Learning Disabilities (LD) are using online learning and other types of technology supported learning, or they should have access to such learning with appropriate support. However, there is sometimes confusion in practice about how to frame and document support. The purpose of this article was to propose such a frame.

Methods: Since this is a practitioner article, there was no formal discussion of methods. What the authors do is take the readers through the process of thinking through a list of lesson checkpoints alongside the service plan goals. These checkpoints include: advanced organizers, explicit instruction, chunked content, key concepts, multiple models and examples, immediate feedback, accommodations and modifications, standards alignment). The process a teacher should go through is to 1. Break down content standard or Individualized Education Program (IEP) goal into discrete learning topics based on your timeline (e.g., unit, lesson level); 2. List each discrete topic. Within the commercially available curriculum, locate where each discrete learning topic is taught; 3. Evaluate the learning targets against the evidence- based practice criteria listed in the lesson check-points column with a Y for yes, N for no, or S for somewhat. 4. For each N or S, decide what resources to include in your curated bank of instructional resources and how.

Results/Findings: The goal of using this systematic process is to ensure that technological resources are aligned with what is known about strong instruction for students, with a specific focus on planning, evaluating, and aligning assessment to instruction within the context of technological features and resources.

Recommendations for Practitioners: The resources and exercise here could make a strong professional learning activity. The authors of the paper give special emphasis to using their work as guidance for asynchronous learning, probably in the context of the remote learning of the pandemic, but this could also be used for synchronous learning opportunities as well.

Martin, F., Ahlgrim-Delzell, L., & Budhrani, K. (2017). Systematic review of two decades (1995 to 2014) of research on synchronous online learning. *American Journal of Distance Education, 31*(1), 3-19. https://doi.org/10.1080/08923647.2017.1264807

Author Abstract: Systematic reviews of literature are studies that strategically search for published research on a specific topic in order to synthesize what is known about the topic. This systematic review describes 157 articles on synchronous online learning (SOL) from thirty-four different countries on instructional setting, content areas, participant demographics, research designs, independent and dependent variables, SOL technologies, and data-collection tools.

Annotation

Background: Following the significant increase in the use of synchronous online learning during the pandemic, the authors began to explore the literature to support best or promising practices using this delivery modality. While there were able to find several meta-analysis and systematic reviews of distance education and online learning, there was no evidence of this kind of research related to specifically synchronous online instruction. For the purposes of their systematic review, the authors define synchronous online learning as the "(a) permanent separation (of place) of the learner and instructor during planned learning events where (b) instruction occurred in real time such that (c) students were able to communicate with other students and the instructor through text-, audio-, and/or video-based communication of twoway media that facilitated dialogue and interaction."

Methods: The systematic review summarize research on synchronous online learning from 1995 to 2014. In the authors' own words, "the year 1995 was chosen as a cutoff date because the Internet was commercialized in 1995, when it became widely available to everyone and had a drastic impact on education" and the year 2014 was chosen because it represented two full decades of scholarship. The authors used the process outlined by the Department of Education, which included " (a) identify area for review, (b) formulate the inclusion/exclusion criteria, (c) develop the review protocol, (d) develop the search strategy and identify relevant literature, (e) screen and review articles, (f) extract the data, and (g) analyze and report the findings." From an initial pool of 986 potential articles based on their initial search, the sample for this study included 157 articles that met the inclusion criteria.

Results/Findings: It should be noted that only 20 of the 157 articles (or 12.7% of the sample) focused on the K-12 environment. Unfortunately the results were not broken out among this subset, so the findings discussed include both K-12 and adult populations. While the authors presented several findings related to the most common journals (which were *Computers & Education*, *British Journal of Educational Technology*, *The International Review of Research in Open and Distributed Learning*, and *Journal of Assisted Learning*) and the most common countries where the participants were located (which were the United States representing over 25% of the sample, followed by United Kingdom, Taiwan, and Canada that all had more than 10, and Sweden and Australia with more than five). Interestingly, the sample included 54 journals that only published 1-2 article and a total of 34 different countries were represented. There were several findings about demographics, instructional settings, data collection procedures, and specific tools that would be less relevant to our audience. The authors did report "that the most

common variable studied in synchronous online learning research was perception or attitude followed by interaction. Motivation was the least studied variable."

Recommendations for Practitioners: The potential recommendations for practitioners from this study are limited. Essentially, the only suggestions that can really be drawn is that if teachers are interesting in the perceptions or experiences of students in synchronous online learning environments that there is some research to guide them. The same can be said about research focused on opinions of students and teachers about interaction in the synchronous online learning environment. However, if a teacher is interested in issues of motivation in the synchronous online learning environment, there is limited research to guide them.

Miller, K. (2022). Teachers' reflections on supporting social and emotional learning: Desires, practices, and tensions in fostering family-school ties. *Journal of Online Learning Research*, *8*(1), 37-65. https://www.learntechlib.org/p/220634/

Author Abstract: This study explores how schools communicated and engaged with families in online/blended learning environments to support students' social-emotional well-being. In the form of reflective learning journals and asynchronous peer discussions, documents were collected during Spring 2020, Fall 2020, and Spring 2021 from a graduate course for experienced K-12 teachers at a 4-year comprehensive university in the Southern United States. Guided by the CASEL framework for social and emotional learning (SEL), thematic document analysis gave form to the data. The following three themes emerged: 1) teachers perceived family-school ties to be more important than ever amid remote/online learning, 2) they amended their practices by acknowledging and empathizing with parents' increased instructional responsibilities, seeking increased knowledge of students' home lives, and offering support to parents through frequent communication, and 3) deficit thinking, time demands, and mounting frustrations with some parents' unresponsiveness were obstacles to building family-school connections. Findings suggest that while experienced teachers hold parental relationships in high regard, efforts to foster two-way, reciprocal partnerships with parents of online learners may be difficult to sustain, particularly when teachers navigate multiple learning contexts simultaneously. The article concludes with implications for schools.

