



INNOVATION CONFIGURATION

Virtual/Hybrid Learning in K-12 Settings

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Innovation Configuration for Virtual/Hybrid Learning in K-12 Settings

This paper features an innovation configuration (IC) matrix that can guide teacher preparation professionals in the development of virtual/hybrid learning opportunities in K-12 settings. This matrix appears in the Appendix. An IC is a tool that identifies and describes the major components of a practice or innovation. With the implementation of any innovation comes a continuum of configurations of implementation from non-use to the ideal. ICs are organized around two dimensions: essential components and degree of implementation (Hall & Hord, 1987; Roy & Hord, 2004). Essential components of the IC—along with descriptors and examples to guide application of the criteria to course work, standards, and classroom practices—are listed in the rows of the far-left column of the matrix. Several levels of implementation are defined in the top row of the matrix. For example, no mention of the essential component is the lowest level of implementation and would receive a score of zero. Increasing levels of implementation receive progressively higher scores.

ICs have been used in the development and implementation of educational innovations for at least 30 years (Hall & Hord, 2001; Hall et al., 1975; Hall & Hord, 1987; Roy & Hord, 2004). Experts studying educational change in a national research center originally developed these tools, which are used for professional development (PD) in the Concerns-Based Adoption Model (CBAM). The tools have also been used for program evaluation (Hall & Hord, 2001; Roy & Hord, 2004). The IC included in the Appendix of this paper is designed for teacher preparation programs, although it can be modified as an observation tool for PD purposes.

Introduction

Digital education, in the form of online, hybrid or blended, and/or technologically enhanced has been steadily growing in the United States for at least the past 30 years, yet the



practice of K-12 online learning has consistently outpaced research (Barbour, 2018). The absence of new teacher training and in-the-field teacher professional learning overwhelms communities alongside the overwhelming amount of largely unvetted digital resources (Rice & Ortiz, 2021a). The online educational modality originated in higher education with the ability to learn through text-based structures, usually grouped as discussions. These were termed *asynchronous* because students could work at different times on the assignments, rather than all coming to the same classroom at an appointed time block (Picciano, 2017). Work often consisted of some common reading, discussion prompts, posting and responding routines from teachers and students, and then multiple-choice tests and/or essays about the covered material. Since these structures were heavily linguistic text-based, they seemed to favor individuals who could use and produce large quantities of academic linguistic text, even though the goal should have been to collaborate to produce ideas (Brookfield & Preskill, 2012).

With the advancement of technologies that enabled video and sound and more complex images, online courses could continue to be asynchronous but have more multimedia elements and a wider array of digital engagement and assessment options. This includes more programs and applications developed and bundled by educational technology vendors (Barbour et al., 2025). For example, teleconferencing also allows for some *synchronous* learning, where teachers and students log on to the internet at the same time and directly communicate. What is different about this scenario from in-person schooling is that the students and the teacher are all in different places and connected through the internet, as is the case when they work asynchronously. There are also online courses with asynchronous elements and synchronous components. The percentages could vary depending on the subject



matter, the school program, and/or an agreed-upon program by teachers, parents, and the student (Castañon et al., 2023). With the widening of textual types from the historic large quantity of linguistic text, digital and hybrid forms of learning could enable more children who are already highly independent with technologies and/or can function as passive learners through text to be successful, but it is also important to realize that more ways to use and produce information means that there are expanded demands for skills and literacies (Alvermann, 2022). Subsequently, it is logical that there would be expanded demands for more kinds of support, especially for children who have historically been pressed into deficit for their learning differences.

The flexibility and expansive opportunities for participation and engagement touted in an online educational setting was considered as a major feature that might attract and support children who were receiving special education services (Rice & Dykman, 2018). However, the hope that the ability to choose the place of learning and some aspects of the pace of learning have not borne out as being inherently accommodating for all students to learn without additional support. In addition to the reporting of testing and grade difficulties that do not always capture the persistence of students who qualify for special education services in fully online programs, children with multilingual backgrounds or who live in rural or urban areas with yet to be developed technological infrastructure and may have certain socioeconomic disadvantages, such as lack of internet access, have not been enrolling in online learning programs or have been quickly leaving them (Molnar et al., 2023; Rice & Dykman, 2018). Beginning with reviews of K-12 online and distance education conducted 20 years ago, researchers have known that online learning programs are a reflection of the social resources of *who* is doing the online learning and *who* made the learning materials and not



sound research and pedagogical practices that have been carefully attuned to assure that all children with a wide range of learner preferences, sensory realities, language and ethnic realities can be successful (Rice, 2006; Rice & Ortiz, 2021b).

When the COVID-19 pandemic caused widespread school building closures, many districts in the United States began offering synchronous learning over the internet to preserve the continuity of learning and claim federal and state funding for holding school. This learning was not planned beforehand, and these were not online courses *per se* but were an emergency form of learning that had been used previously in countries in Asia during previous flu epidemics (Barbour et al., 2020). Distance learning as a form of health mitigation had been practiced in education at least as far back as during the H1N1 Influenza outbreak in the 1930s. During that time, children stayed home from school and listened to school lessons via the radio (Barbour, 2022). While some states had also been allowing what they were referring to as *asynchronous days* of a similar term for snow or other inclement weather, the number of states allowing districts to budget days for occasional online learning increased in the aftermath of COVID-19 (Morones, 2014; Rice & Barbour, 2023). Other than these allowances, it is unclear what additional plans have been made in most districts to plan for the potential of widespread school building closures that might happen due to additional epidemics or pandemics, climate disasters, and/or social and political upheaval such as widespread unemployment and/or loss of healthcare access (Rice & Zancanella, 2021).