Annotation

Background: Parental support is regarded to be important for success in online learning because the parents typically have opportunities to be more physically proximate to the children during the learning. During the pandemic some schools and teachers were aware of the need to strengthen ties between home and family to recruit parental engagement in online learning. Research questions for this study were: 1. What perceptions did experienced teachers have regarding the value of family-school ties? 2) How did experienced teachers foster family-school ties to support online students' well-being? Did their approaches represent traditional, school-directed parental involvement practices or efforts to build reciprocal family-school relationships? 3) What challenges to fostering family-school ties did they encounter?

Methods: This was a qualitative study of teachers' experiences between Fall 2020 and Spring 2021. The teachers were enrolled in a graduate study course at a university in the southern

United States. Across three semesters, the average course enrollment was 22 students. Course participants completed four learning journals per semester with multiple entries and contributed to four peer discussions. All learning journals and peer discussions were downloaded and identifying information was removed prior to analysis at the end of each semester. Data collection resulted in 261 journals with 873 unique entries and 12 discussion forums containing 264 discussion threads. Thematic document analysis was used to identify themes across multiple types of documents. There were two major stages in this analysis, the first looking for broad ideas in all the documents and the second, seeking to connect the ideas and coalesce them into succinct themes.

Results/Findings: The researcher found that the teachers valued the relationship with the parents and developed a deeper understanding of the parental role through the course assignments that asked them to think and reflect on their interactions with them. Also, the teachers seemed to realize that the parents were indispensable in the success of the online teaching effort. They also developed increased appreciation for students' home cultures. A major obstacle to building home-school connections was the teachers' deficit view of the parents and their culture where these views were present. Teachers' also found it difficult to be able to spend the time necessary in some instances to build these connections.

Recommendations for Practitioners: The researcher recommends deliberate interventions with the teachers to shift their thinking about the importance of meaningful school ties. These need to acknowledge and honor the parents, the strengths they bring, and the cultural knowledge within the families. This is different from the typical school narrative of communicating for the purpose of making sure that families know what *school expects of them*. In addition, it seems important to consider shifting these views from a local or context-based frame rather than making general injunctions just to 'appreciate students' home cultures.' Further, there seems to be a need to take seriously the way in which instructional materials could be interwoven into family life in online learning rather than acting as objects outside of family life.

Rehn, N., Maor, D., & McConney, A. (2018). The specific skills required of teachers who deliver K–12 distance education courses by synchronous videoconference: Implications for training and professional development. *Technology, Pedagogy and Education, 27*(4), 417-429. https://doi.org/10.1080/1475939X.2018.1483265

Author Abstract: The purpose of this research is to identify the specific skills required of videoconference teachers who teach K–12 distance education courses. Many schools and educational districts worldwide are using videoconference technology to deliver courses to students as an economic solution when they cannot afford specialised teachers at remote locations. However, teachers are rarely trained to use this instructional technology and must therefore translate their experience in face-to-face and/or online teaching to this alternative medium. The collective case study used observations and interviews of eight teachers across five schools to identify the specific skills required to teach in a way that they perceived as successful in a videoconference class. It was found that teachers are largely under-prepared with strategies to project presence, develop relationships, foster interaction, manage the course and teach content across a distance when the screen is the main tool of connection. The authors offer a path

to improvement that involves supporting teacher action research, creating communities of inquiry and developing teaching quality standards specific to videoconference.

Annotation

Background: In this pre-pandemic study, the authors examined the practices and reflections of teachers who taught synchronously using a video-conferencing system to distance students in rural and remote locations. Both the teachers and the students were using videoconferencing suites with interactive whiteboards and screen-connecting software. The distance instruction was also supplemented by a learning management system and other distance learning tools (although these asynchronous platforms were not the focus of the study).

Methods: This case study focused on eight teachers in a single Canadian province who were located at five different teaching sites, who taught students that were located in one of 13 different locations. The data collection methods included the observation of one or two synchronous lessons (which included field notes) and then a follow-up interview with each teacher. The data were analyzed using an inductive analysis process.

Results/Findings: The authors succinctly summarized their findings as "(a) successful teaching by videoconference requires teachers to master a complex and distinctive mix of technical, pedagogical and interpersonal skills, including: communicating across a two-dimensional screen, forging relationships with students through technology-mediated interaction, developing teacher presence, championing the technology within the community and designing courses that leverage the affordances of the medium to foster deep inquiry and student engagement; and (b) teachers felt underprepared and untrained for the role of videoconference teacher and would welcome support through teacher action research, professional collaboration and specific pedagogical training."

Recommendations for Practitioners: One of the main takeaways from the findings is that synchronous instruction via video-conferencing "require skills… (that are unique from online and face-to-face teaching in order to teach in a way that they perceive as successful," as such it is necessary for teachers to have access to professional development opportunities – and for schools and districts to consider requiring certain professional learning prior to teaching these alternative mediums. Further, "many of the individual teachers had solutions to other individual teachers' questions," so individual teachers should seek out communities of practice with which to engage (and schools and districts should look to create formal opportunities for this kind of collaboration). While not at the practitioner level, the authors suggested the need for specific standards – beyond those required by the jurisdiction – that addressed teaching at a distance. While the authors referenced the iNACOL standards, they also indicated that those standards were not representative of the local jurisdictional context.

Rice, M. (2018). Supporting literacy with accessibility: Virtual school course designers' planning for students with disabilities. *Online Learning*, *22*(4), 161-179. https://olj.onlinelearningconsortium.org/index.php/olj/article/view/1508

Author Abstract: As more K-12 students with disabilities enroll in online courses, virtual schools and programs are working to make courses accessible through stronger course design. When course designers approach the issue of accessibility, they must comply with legal requirements and mitigate the challenges many students with disabilities face for literacy and learning. These challenges include a lack of vocabulary support and complex text in online course materials. This study describes qualitative research that sought to uncover strategies course designers used to meet accessibility standards and promote literacies online for all students, especially students with disabilities. Three strategies emerged as findings: (1) composing clear articulations of learning objectives, (2) promoting personalized and contextualized learning, and (3) planning for visual and audio representation of concepts. While the course designers displayed emerging understandings of accessibility, they were less adept at addressing the interplay between literacies that promote access and accessibility features that promote literacies.

Annotation

Background: Virtual schools had a long history of low accountability for outcomes like student enrollment equity, persistence, and achievement. Leading up to the pandemic, some states were taking on initiatives to increase evaluation of virtual school outcomes and accountability. One area of accountability focused on teacher knowledge of accessibility, which is sometimes confused with broader notions of access. This study is based on findings from a state that had to undergo an accessibility audit as part of a broader accountability initiative. Teachers were surveyed about their perception of the accessibility of the instructional materials. The research question was: How do virtual school teachers perceive the accessibility of the instructional materials for the courses they teach?

Methods: The data for this study was self-reported via an online survey. The Quality Matters rubric was used to generate items for the survey. Items were developed using a 7-point Likert-like scale that ranged from "strongly agree" to "strongly disagree." This framing based on the level of agreement enabled the researchers to use the words from the rubric verbatim. Standard eight from QM refers to specific knowledge and skills related to usability and accessibility: “The course design reflects a commitment to accessibility and usability for all learners”.. Content validity procedures were enacted using 5 trained QM reviewers and 5 state-level stakeholders to rate the items on a scale of 1-3 in terms of their fidelity in reflecting the QM standards. The mean rating per item was 2.9. The survey was sent to administrators at six virtual schools in the state. Administrators were asked to send the survey to both full and part-time certified teaching staff. These teachers were assigned to every subject, including special education. Across all six schools, the responding teachers had an average of five years of experience teaching, but the range of their experience was seven months to 10 years. All survey respondents’ personal identifying information was kept anonymous to increase response rates and decrease bias in responding. The survey was released in May of 2020 and closed in June of 2020. Forty-seven teachers completed at least part of the survey out of a possible 111 number of teachers across the six schools resulting in a 42% response rate.

Results/Findings: For all five areas of the standard (course navigation, course readability, accessible text and images, alternative means of access to multimedia content, and vendor accessibility statements) teachers agreed with the statements that instructional materials were accessible, but standard deviation information showed widely dispersed responses. This suggests that teachers as a group were actually not sure what it meant for instructional materials to be accessible.

Recommendations for Practitioners: The researchers recommended that teachers receive specific information about what constitutes accessibility in digital instructional materials. They also recommended additional considerations for accessibility of these materials, including the number of access points in a document to use and interact with it and more specific considerations about issues (e.g., alternative text for visual images, captions, font and background changing capabilities, navigational capabilities).

Sayed, W. S., Noeman, A. M., Abdellatif, A., Abdelrazek, M., Badawy, M. G., Hamed, A., & El-Tantawy, S. (2023). AI-based adaptive personalized content presentation and exercises navigation for an effective and engaging E-learning platform. *Multimedia Tools and Applications*, *82*(3), 3303-3333. https://link.springer.com/article/10.1007/s11042-022-13076-8

Author Abstract: Effective and engaging E-learning becomes necessary in unusual conditions such as COVID-19 pandemic, especially for the early stages of K-12 education. This paper proposes an adaptive personalized E-learning platform with a novel combination of Visual/Aural/Read, Write/Kinesthetic (VARK) presentation or gamification and exercises difficulty scaffolding through skipping/hiding/ reattempting. Cognitive, behavior and affective adaptation means are included in developing a dynamic learner model, which detects and corrects each student's learning style and cognitive level. As adaptation targets, the platform provides adaptive content presentation in two groups (VARK and gamification), adaptive exercises navigation and adaptive feedback. To achieve its goal, the platform utilizes a Deep Q-Network Reinforcement Learning (DQN-RL) and an online rule-based decision making implementation. The platform interfaces front-end dedicated website and back-end adaptation algorithms. An improvement in learning effectiveness is achieved comparing the post-test to the pre-test in a pilot experiment for grade 3 mathematics curriculum. Both groups witnessed academic performance and satisfaction level improvements, most importantly, for the students who started the experiment with a relatively low performance. VARK group witnessed a slightly more improvement and higher satisfaction level, since interactive activities and games in the kinesthetic presentation can provide engagement, while keeping other presentation styles available, when needed.

Annotation

Background: Designing personalized learning involves decision making about content presentation, including how and whether to include multimodal elements and strategies like gamification. The APPEAL personalized learning platform based on Moodle was developed to teach 3rd graders mathematics. It has two tracks, a multimodal track (Visual/Aural/Read,

Write/Kinesthetic) and a gamified track. The purpose of this study was to learn the following: 1. Does APPEAL improve aggregated-level academic performance and learning effectiveness indicators (pre- and post-test scores, completion time and learning efficiency) and how much improvement is achieved?; 2. Does APPEAL improve the data dispersion for these academic performance and learning effectiveness indicators and how much improvement is achieved?; 3. Does APPEAL improve disaggregated-level academic performance and learning effectiveness indicators for each student on lesson and exercises level?; 4. Does APPEAL achieve good student engagement and satisfaction indicators?