But what happened to fully online schools after the pandemic? Molnar et al. (2023) reported that the number of fully online schools and programs increased, particularly the number of programs within school districts. However, the number of these schools dropped after 2021 when students were directed to return to in-person learning. While enrollment



decreased, the decrease in enrollment was fewer students than were being served in the number of schools and programs that were closed. This suggests that some of those who went to fully online schools during the pandemic wanted to stay in that type of school afterward. However, many communities that were left without adequate resources, such as internet infrastructure and devices, during the pandemic for online learning continued to lack those resources afterward (e.g., Running Bear et al., 2021). There were also children who did not attend any school during the pandemic—online or offline—and who never returned to any type of schooling on a regular basis (Nathwani et al., 2021).

One potential benefit to instruction that is delivered at least partly online might be to ensure that children have access to high-quality instructional materials that can be rapidly updated without effort from children or their families. However, it is unknown whether and to what extent these updates occur and what administrative barriers or approvals might be present. Another supposed benefit might be that digital materials available in online learning environments can more easily provide algorithmic formulas to provide exercises or materials matched to student abilities or sometimes interest (e.g., Dogan et al., 2023). However, studies that compare modalities are problematic methodologically because of all the variables involved in ensuring that these can be sufficiently isolated (Barbour & Rice, 2025). Also, studies with findings that favor the non-digital—for example, that might find children learn more from print books than digital ones—face stiff opposition from educators who fear how they will look if they do not embrace technologies (Rice & Argüello de Jesús, 2024). Also, online learning environments might draw families interested in receiving instruction asynchronously so that they can do their learning at a convenient time of day, avoid peers or



carefully choose peers, or have synchronous time with teachers and peers at strategic times (Beck, Egalite, et al., 2014).

During the onset of the COVID-19 pandemic, it was observed and demonstrated empirically that certain populations, notably students with disabilities, multilingual children and children without socioeconomic access to digital infrastructure needed particular kinds of support consideration when learning online, especially when learning was asynchronous (Catalano et al., 2021; Parmigiani et al., 2021; Rice, 2024; Tremmel et al., 2020; U.S. Department of Education [USDOE], 2020; U.S. Government Accountability Office, 2020). However, extensive attendance expectations for synchronous learning where children needed to sit at the computer for six hours per day were also onerous.

Scholars like Kozleski (2020) have pointed out the lack of teacher preparation for delivering instruction—synchronous or asynchronous online—particularly for children who qualify for special services. Indeed, Rice (2022) highlighted the intense work that teachers were doing during to try to meet what they understood as children’s needs during that time. These moves that teachers were making included finding additional ways to make instruction tangible and digital materials accessible, experimenting with how to make digital spaces for virtual relationship building, and exploring how positive social interactions inside and outside of the curriculum can be supported. They also were identifying additional ways for parents to be involved in the digital transformation of schools and learning.

In the current climate, school must go on, no matter the calamity, and many states are doing away with inclement weather days and other instances where in the past years, schools would have been canceled in favor of remote learning days (Morones, 2014; Rice & Barbour, 2023). In these instances, there is a renewed need to consider how to meet the needs of



students who might have difficulties learning online or learning exclusively with digital instructional materials. The assumption for this is that children who have been identified as needing additional assistance for in-person learning will not be able to pivot suddenly for remote instruction without prior planning and proper support.

The Individuals with Disabilities in Education Act (IDEA, 2004) guarantees children in the United States a Free and Appropriate Education (FAPE). Schools are supposed to engage in strategies to identify children who are having difficulties learning and find out if they have a disability under the legal and administrative definitions. If the child meets the definition, a team is supposed to facilitate a process of service making called an Individualized Education Program (IEP) to support these students. Judges in recent court cases, such as *Andrew v. Douglas* (2017) have written that previous standards of *de minimis*, or providing only minimal services for students, is insufficient. Instead, the IEP must be calculated to support children in making progress. In some school settings, such efforts to provide actual help may be elusive because of preferences to standardize or automate the process (Dunn & Rice, 2022).

IDEA 2004 also guarantees that students have the right to parent involvement in the educational process, which is not supposed to be nominal or minimal, and that children should be educated in the Least Restrictive Environment (LRE) with their peers to the greatest extent possible. This means that children cannot be placed in online settings or kept out of online settings because they have been identified as having a disability. Also, there are examples of *Dear Colleague Letters* providing guidance for how students with accessibility needs are entitled to have those needs met in online learning environments with the same urgency and thoughtfulness that the law demands in the in-person setting (Swenson & Ryder, 2016).



Moreover, the need is supposed to be authentic to the child and not merely a reflection of some deficit that has been placed on the children because of a lack of resources in the school or a lack of understanding about the child's background or linguistic realities. In summary, there is evidence, case law, and law suggesting that children should be receiving educational services online that help them succeed in the same way that they are entitled to services for in-person learning that online learning is not an *optional* setting that children should just leave if they cannot do well without support.

States and local school districts have important, formal roles in ensuring that students and families can access educational programs and services. For digital schoolwork, there are also guidelines newly released through the Title II of the Americans with Disabilities Act (ADA.gov, 2025). In this revision, all digital materials are required to be accessible for all internet and mobile applications. These materials must meet the Web Content Accessibility Guidelines WCAG 2.1 A/AA checklist to meet the standards. These checklists contain guidelines, such as making sure that course materials contain Alternative Text (ALT Text) for images and captions for videos (World Wide Web Consortium, 2020). There are also more technical guidance requirements, such as stipulations for color contrast and requirements for linear presentation for information. Thus, the WCAG standards are more detailed and technical than frameworks for inclusive digital materials from other sources and organizations, although they do not exclude schools or programs from teaching these other frameworks.