Methods: Students log onto the platform and then take a questionnaire to see if they would prefer the multimodal presentations or the gamified presentation. Then, they are led through the content. Exercises are at Easy-Medium-Hard levels that can be set by the teacher and are also linked to tasks based on Bloom's Taxonomy. An algorithm keeps track of student progress and presentation of content. A simulation with students occurred before actual students used the platform. There were 13 students in each group. No other information was given about the students.

Results/Findings: Most students received higher post-test scores than pre-test scores indicating that learning was occurring. The majority of the students achieved. 61.54% of the multimodal group students achieved higher than 50% and 38.46% of gamification group students achieved higher than 35%. This suggests that the multimodal group achieved more than the gamification group. The multimodal group also had a higher satisfaction rate with the materials (94% compared to 75%).

Recommendations for Practitioners: Multimodal presentations of material were better for the students who chose it; we do not know what a random assignment would have yielded, particularly we don't know what doing the multimodal work would have done for the gamified group that did worse. We also don't know how doing the games affected the amount of content exposure. We can say that it is unlikely that the two ways to present content are equal–it does make a difference how we present information to students.

Shelton, A., & Gezer, T. (2023). Investigating the educational experiences of students with disabilities during the COVID-19 school disruption: An international perspective. *Large-scale Assessments in Education, 11*(1), 1-26. https://doi.org/10.1186/s40536-023-00183-7

Author Abstract: Students with disabilities generally experience educational inequities around the world. The coronavirus 2019 (COVID-19) pandemic likely exacerbated these inequities in access, resources, and support as schools shut down to mitigate the spread of the disease. Although some research has explored disparities between students with and without disabilities during the pandemic, limited research has explored this issue from the perspective of students across multiple countries. Therefore, we conducted a secondary analysis of the UNESCO Responses to Educational Disruption Survey student questionnaire administered to eighth graders in five countries to investigate changes in the educational experiences of students with disabilities during COVID-19 school disruptions and differences between these experiences and the experiences of students without disabilities during these disruptions. Specifically, we aimed to understand how students with disabilities' perceptions of their educational experiences

changed during disruptions and varied from those of students without disabilities. Contrary to previous research, our findings revealed that students with disabilities generally reported positive experiences to a greater extent than students without disabilities. We discuss the implications of these findings and areas for future research beyond the COVID-19 pandemic.

Annotation

Background: The Responses to Educational Disruption Survey (REDS) was a joint effort by the International Association for the Evaluation of Educational Achievement and United Nations Educational, Scientific and Cultural Organization (UNESCO) as an initiative of the Global Education Coalition, which was founded in March 2020 by UNESCO. Its purpose was to examine "the effect of COVID-19 school disruptions on teaching and learning from an international perspective." REDS was administered in eight countries: Burkina Faso, Denmark, Ethiopia, Kenya, Russia, Slovenia, the United Arab Emirates, and Uzbekistan

Methods: The purpose of this study was to determine the extent to which students with disabilities' perceptions of their educational experiences changed and varied from those of students without disabilities during school disruptions. Data collection occurred from December 2020 and July 2021. As Russia, Slovenia, and Uzbekistan did not include any students with disabilities in their data, the authors focused this study on the data from the remaining five countries. The final sample for this study included 12,229 students – 3,195 in the students with disabilities cohort and 6,622 in the students without disabilities cohort.

Results/Findings: The authors reports that "in general, the percentage of students with disabilities who reported not needing support in each area decreased during the COVID-19 disruption, indicating that more students with disabilities needed support during this time." Further, students with disabilities reported higher ratings – in varying amounts across the five countries – of teacher support, schoolwork, and learning progress than students without disabilities, which suggested that these students generally had better perceptions of their learning experience than students without disabilities. Overall, students with disabilities reported needing more school support during the COVID-19 school disruption than before the disruption, while at the same time believing that there was an increase in the school support they received.

Recommendations for Practitioners: The authors outlined two specific recommendations. Practitioners should consider "providing students from lower socioeconomic backgrounds additional resources during remote learning"; and (2) "putting policies and structures in place that provide SWDs with ongoing support during remote learning…. [that] aim to (a) increase students' teacher support, while promoting (b) positive perceptions of their schoolwork and (c) positive feelings."

Shively, K., & Geesa, R. L. (2023). An online professional learning series: Preparing P-12 educators to teach in online SEL environments. In R. Rahimi & D. Liston (Eds.), *Exploring Social Emotional Learning in Diverse Academic Settings* (pp. 271-295). IGI Global. https://www.igi-global.com/chapter/an-online-professional-learning-series/321394

Author Abstract: This chapter describes an online professional learning series (OPLS) focused on supporting educators in designing P-12 online social-emotional learning (o-SEL) environments. The authors argue there is a need for o-SEL professional learning, which can serve as an ongoing, flexible resource educators can reference as they design their online learning environments (i.e., online classrooms). To participate fully in this OPLS, P-12 educators are situated to participate in professional exercises, guided by design thinking, to identify problems and possible solutions specifically related to their individual online learning environments. Through this process, educators draw upon the content, resources, and online teaching strategies to brainstorm practical solutions to better serve their learners' needs in online learning environments. To earn credit for completing the professional learning modules, educators submit solutions for peer review and professional evaluation. Upon receipt of the feedback, they may revise and resubmit, if needed, to demonstrate their new skills and competencies.

Annotation

Background: Teacher educators at a midwestern United States university created an online professional development program aimed at supporting teachers in developing strategies for providing Social Emotional Learning (SEL) to students. They began in July 2020 during the school building closures that resulted in large-scale use of remote and distance learning and continued to develop the materials presented in the article until 2022. The sources they drew on included: Collaborative for Academic, Social, and Emotional Learning (CASEL; 2022); American School Counselor Association (ASCA; 2021a); University of California San Francisco (UCSF), Healthy Environments and Response to Trauma-Informed Systems (HEARTS) (Dorado et al., 2016; UCSF, 2022a); Learning for Justice (Teaching Tolerance, 2018) Social Justice Standards; and the International Society for Technology in Education (ISTE; 2021) Standards for Educators. The question for their research was: “How and in what ways might we prepare educators to facilitate online social-emotional learning opportunities for P-12 students?”