In this review, we have synthesized what we know about digital and online learning as it relates to establishing and sustaining more holistic, respectful, and thus, effective programs in schools through appropriate strength-based approaches for transformational growth within



teacher education from inherent deficit discourses and ideologies that might emerge within the teaching profession.

To generate Appendix A, we searched for peer-reviewed research studies that describe online learning or schools working to integrate digital learning at a high level from 2015-2025. Most of the studies that we found were survey studies of teachers associated with the COVID-19 pandemic. However, we also located several studies and reviews of literature focused on the use of various strategies to engage parents and children with various demographic characteristics (e.g., Adigun et al., 2023; Rice, 2024; Tonks et al., 2021). Several literature reviews that had already been published in high-quality journals (e.g., Rice et al., 2023) helped reinforce broad ideas and helped identify individual studies about specific topics. We were especially interested in studies that focused on teachers and/or had practical implications for teacher practices and preparation. Because students who need additional support for successful online learning also claim social and political identities beyond that of a definitive or possible disability and beyond any administrative label, many studies that we used also mention the languages students speak and other aspects of their identities. It is typical for researchers who publish studies to mention these characteristics to ensure that research is properly contextualized as well as focused on what aspects are considered scalable and generalizable to which populations. It is also usual because the normative expectation in the U.S. educational system is White, monolingual English speaking for children, teaching staff and administrators, even though there is much variation among children (Kircher & Kutler, 2023). Thus, we have retained references to these identities in our recommendations whenever possible. Finally, while the focus of this Instructional Configuration is virtual/hybrid learning that is regularized in a program, we wanted to acknowledge the



growing use of such learning for emergencies and inclement weather (Rice & Barbour, 2023). To this end, we have included special subsections at the end of each main section addressing this type of virtual/hybrid learning.

Background

In U.S public schools, there are approximately 6.5 million students with disabilities enrolled and served (USDOE, 2022). This population of students comprises 12.7% of the total population of students ages 6 through 21; also, these students claim various racial, cultural, and socioeconomic backgrounds. There are 13 disability categories. Various states use the funds received through the U.S. Congress for IDEA differently depending on their needs. However, serving students in the general education classroom with support has been the most employed strategy (USDOE, 2022). This is especially important in the context of the teacher shortages in the U.S. that are especially acute in special education in most areas of the country and across demographic categories (Cormier et al., 2024; Peyton et al., 2021). To support online learning, some teachers also need to follow or have accommodations available for physical, cognitive, or emotional differences—a fact which has also been often overlooked in research (Rice, 2022; Rice & Smith, 2022).

K-12 students with identified disabilities or who are considered academically at risk of being identified as such need equitable access to digital technologies for learning age-appropriate content (Xie et al., 2018). Leading up to the COVID-19 pandemic school building closures, there has been increased interest in using technologies to address learner preferences within the limited range of technological mono-lingual/cultural assumptions/projections, regardless of disability status in the United States and abroad (Drexler, 2018; Lunde, 2020; Rose & Meyer, 2006).



Online learning prior to the pandemic consisted of a variety of different programs (Digital Learning Collaborative, 2019). The landscape of chartering in the U.S. is complicated because it varies by state who can be a charter authorizer. In some states, city mayors or governors can authorize—in other states, there are authorizing bodies given powers by state legislatures or city councils. Some charter schools are not for-profit in their formal structure yet have a range of community ethical dedications or appearances while due to budgetary limitations may function like small businesses. Instead, they are attached to local school districts while others can be their own self-standing school district with less oversight and accountability mechanisms. Some states allow combinations of these realities while very little resources exist that help children, families, and communities have the institutional and policy literacy to distinguish between these variations of structures, functions and therefore learning services that may or may not match their own understanding of the children’s preferences and support needs. Also, states have different configurations for flowing money, resources, and governance through state offices to intermediate offices, district offices, and local schools. This made online learning programs—fully virtual or hybrid—look very different across states and geographical areas. Some programs were very small with only a few students and may have been focused on credit recovery. Others may have been state virtual schools with literally hundreds of thousands of enrollments. When Ortiz et al. (2020) examined the patterns of funding flow from the federal level to local levels all 50 states, they found that there were many tensions between various levels as the funding traveled over who would provide services for students who were entitled to special education and those who were perceived to be initially receiving the money and either not passing it along, or not doing so in a timely and



straightforward manner. When the money fails to flow properly, it is more difficult to offer timely and appropriate services.

Thus, while there should have already been an infrastructure for serving K-12 students with disabilities or related potential challenges with learning in the U.S. in online settings, there was not (Rice & Dykman, 2018). Providers of online learning in the U.S.—whether they were virtual schools operating with a special license or charter or programs built within traditional school management frameworks—expressed concerns about the suitability of fully online learning for students who qualified for support services (Rice, 2018; Rice & Carter, 2015).

The onset of the COVID-19 pandemic further tested the ability of school systems to respond with research-supported activities for instruction that was provided wholly or partially online. An estimated 1.5 billion children worldwide received instruction using online devices, applications, tools, and/or programs with very little notice or advance preparation for them, their families, or their teachers (Kozleski, 2020). Such policies seemed to intend that online and digital learning would enable youth to continue their learning without disruption. However, it soon became apparent that not all K-12 schoolchildren and their families were positioned to benefit from remote learning through the online modality. Schools, districts, and/or lawmakers appeared to have made a series of over assumptions about access to the internet, and the abilities of most families to manage learning for extended periods. Moreover, school leaders lacked the ability to support teachers in presenting virtual/hybrid learning forms to the community in ways that highlighted the potential benefits other than the possibility of keeping learning going (Rice & Deschaine, 2021). Instead, there was intense, public criticism. Given the additional layers of publicness for virtual and hybrid teaching,



teachers will need more support as they learn to do it both before they come in front of communities and into homes virtually after they are hired and start working.

Rice et al. (2025) introduced a conceptual framework that drew on existing research to guide thinking about how to serve all students. By using existing literature and GIST concept-building techniques (Vigo, 2013), researchers and state education leaders built the Inclusive Online, Distance and Digital Education (IODDE) conceptual framework. This framework focused on learners' biopsychosocial needs alongside two major types of support: policy supports and direct learner supports. There are also two types of crucial access: digital access and instructional access. The premise of IODDE was that ensuring learners' success requires contexts where access and support are balanced against learner needs. This conceptual framework was used to develop this IC, with additions for assessment and service plan development, since these are major issues that emerged in literature that are relevant specifically for teacher education programs that did not appear in the original IODDE framework. In this document, we share the parts of IODDE individually as biopsychosocial needs alongside two major types of support: policy support, and direct learner support. There are also two types of crucial access: digital access and instructional access. Service plan development and assessment considerations are added. Finally, we conclude with an IC based on this research (see Appendix A), which identifies the critical knowledge and skills. Appendix B provides levels of support for EBPs for effective digital learning.

Biopsychosocial Needs

Children's brains and bodies have needs that need to be met in a physical environment so they can focus on schoolwork (Black et al., 2022; Rice et al., 2019). Some K-12 students can navigate online learning and its digital applications with typical support available in the space where they are working—at school or at home. Basic biopsychosocial needs are



required for daily living and for learning regardless of what type of learning environment students are in. These include sleep and access to food and a regular restroom break, along with the peace and quiet to concentrate (Rice et al., 2019; Rice & Ortiz, 2022; Tonks et al., 2020). In virtual/hybrid education, these biopsychosocial needs manifest in various ways, including children not wanting to sit in front of camera for instruction delivered during a video conference, experiencing multiple demands for their attention while on the computer, failing to submit assignments because they take too long to complete and losing motivation, and learning management systems that will no longer allow submission; parents may also withdraw students or request meetings often, and more interventions may become necessary from supplementary service providers such as social workers and increased requests for special education service evaluation (Rice & Ortiz, 2021b).

Parents and Teachers' Shared Biopsychosocial Responsibilities

Attention to biopsychosocial needs is different in the online environment versus the in-person one because teachers do not share physical spaces with students. Children's biopsychosocial needs may not be as obvious and present in teachers' space or in their minds. Teachers must exercise additional vigilance to notice, remember, and attend to children's needs in addition to attending to teaching the lesson (Aguilar et al. 2022). A major challenge during the hybrid learning period in 2020-2021 occurred as some children were in the classroom, and some were online. Some teachers forgot about the online children because the children with physical bodies in the classroom demanded their immediate attention (Rice, 2022).

In an online learning environment, teachers use respectful communication to share direct responsibility for biopsychosocial needs with parents or other helping adults in real time



instead of passing the child back and forth as in an in-person scenario (Rice & Ortiz, 2022). Parents might also be attending to multiple children at multiple grade levels at the same time, which is less common for in-person learning, except perhaps in an intervention setting (Rice & Ortiz, 2021b). Sometimes there is the sense that parents are doing the schoolwork for the children. When there is confusion about parent help, it is more difficult for teachers to discern whether a child needs help, especially if the confusion is masked in silence or absence, which can be compounded by an expectation of English language skills in line with specific educational levels. The fact that some parents do, in fact, give a lot of help, or even do the work for the child is an outgrowth of the pressure, even directives that parents receive from online schools and programs to constantly monitor children and make them look good as online learners (Rice & Ortiz, 2022). Also, it is important to remember that parents are not used to seeing their children struggle to learn academic content and the parents feel upset when their children are sad, frustrated, and they want to help them. Children also experience a new pressure to perform learning in front of parents and look successful. Instead of accusing of cheating, it may be more useful to consider appropriate resources for helping parents understand how to soothe their children when they are frustrated while doing an academic task, and/or how to help their children recruit academic support from an online teacher or another source, like a video library where they can hear a lecture or explanation multiple times.

In a synchronous online instructional situation, the parent can see what the teacher is doing *to* and *with* the child in the virtual space during synchronous instruction. Likewise, the teacher can see what the parent is doing, what the home or space used as schooling is like yet only within the frame of the camera and so forth (Rice, 2023). For asynchronous instruction,



when children make videos or have video chats with teachers, there is more access to children's spaces and family life (Rice & Deschaine, 2021). Teachers may be tempted to comment, complain about, or even make nuisance reports about what they see in the backgrounds for families, but they need to use caution when un/consciously judging then deciding what to share with others in respect to confidentiality. Of course, children's safety is paramount, and reporting is required if there is inference that physical or emotional harm has or will occur (Rice, 2023). However, online teachers might be wiser to consider the ability to see into children's spaces as a position of trust that they should hold in high esteem, verbalizing their gratitude for being allowed into a family's space and as a chance to learn about children's lives and what is interesting for promoting learning and avoid what might be natural urges and perceptions of being a snoop and/or a judge.