Methods: This work was design-based research. The o-SEL environments were developed online via a web conference platform (i.e., Zoom) and website (e.g., WordPress) with SEL educators and professionals from Midwestern public elementary schools and high schools. The research team involved in creating this experience consisted of a design thinking team from the graduate program, Emerging Media Design and Development graduate students from another university program, the university Digital Corp, elementary education and educational leadership faculty, and five experts from the P-12 field. The team created and led the brainstorming protocol for the two one-hour synchronous, online sessions. The graduate students asked five SEL educators and professionals questions related to the identified problems from a survey sent prior to the first meeting. Five SEL educators and professionals completed one informal survey and participated in two one-hour brainstorming sessions about challenges and solutions gathered in the informal

survey. The ideas shared informed the search and collection of content and digital tools for the series' modules. The creation process required weekly meetings with Digital Corp and graduate students to create prototypes that included interactive graphics, videos, and images. After a draft was completed, the website was reviewed by the educators and professionals from the brainstorming sessions, and faculty invited from the college to review and provide feedback. After revisions were completed, the series was published for the public to access.

Results/Findings: In the design thinking process, a model emerged for creating an online learning environment. The model includes six elements, which suggests these elements are needed to develop understandings of and ways to address the social-emotional needs of P-12 online learners. The elements were: Empower, Engage, Motivate, Include, Collaborate, and Extend.

Recommendations for Practitioners: The researchers would like practitioners to use their model to do professional development along with the resources that they have developed. However, there are also important ideas about the process of gathering practitioners together and giving them the time and resources to develop their own models for thinking about how to do online teaching in their context. Even if these have redundancies with other models, the process of doing the thinking and learning together might prove fruitful.

Standen, P. J., Brown, D. J., Taheri, M., Galvez Trigo, M. J., Boulton, H., Burton, A., ... & Hortal, E. (2020). An evaluation of an adaptive learning system based on multimodal affect recognition for learners with intellectual disabilities. *British Journal of Educational Technology*, *51*(5), 1748-1765. https://bera-journals.onlinelibrary.wiley.com/doi/pdfdirect/10.1111/bjet.13010

Author Abstract: Artificial intelligence tools for education (AIEd) have been used to automate the provision of learning support to mainstream learners. One of the most innovative approaches in this field is the use of data and machine learning for the detection of a student's affective state, to move them out of negative states that inhibit learning, into positive states such as engagement. In spite of their obvious potential to provide the personalisation that would give extra support for learners with intellectual disabilities, little work on AIEd systems that utilise affect recognition currently addresses this group. Our system used multimodal sensor data and machine learning to first identify three affective states linked to learning (engagement, frustration, boredom) and second determine the presentation of learning content so that the learner is maintained in an optimal affective state and rate of learning is maximised. To evaluate this adaptive learning system, 67 participants aged between 6 and 18 years acting as their own control took part in a series of sessions using the system. Sessions alternated between using the system with both affect detection and learning achievement to drive the selection of learning content (intervention) and using learning achievement alone (control) to drive the selection of learning content. Lack of boredom was the state with the strongest link to achievement, with both frustration and engagement positively related to achievement. There was significantly more engagement and less boredom in intervention than control sessions, but no significant difference in achievement. These results suggest that engagement does increase when activities are tailored to the personal needs and emotional state of the learner and that the system was promoting affective states that

in turn promote learning. However, longer exposure is necessary to determine the effect on learning.

Annotation

Background: Students who have been identified as having intellectual disabilities are deemed to need additional support in school settings. The support that is needed is deemed burdensome to schools and in the interest of relieving it, tools and technologies such as artificial intelligence are being tested to determine whether there is promise for use as a support. In this study, a program called Managing Affective-learning THrough Intelligent atoms and Smart InteractionS (MaTHiSiS) was used to determine whether a program could monitor affective states and link those states to when learning was happening.

Methods: A within subjects repeated measures design was adopted whereby each participant took part in intervention (A) and control (B) sessions. The intervention (A) was MaTHiSiS used as it was designed: with affect and achievement data driving the presentation of the learning material and (B) where the presentation of the learning material was based on achievement alone. In this design, each participant acted as their own control, thus, controlling for differences between very varied participants; there was flexibility to fit in with teachers' and learners' requirements as session length and timing of sessions can vary to suit classroom and learners' obligations; order effect that comes from one condition always being first or second was reduced; number of testing sessions to minimize effects of any unwanted variations such as time of day or specific learning material was maximized. Participants were recruited from schools at six different sites: Nottingham and London in the UK, Rome, Salerno and Fumane in Italy and Valladolid in Spain. Participants were judged to be below their peers and identified with either intellectual disability or autism, aged between 6 and 18 years, nominated by the teacher for being able to potentially benefit from using the MaTHiSiS system, having parental or guardian consent to participate. There were 67 students in this study. Teachers involved each participant in 12 sessions, half of which would be intervention. To reduce the order effect, teachers alternated sessions between the two conditions in bouts of three, that is, AAA BBB AAA BBB, with half of the participants experiencing a reversed order of the conditions, that is, BBB AAA BBB AAA. Teachers ended the session whenever they thought appropriate for the learner, but to avoid going over 20 minutes. Participants worked through learning graphs considered relevant for them by their teachers. The choice of device on which they interacted with the system (laptop, tablet or NAO robot) was determined by their teacher. The number of A sessions ranged from 1 to 13 (mean 5.3), with 91% of participants taking part in 3 or more A sessions. The number of B sessions ranged from 1 to 11 (mean 4.3), with 75% of participants taking part in 3 or more B sessions. Total time during which the participant was using the system either in A or B sessions ranged from 15 to 413 minutes (mean 113 minutes). About 84% of participants had a total duration of 60 minutes or above.