Attention as a Biopsychosocial Demand

Some children need additional support in an online setting because they are easily distracted (Crouse et al., 2018; Parmigiani et al., 2020). These distractions include things going on in the space where the child is sitting or online through access to videos and applications. Distraction could happen whether the learning is occurring synchronously or asynchronously. Learning online demands additional attention and cognitive effort to learn the content (Tonks et al., 2020/2021). Specifically, Fauville et al. (2021) highlighted four reasons. First, when in limited spaces that force proximity, people tend to compensate by looking down to avoid eye contact. Lack of eye contact has been identified as a biomarker for Autism Spectrum Disorder, and many studies attempt to use digital technologies to track eye contact (e.g., Alcañiz et al., 2022); however, the online space is an uncomfortable place for eye contact. There are also ethnic/cultural unconscious practices of averting eye contact as a



display of respect (Akechi et al., 2013). Video conferences challenge the human ability to make this trade-off. People must use long stretches of direct eye gaze with faces that appear larger on a screen. This mimics a proximity that would be avoided in an in-person situation.

Second, attending a video conference increases cognitive load in interpersonal interactions compared to audio-only interactions. Digital software and devices that pick up soft unconscious expressions such as gasps, breathing responses or even the lack of breathing as non-verbal communication may also draw attention and be additional obstacles.

The increase in cognitive load is likely because additional cognitive resources are needed to manage the technological aspects of a videoconference, such as image and audio latency.

Also, people use different behaviors in a video conference, such as consciously monitoring nonverbal behavior, and intentionally sending cues to other participants. While the opposite could also be true for students and families that culturally display various non-verbal physical communication who can become unconsciously anxious or hyper vigilant of their physical movements while on camera. Often, people will nod in an exaggerated way for a few extra seconds to signal agreement, which would be unnecessary if interacting in person. Third, it is anxiety-inducing to be viewing a mirror of oneself during a videoconference. Women and girls have shown to become more self-conscious in video conferencing situations (Fauville et al., 2021). Others who are already self-conscious might increase in their anxiety when having to participate in video. Fourth, movement has been found to be especially important for children's learning. While movement is not prohibited *per se* in an online environment, there is often a greater emphasis on sitting still and being quiet during an online lesson.

Asynchronous lessons lose opportunities for children to experience group movement (Fauville et al., 2021).



The result of having to sit quietly on the computer with additional cognitive load that might induce anxiety and prevent movement is that children might feel shame or confusion and disengage. This can be especially true for students who may have developed their own coping mechanisms to decrease their visibility to teachers and peers during in-person learning that is now impossible if camera and screen appearance demands are made. They might escape the online instructional situation by going to another window on their screen; they might look away from the screen; they could turn off their cameras; they could fidget with something in their space. They may also just want to get into bed and fall asleep. Access to sleep and food changes children's abilities to pay attention in online learning (Rice & Ortiz, 2022). Having to stare at a screen intensely could make a person tired. It can also make a child increase their physical activity. For example, Dekkers et al. (2021) found that children who had been identified with attention deficit hyperactivity disorder (ADHD) increased their gross motor activity even more beyond their peers without ADHD when they were given a cognitive task to do that exceeded their working memory capacity. What is important to understand is that *all* the children in the study whether they were identified with ADHD or not, flailed and moved more when heavy demands were put on them to juggle multiple cognitive tasks *in their heads*. This sort of load up is very likely online as there are so many multiple simultaneous tasks to manage and multiple steps to access, do, and submit work. Children will want to move more, not less, and they will need to rest more, not less, than in an in-person situation.

There is the potential for tension when teachers who might have anxiety and fatigue themselves are setting expectations for children's attention and behavior online that are not appropriate (Rice & Carter, 2015, 2016). During the pandemic, some teachers had their own



children to attend to while teaching. Parent collaboration to learn about children is essential (Crouse et al., 2018; Tonks et al., 2020/2021). However, if collaboration consists of merely informing parents of what the teacher would like the child to do or asking the parents to do something like send the child to bed earlier, it will likely be insufficient; it seems unreasonable to expect parents to understand issues like how the physiology of how attention shifts online. Also, sometimes family and community dynamics are complicated, making what might seem to be simple and straightforward requests from school to actually be onerous and difficult demands.

During the pandemic-era school building closures, teachers tried to take control of this situation by becoming entertainers *extraordinaire* (Reich, 2021; Rice & Deschaine, 2021). While it may have been noble to attempt to catch the children's focus, maneuvers like this were not the sort that helped children deal with the struggles around them and they likely left the teachers exhausted. Rice et al. (2023) discussed the responsibility that was given to instructional coaches to provide support for teachers who were doing virtual/hybrid teaching and transitioning back to learning. This support that the instructional coaches were providing was less about what to teach and more about the emotional support needed for teachers to be emotionally stable so that they would be willing to see the benefits in providing kindness to children. In addition, Geesa et al. (2022) developed and piloted lesson modules for helping children discuss emotions and build communities online. The attempt in these lessons was to move beyond traditional models of social/emotional learning that focus on teaching compliance behaviors, although it is difficult to teach social/emotional learning in any way that is culturally neutral.



For example, attention span research with children suggests that many have limited attention spans—*two to three minutes* of attention for every year of life they have completed. For 10-year-old children, they need attentional support every 20 minutes or so, when they are not online (Shakibie, 2025). Unfortunately, no strong research exists examining variation for children in online learning—the studies that have been done have mixed results, with some studies suggesting that 6–8-year-old children should spend no more than 60 minutes online per day to preserve their overall attention span (Panjeti-Madan & Ranganathan, 2023). For the past 20 years, researchers have suggested that strong instructional practices are superior to reward systems for preserving attention (e.g., Moberly et al., 2005). Yet, within the in-person setting, there may be all kinds of variables that have conditioned children’s attention. For example, candy, breaks, and praise that develop a short-term focus vary from classroom to classroom but might be more common in classrooms designated for special education. Therefore, it is important to understand that while many children do not come into virtual/hybrid learning with the attention capacity that schools demand, there is ongoing hope for potential for the children to make some improvements without support. This is probably unlikely.

There are also physical issues, such as the fact that young children have smaller hands than adults. Asking children to do image or text resizing online may take longer than teachers expect it to. Also, it might take some children longer to do digital manipulations than manipulations with tools like pencils (Rice et al., 2020; Rice & Ortiz, 2022). Using devices and programs that challenge dexterity and are difficult to navigate may challenge attentional capacity. Children who have migrated from other countries or who have had limited access to formal schooling or computer equipment like computer mice or trackpads will be at a



greater disadvantage. Many children may need more practice, and it will take them longer to do the same amount of work if they can do the cognitive parts of the assignment just as quickly. Some teachers might think that children should be skilled at these activities because of video games. However, there is some evidence that experience playing video games assists with some aspects of motor development but has negative effects on attention (Kappi et al., 2024). Whatever might be gained in motor control could be lost on attention. Also, using a controller is different than using a keyboard. Schools will have to provide access to practice with the types of devices that they want the children to be able to use.

Introductory Courses Fail to Override Biopsychosocial Needs

Another strategy that has been well-funded and tried in online schools is giving students access to pre-course preparation that provides an overview of how to learn online. When Zweig et al. (2022) studied these courses, they found that students taking these courses were *less* likely to finish. This is potentially because taking the pre-course with large amounts of information about how to be successful was intimidating and gave the impression that they were on their own. Another finding from that same study was that children who enrolled in the course closer to the enrollment deadline were the most likely to struggle. Some students who enroll in the course at the last minute might have just recently learned about the course and were not planning to do it. Others might lack planning skills of the nature expected for school or might be coming in under personal or family crisis or challenge. A piece of information about late enrollment could help educators realize a need to offer early support related to identifying challenges, determining anxieties about learning and/or learning online, supporting planning, and/or recognizing when they have done well. What does not help—



based on the best available data we have—is launching large amounts of information at students about their responsibilities and then leaving them to fend for themselves.

Although it is possible to be bullied in the virtual learning space, alleviating in-person bullying and harassment informs the decision to move to virtual learning (Beck et al., 2014). Sometimes parents desire their children to choose fully virtual settings because they are fatigued from poor reports from the school about the child’s behavior or having to comfort their children who are upset about how they are being treated in an in-person setting. When the child moves online, the acrimony may cease, but that does not mean the child is learning—it could just mean that the child has been secluded from peers. Avoiding peers altogether by moving online might result in loss of the opportunity to develop pro-social orientations (Zhang, 2018). Also, recall from earlier in this section that video conference sociality is not the same as in-person sociality and school video sociality is going to be different from non-school video sociality. Thus, teachers may provide opportunities to socialize for the purpose of subject matter tasks and for non-cognitive reasons (Rice, 2022). These might include games or informal conversations. Teachers can also assist with age-appropriate video conference social skills, such as turn taking, nodding, and chat etiquette, while understanding that this adds a layer of monitoring to their work. Sometimes this monitoring can be at least partially undertaken by a teacher’s assistant, but many teachers do not have the luxury of other adults to help. What is crucial is the need to balance opportunities to interact with the teacher’s labor requirements to keep children growing in their abilities to learn online and learn about learning online.

Implications



Teachers need professional learning that supports them in reconsidering what it means to operate as a teacher from a place that is distant from the physical bodies of the children when a parent or some other adult was in the space (Rice et al., 2025). Instead of information about the importance of paying attention, teachers need to develop new instructional pacing for each grade level based on information about attention spans and screen access for children of varying ages (Panjeti-Madan & Ranganathan, 2023). Children need to be doing far less sitting quietly listening to online lessons and instead are being directed to do tasks at regular intervals (Dekkers et al, 2021). Also, instead of the teachers being entertainers, moving around and trying to do interesting, eye-catching things, they are developing plans for helping the children move and be in the spotlight as part of the learning experience (Geesa et al, 2022). For older children, planning sessions were held for how to manage attention, breaks, and pacing for asynchronous coursework based on what might be helpful.

Another area for support involves teaching all students about what happens to their bodies when they are in a video conference and teaching them to notice how they feel (Rice & Smith, 2023). Teachers also need to become more aware of these changes in themselves, and they might even share their experiences with students about their own shifts in attention and sensation since these seem to help when teachers talk to each other (Rice et al., 2023). Regular check-ins for all students at all grade levels were instituted during lessons. When students experience anxiety, stress, or fatigue, various strategies and replacement behaviors were offered to them (Rice & Ortiz, 2022). For example, instead of crawling in bed and covering up, students might want just a blanket on their lap, or a stuffed toy. When tired of looking at the camera or looking at oneself, turning off the camera for a few minutes and then turning it back on, or trading between camera and the chat, or even having the camera off while doing



work on applications where students are just working on a shared document became negotiated norms (Fauville et al., 2021).

There also needs to be a more earnest interest in trying to determine who is signing up for classes at what points in the semester and making efforts to learn what brought them to online learning (Zweig et al, 2022). For some children, there was an interest in doing something different, but for others, online learning was seen as the last opportunity to be successful in a schooling system that had never served them well. Making time to listen to children and families' stories about why they come into a given virtual space can be given additional priority over the usual one-way communication from the school about what the school needed children to do, although there can be a new emphasis on collaboration for reasonable expectations for children, parents, and educators (Ortiz et al., 2021).