Results/Findings: The state labeled "lack of boredom" is the state most strongly linked to achievement, whilst those labeled "frustration" and "engagement" are positively related to achievement. Frustration detected by the MaTHiSiS system did not linger, either because the software adjusted to move the learner to a different state (by reducing the level of difficulty or by choosing alternative learning materials) or because the learner adjusted their affect to meet the

challenge that led to their frustrated state. The system did increase the time that learners were engaged and boredom decreased. No significant difference in learning achievement was found when adaptation was based on both the affective state and achievement of the learner, compared with achievement alone.

Recommendations for Practitioners: The system showed some promise, but still needed further development. The findings lend legitimacy to the idea that learners experience varying affective states during instruction and they have varying abilities to process and recover from negative ones on their own. It was interesting to label "engagement" and affective state. Also, it is important to understand that frustration may not mean that no learning is happening even though learners do not like to be frustrated and in the case of children, their parents do not like their kids to be frustrated while learning online.

Tysinger, D., Tysinger, J. A., & Diamanduros, T. D. (2016). Crisis events in K-12 online learning: Educator perceptions and preparedness. *National Youth Advocacy and Resilience Journal*, *2*(1), 41-48. https://digitalcommons.georgiasouthern.edu/nyar/vol2/iss1/4/

Author Abstract: Although K–12 online learning institutions may be protected from certain school safety concerns (i.e., physical violence on a student or a teacher), physical distance does not offer protection from all potential crises that may impact individual students or the online school environment. The current survey research explored educators' perceptions of and preparedness for the following crisis frequencies in the online learning environment: suspected child/adolescent neglect, suspected child/adolescent abuse, suspected student suicidal ideation, suspected student homicidal ideation, unexpected death of a student, unexpected death of a teacher, emotional aftermath of natural disasters, and emotional aftermath of terrorist incidents. Across the sample, the crisis events were noted as occurring at least one to two times per year by some participants. Even more striking, 80–95% of participants noted having no training for recognizing the warning signs of the various crisis events in online content, and at least 1 in 4 participants in every category indicated that they felt somewhat unprepared or very unprepared to respond based on their school's current crisis plan.

Annotation

Background: Periodically, there are crises in the United States and other countries where that cause disruption in schooling and distance and remote strategies, including moving instruction to the online modality are used to preserve continuity. However, such crises often seem to catch schools by surprise. The researchers wanted to know about teachers' perceived levels of preparedness for crises that might disrupt school.

Methods: Participants for the survey were administrators and teachers from a large, public online high school in the western United States. Of the 54 respondents, 41 (all noting their roles as teachers) completed most survey items. Of the participants, 80.48% were female (n = 33) and 19.51% were male (n = 8) with years of teaching experience ranging from 1–15 years (M = 5.46 years). For educational attainment, 11 participants (26.83%) reported training at the Bachelor's level (B.A. or B.S.), 18 participants (43.90%) had a Master's degree (M.A. or M.S), 11

participants (26.83%) said that they had Master's+ or Ed.S. degree, and one participant (2.43%) had a doctoral-level degree in education. Participants responded to the Crisis Event Perception Survey (CEPS). This is a 37-item survey electronically-delivered instrument that was created specifically for use on this research project. The CEPS consisted of five demographic items and 32 items addressing educators' perceptions of the frequency of various crisis situations in the online learning environment as well as their preparedness for responding to each type of crisis.

Results/Findings: The respondents perceived that there were a number of personal and familial crises occurring among their students. These included health issues, abuse, neglect, homicidal and suicide ideation. They felt prepared to address issues of abuse and neglect and less prepared to address issues of ideation for killing, particularly homicide. The instrument did not ask questions about crises such as mass illness and death from a pandemic.

Recommendations for Practitioners: While the researchers recommend general preparedness for crises in line with their survey items, it is worth noting all of the crises that have happened since that were unforeseen in 2016. The assumption among the researchers that crises by definition do not happen very often is also outmoded in current circumstances where crises are almost more common than non-crises in a school day and among families. Schools–including online schools–should be aware of the fact that many families are experiencing significant stress and professional learning should address specific types of crises (e.g. homicidal ideation) and how to address these.

Yu, H., & Ha, T. (2021). Effective pedagogical practices in synchronous online physical education. *Journal of Physical Education, Recreation & Dance, 92*(9), 63-68. https://doi.org/10.1080/07303084.2021.1979872

Author Abstract: The purpose of this article is to propose 15 pedagogical practices in a synchronous class environment through Zoom Video Communications, which is one of the most widely used video conferencing software across the U.S. The practices will be discussed within three categories of pedagogical aspects, including active lectures, active discussion, and active group activities that would produce alternative and innovative ways of learning in physical education.

Annotation

Background: While this article was published more than a year and half into the pandemic, the authors situated their commentary within the broader context of the growth of K-12 online learning, the lack of preparation and/or training given to physical education teachers to teach online, and growing use of Zoom as a synchronous online instruction tool. The purpose of the article was to propose 15 pedagogical practices in synchronous online learning, although there was no reference to or citations to support the 15 specific suggestions.

Methods: This journal article was a commentary, as such there were no methods.

Results/Findings: As a commentary there were no traditional results or findings to report (only the suggestions below). However, it is worth noting that the authors organized their suggestions

into “three categories of pedagogical aspects, including active lectures [items 1-7], active discussion [items 8-12] and active group activities [items 13-15] that would produce alternative and innovative ways of learning in physical education.”