Emergency and Occasional Online Learning

For schools that are using online learning for emergencies and inclement weather, understandings about biopsychosocial needs are still crucial because teachers will have to compete with other screens like video games, and children will not be used to being online to learn (Rice, 2022). Lessons that require large numbers of hours online doing lessons that are physiologically unsuitable will likely go undone or be ignored. To help teachers think about these types of lessons, the big ideas are that teachers need to speak in explicit terms about what it means to be in a videoconference for class if videoconferencing is required and then strategize with the children about how they can help each other move through the lesson (Fauville et al., 2021).

If the lesson is asynchronous, teachers should set realistic expectations about how much time it will take and what the demands are for the body in terms of sizing/re-sizing,



staring/watching, sitting quietly and so forth (Rice & Ortiz, 2022). In the case that the emergency online learning is due to catastrophe such as flood or fire, there will also be trauma that children and families are experiencing that will make it more difficult for them to do biopsychosocially demanding tasks (De Brito et al., 2013). It is also inappropriate, perhaps even unethical, to assign children a physically demanding task (e.g., resize these 20 items) just because it takes the amount of time the school district says the lesson must be. The best advice might be to plan asynchronous emergencies or occasional lessons with minimal biopsychosocial demands. Educators should inform parents and students about any demands that exist, suggest strategies or pacing, and then provide information about how to access help from you, if needed.

Digital Access

A major area of consideration for virtual learning is digital access (UNICEF, 2020). While individuals in urban areas can also have digital access issues, many of the most acute access considerations are in rural areas (Becker, 2000; Catalano et al., 2021; Running Bear et al, 2021). Rurality is not a monolith (González-Leonardo et al, 2022). Some rural communities are agricultural spaces; families with the larger, intergenerational farms and ranches might be wealthier and better able to access satellite internet. Families with smaller farms or ranches or who are workers on the larger farms are less well off. There might be families with workers who were recruited from other countries and who may not speak English as their dominant language, working on large and small farms. Families with migrating workers live with socioeconomic precarity and infrastructure factors largely out of reach of their own efforts. Technological access in rural and underserved urban communities reflects socioeconomic stratification where wealthier people access the internet reasonably



well and people with less economic abilities access internet infrastructure rely on public facilities like libraries, churches, fast food restaurants, and mobile phones (Junod et al, 2025). Some U.S. rural communities are Indigenous Tribal Lands that are considered Sovereign territories, which many have Federally required Traditional Tribal Governments that operate alongside state and local governments (Gover, 2010). Technological infrastructure availability in these areas can be a difficult balance of Tribal community, or Tribal government decisions, previous support from governors of the Indigenous Tribal Nations, Federal regulations, state legislature, and considerations for variations of infrastructure and terrain. For example, an area with very high mountains may be difficult to traverse to lay down and maintain the materialities of infrastructure without cooperation from multiple entities.

Finally, there are rural communities that are micropolitan in nature and have access to the internet through their proximity to larger urban areas, branch campuses of universities, larger well-paying employers, and/or have a tourist industry that demands the internet as part of the luxury experience. As limited funds are dispersed, educators in various types of rural areas do not all face the same challenges in providing digital access to their students so that they can do virtual and/or hybrid learning (Rice, 2024b). Since grant funding sources are so crucial and rural schools are less likely to have the resources to even compete, they are most likely to continue on a trajectory of little to no internet infrastructure. Another issue is that students from varied demographic groups might be relied upon for enrollment and funding in online programs, but the planning and resources do not favor their needs (Kaupp, 2012).

More than 20 years ago, researchers began noticing that children with computers in the home showed positive learning gains compared to children without them (Battle, 1999; Fairlie, 2005). When additional research was conducted to consider income level and digital



access, it was confirmed that higher income families were more likely to have personal computers, but *perhaps more stunning* was the fact even when families with fewer socioeconomic resources had computers, they did not have an internet like wealthier families did (Katz et al. 2018). Thus, better-resourced families were not gaining an edge in school just by having a computer. These children were also able to use the computers to do more interesting activities than they were assigned to do with computers in school. Children with more socioeconomic resources were doing more interesting activities than their less socioeconomically and technologically-access favored peers who had computers, but no internet (Becker, 2000). During the pandemic, a study of 10,000 U.S. parents found that access to devices and internet connectivity was a major driver of children’s engagement, with children whose parents identified as non-White reporting less access to devices, less access to internet, and less resources (e.g., time and support from the school) to help their children (Domina et al., 2021). Associated with this lack of access were reports that children logged on less and liked online learning less.

Digital access policies matter locally and nationally since individual schools and teachers cannot overcome access policies especially when these are tied to funding. Such policies often focus on the ability to obtain devices and log on to the internet. There are also important access issues that are part of the ability to sign into major networks and platforms where instruction is delivered, such as the Learning Management System (LMS) and the Video Conferencing System (VCS) if the online school is using synchronous video conferencing to deliver any of the instruction. Once children are in these systems, whether they can locate, find, use, and learn from the materials are matters of instructional access, which is discussed in a later section. During the onset of the school building closures resulting



from the COVID-19 pandemic, schools distributed devices to students even if taking them home was previously against policy.

School leaders were not all equally savvy about matching the device with what children were going to be asked to do and with what bandwidth and other infrastructure was available (Rice & Ortiz, 2021b). If children are going to be asked to design and develop many different types of learning artifacts that will require typed text, they will need a keyboard suitable for their fingers, hands, and body. If the students are going to be mostly watching or reading material, then a tablet might be fine. There are also many types of peripheral equipment that might be distributed such as keyboards, computer mice, cords and chargers, headsets, and even monitors. The need for these devices and other equipment may vary by student and some items might be included in student service plans. It is the responsibility of an entire team to review such equipment needs and make decisions. Another set of considerations raised by Rice and Argüello de Jesús (2024) centered on access alongside traditionally ethnic cultural communities and their unmet needs balanced when advanced technologies come into learning spaces. These losses might be about Land and Water, community social life, shared decision-making power and/or more. They also ask critical questions about who these technologies are really created for when a group of multilingual children, who have all qualified for special educational services in a rural setting, are unable to get their digital device to work because it will not recognize their speech properly.