Recommendations for Practitioners: The authors outlined 15 specific suggestions for teachers engaged in synchronous online instruction that included the following.

1. “To keep students engaged, a teacher periodically pauses the lecture to ask for students’ participation/opinions using reaction buttons.”
2. “By using the ‘polls’ function on Zoom, a teacher prepares a list of statements for common misconceptions about the health-related topic.”
3. “The ‘chat’ feature on Zoom allows a teacher to send messages to an individual or an entire class during lectures.”
4. “After 10–15 min of lecture, students are asked to write up everything they recall. After the recall, they can be separated into breakout rooms to organize their memories within small groups.”
5. “A teacher presents PowerPoint slides using “share screen” on Zoom. After three slides, students are randomly selected to interpret what the teacher said in their own words.”
6. “During a lecture, students prepare a list of questions that can be applied to their real lives and explain why the questions are important.”
7. “Students visualize what they learned using graphic organizers and share the graphics.”
8. “A teacher poses a question relevant to students’ real lives… The teacher should provide open-ended questions to provoke active/meaningful discussion. Then each student takes some time to think of answers (self-questioning), share the ideas within small groups”
9. “A teacher provides several templates to help students determine their… problems/issues to spark conversation and motivate them to be knowledgeable for themselves. Then students are assigned to breakout rooms to search for information about the presented issue, discuss based on their experiences, and formulate the answers.”
10. “A whiteboard feature on Zoom allows the teacher to share the topic and have students annotate their thoughts”
11. “A fishbowl discussion can be used when students need to discuss… topics within a large class. The teacher presents students with a list of open-ended questions to think about. Within breakout rooms, five or so students work on the given questions. After small-group discussions, each group enters the ‘fishbowl’ together to present their topic as a panel while the rest of the class observes.”
12. “A teacher asks all students to take 2 minutes to brainstorm about the discussion topic. Students also take 2 minutes to write down their ideas on a brainstorming board, avoiding any evaluation. Then, they participate in a discussion while looking at the whole brainstorming board.”
13. “While students are working in small groups, one student in each group serves as a patrol officer and visits another group to gather additional information as well as report their progress.”
14. “A teacher introduces some words to explain new concepts. Students within groups hunt for (i.e., seek, pursue, and capture) additional information/ examples to support the topic. They are able to work on it together… to share their work.

15. “Students in each breakout room learn just one piece of the material/topic After becoming an expert in each group, students are sent to their original groups to synthesize the knowledge/expertise they have learned and create a presentation.”

Zayet, T. M., Ismail, M. A., Almadi, S. H., Zawia, J. M. H., & Mohamad Nor, A. (2023). What is needed to build a personalized recommender system for K-12 students’ E-Learning? Recommendations for future systems and a conceptual framework. *Education and information technologies*, *28*(6), 7487-7508. https://link.springer.com/article/10.1007/s10639-022-11489-4

Author Abstract: Online learning has significantly expanded along with the spread of the coronavirus disease (COVID-19). Personalization becomes an essential component of learning systems due to students’ different learning styles and abilities. Recommending materials that meet the needs and are tailored to learners’ styles and abilities is necessary to ensure a personalized learning system. The study conducted a systematic literature review (SLR) of papers on recommendation systems for e-learning in the K12 setting published between 2017 and 2021 and aims to identify the most important component of a personalized recommender system for school students’ e-learning. Recommendations for later studies were proposed based on the identified components, namely a personalized conceptual framework for providing materials to school students. The proposed framework comprised four stages: student profiling, material collection, material filtering, and validation.

Annotation

Background: With the increased popularity of online learning and so-called personalized programs and applications, the researchers believed that there was a need to conduct a five-year review of what is known about personalization tools. The research questions for this paper were: Q1. What are the “must exist” modules in PRS-ES? 2. What are the personalization features that can be used to ensure personalization?

Methods: The reviewers followed a process where they developed keywords and then performed searches. Inclusion and exclusion criteria focused on recency and alignment with keywords along with being published between 2017 and 2021. A quality analysis was conducted that included the following elements. QA1: Are the study objectives and goals clearly defined? QA2: Does the study clearly state the research methodology? QA3: Are the study contributions and limitations clearly stated? QA4: Are the data collection procedures and results clearly explained? And QA5: Does the study mention how the personalized recommendation system is built? The studies were given scores of 0 to 5 for these elements. Ultimately, 32 studies were high, medium, and low quality, while nine studies were excluded for being low quality. The study created a form to record the data extraction of 23 articles for data collection completeness. Critical elements identified for data extraction included: study ID, types of system modules listed in the study, types of personalization features, students’ characteristics, and type of recommended items or context. Content of the remaining studies was carefully reviewed and analyzed.

Results/Findings: The study suggested a personalized conceptual framework to recommend materials to school students based on the proposed recommendations. The framework operates in

a semi-automated mode with certain activities requiring human intervention and others being completed automatically. The four primary stages of the framework are student profiling, material gathering, material filtering, and result validation.

Recommendations for Practitioners: The researchers recommend implementing the framework and then gathering more data about it to determine whether it is a good framework. An important recommendation might be to understand that much research about personalization is uncritical about its strengths and limitations. In this framework, there was an attempt to identify characteristics that empirically support a programmer's claim that an application or program is *personalized* but there was no interrogation of any of these features. Practitioners might be helped by these findings in that they can use them as examples of how much thought should go into strong personalization. Moreover, they can use these as examples for how to give language to reasons why students might reject some students and not others.

Zeng, H., & Luo, J. (2023). Effectiveness of synchronous and asynchronous online learning: a meta-analysis. *Interactive Learning Environments*, 1-17. https://doi.org/10.1080/10494820.2023.2197953

Author Abstract: Distance learning and online learning have become the new educational paradigm. Based on synchronicity, online learning environments can be classified into synchronous and asynchronous online learning. However, previous evidence demonstrating the effects of these two online learning modalities on students' academic achievement has been contradictory. The current meta-analysis study pooled the observed effect sizes from previous research and addressed the following two research questions: (1) Which online learning format (synchronous or asynchronous) generates stronger learning effects? (2) Do the effects vary by the disciplinary field and educational level in which the learning is carried out? A systematic search of studies published between 2002 and 2022 was conducted. A total of 14 studies with 1,098 participants for the synchronous learning condition and 804 participants for the asynchronous learning condition met the study selection criteria. The results showed that asynchronous learning was more effective in promoting student knowledge than synchronous online learning, but the effect was trivial in size. The overall effect size was largely invariant across educational levels and disciplines. The implications of this study are also discussed.

Annotation

Background: The study was situated both within the context of traditional online learning, as well as the rise of remote learning that occurred during the pandemic. One of the rationales that was implied by the authors was due to the fact that the pandemic-induced remote learning tended to focus on synchronous online learning, there was a need to examine the existing literature based on the modality of instruction. While there had been previous meta-analyses conducted on comparing online learning with traditional face-to-face instruction, there had not been any meta-analysis that had compare both asynchronous online learning with traditional face-to-face instruction and synchronous online learning with traditional face-to-face instruction, as well as asynchronous online learning with synchronous online learning.

Methods: The authors began with a possible pool of 3,590 from 2002 to 2022, which resulted in 82 articles being potentially eligible after a review of the titles and abstracts. A full-time assessment was conducted on these 82 articles, and 13 were eligible for inclusion – with a fourteenth identified from other resources. The final sample included 14 studies with 25 datasets published between 2006 and 2022.

Results/Findings: The findings indicated a small effect size in favor of asynchronous online learning compared to traditional face-to-face instruction. This result was across all areas, but was higher in mathematics (which the authors suggest might make mathematics more suitable for asynchronous online learning). Further, the authors reported that "an asynchronous learning environment was shown to be better in prompting students' learning effects or at least as good as synchronous learning." However, it should be noted that this study did not include any variable that would have determined whether the original data was based on a K-12 or adult population.

Recommendations for Practitioners: While the authors concluded that if face-to-face instruction was not available, that asynchronous online learning would be a suitable replace (in particular for mathematics), they also made some recommendations for things that practitioner needed to be aware of. In their own words, "asynchronous online learning depends on students' motivation to get through the materials on their own. A lack of motivation could result in an accumulation of workload, which may increase learning anxiety and decrease learning effects… Moreover, as synchronous online learning often increases 'personal participation,' which may increase students' commitment and motivation and reduce dropout rates."

Zhang, Y., & Lin, C. H. (2020). Student interaction and the role of the teacher in a state virtual high school: what predicts online learning satisfaction? *Technology, Pedagogy and Education, 29*(1), 57-71. https://doi.org/10.1080/1475939X.2019.1694061

Author Abstract: As online K–12 education continues to expand, concerns about its quality have taken centre stage. This study utilised online learning satisfaction as an outcome indicator for the success of online learning, and investigated student- and teacher-level factors that affected it among 226 high school students taking online world language courses from 15 teachers at a Midwestern virtual school in the US. Hierarchical linear modelling revealed that, at the student level, learner–content interaction was the only significant predictor of satisfaction; while at the teacher level, satisfaction was positively and significantly correlated with teachers' adoption of pedagogical roles, but negatively predicted by their adoption of managerial ones. The findings particularly highlight the importance of content-based teaching and learning in the context of K–12 world language learning.

Annotation

Background: Written about a year before the pandemic, the first line of the authors' own abstract was somewhat prophetic: "As online K–12 education continues to expand, concerns about its quality have taken centre stage." In their own review of the research in the field, the authors make the claim that "thus far, two main lines of research have sought the keys to online learning success: one by studying learner-level characteristics, and the other teacher-level ones." The purpose of this study was to undertake "a more comprehensive examination of factors at

different levels that may influence individuals' online learning experiences." In particular, the authors were interested in explore how different types of interaction (i.e., student-student, student-teacher, and student-content) played on student satisfaction, as well as the effects of the teacher's pedagogical, managerial, and social role had on student satisfaction.

Methods: The possible sample included 1593 students enrolled in Chinese, French, German, Japanese, Spanish or Latin from 38 different teachers at a Midwestern state virtual school in the Spring 2014 term. A total of 466 students and 17 teachers completed an online survey, however, only 226 students and 15 teachers were suitable for the hierarchal linear modelling the authors intended to use to analyze the data.

Results/Findings: In their own words, the authors found "that at the student level, learner–content interaction was the only type of interaction that significantly predicted satisfaction; and that at the teacher level, the pedagogical role was a significant and positive predictor of student satisfaction, whereas the managerial role predicted learning satisfaction significantly and negatively."

Recommendations for Practitioners: Based on their findings, the authors themselves recommended that "K–12 virtual-school teachers, especially those who teach world language classes… should strongly emphasise their pedagogical roles to promote students' satisfaction, and thus their overall learning experience." Additionally, "to promote high levels of learning satisfaction, it is also crucial to ensure a high quality of student interaction with course content. More diverse, engaging and individualised activities are therefore needed, and learning management systems should be made more user-friendly and interactive. In those virtual schools that use ready-made online courses and allow teachers to make few or no changes to course content, teachers should be especially aware of their pedagogical role – and in particular, their sub-roles as profession-inspirers, feedback-givers and interaction-facilitators. In addition, given the negative influence of teachers' managerial role that this study identified, online teachers must balance carefully between the time spent on pedagogical practices and that spent on managerial ones. In part, this will depend on how well they get to know their students."