Device Stewardship

The quality and condition of the devices are important. Students learning online need to have serviceable, functional, unshared devices and assistive technologies that suit their needs (Black et al., 2022; Fernandez et al., 2016; Rice & Carter, 2015). In addition, internet-



ready devices for learning online need proper storage and care along with regular maintenance. It is common for small laptops to lose keys for instance, as part of normal wear and tear. Educators seem to need to provide planning help for charging and screen cleaning alongside regular software updating (Stahl et al., 2017). In another study, Tremmel et al. (2020) found that frequent check-ins to determine family needs instead of telling families what to do resulted in more positive outcomes for students. Such planning support should be intensive initially and then can taper after the first few weeks of school and then remain as periodic reminders for most students.

In reviewing previous research, mothers or grandmothers provided much learning support for the online instruction that was occurring during the COVID-19 pandemic school building closures as part of what might have been a social or cultural expectation for women to tend children and manage schooling (Rice, 2024a). Some fathers provided technical support for keeping the internet-ready devices up-and-running and ensuring the family home had access to the internet (Adigun et al., 2023). Families divided the labor for supporting the child's access in various ways. Research has shown that the person providing support could be a grandparent, older sibling, day care provider, foster parent, or someone like a neighbor (Rice et al., 2019).

Educators seemed to expect that families would automatically tend to engage in device stewardship tasks like screen, key, and charge care, but they might not without prompting or reminding in regular intervals and can be disappointed when this is not the case (Rice & Carter, 2015). Care for the device may be part of the job skills that predicted the ability to guide online learning for children during the pandemic (Domina et al., 2021; Rice & Ortiz, 2021b). Among the findings from Rice and Carter (2016) was the need for ongoing review of



important processes and procedures necessary to keep children logging on to learn. This might include the devices that have been given or loaned out to the family. Check-ins could focus on immediate needs and information gathering, even though there might be a temptation to frame the devices as borrowed property and make families afraid that if they reveal needs authentically, they will be punished or deemed unfit for virtual/hybrid learning (Rice & Carter, 2015; Rice & Ortiz, 2021b). Also, if care and maintenance of the devices are unfamiliar tasks, the requirement to do so could be overwhelming for some families, particularly if there are many children (e.g., number of outlets are needed; stable living situation; evening routine) (Domina et al., 2021).

Where there are agreements that devices are school properties, loaned to students, it still might be appropriate to negotiate expectations for device stewardship and maintenance. There is not a lot of research about this topic. However, acceptable use policies need not focus just on perceived responsibilities of the families or children (Cramer & Hayes, 2010). Acceptable use policies might also share what the school officials consider its reciprocal responsibilities for supporting regular maintenance, replacing devices and charging equipment, helping families find internet access, and describing normal use. Although it is becoming rarer, some schools have had Bring Your Own Device (BYOD) policies, where children may bring a device owned by the family to school. Often the device children brought with them was a mobile phone (Selwyn et al., 2017). These BYOD movements were expected to be transformative, but research found students rarely did creative or interesting things with the phones and the phones became a nuisance on the school landscape as importers of bullying and conduits of surveillance for schools into children's non-school lives (Selwyn et al., 2017). In cases where teachers might do their work in a



school with a BYOD policy, it is still important to provide information about keeping the device charged and in good condition. It also seems important to lead conversations with families about what the school is asking from them in terms of making sure there is enough memory on the device for downloading and/or running applications and programs for schoolwork, and that children know when they can delete school information from their devices (Rice, 2024b).

In the technological industry, devices have not been designed to survive to be heirlooms—they are designed for one person to use extensively for a short period of time and then be traded in for a new device with brand new features every several months to perhaps one year (Slade, 2007). School budgeting may not allow the luxury of replacing internet-ready devices every year, or even every 2 or 3. Instead, schools attempt to operate as if devices are durable goods like the textbooks they historically used for 10 years. When the devices fall apart—which they will—school officials might be tempted to be blameful of children and families for not being good stewards when these devices were never designed or expected to be maintained in perpetuity. Among the recommendations from Rice (2024b) who looked at rural technology use was for educators who are using digital devices virtual/hybrid learning to set reasonable expectations about stewardship of devices. These would include considerations for when they need to be replaced, and the quality of what they should be asking for from vendors.

Internet Service Access

Internet service is an important part of asking children to be engaged online (Junod, 2025). Research studies have discussed the need for the devices to have a stable and reliable internet connection. For example, MacDomnaill et al. (2021) found that students stayed online



and completed more of their work when their internet connection was consistent. Students need to be able to connect their devices to the internet with minimal to no support and maintain that connection while they are doing their learning (Rice & Ortiz, 2021b). Proactive responses to these challenges are needed, such as calling students on the phone and helping them get online (Rice, 2022). School leaders might have to work with community leaders to ensure that internet access is available where all the families live. In many communities, the priority for high-speed cable is often the business district or wealthy neighborhoods. Schools and less wealthy neighborhoods are left out of infrastructure improvements when there is no coordination. Some families are willing to take their children to churches and restaurants to do their schoolwork, but not all families can do this (Mellard et al., 2020).

Accessing the LMS and Major Learning Platforms

Once students have their own devices and other equipment and have logged onto the internet, the next step is for children to be able to locate and enter the learning platform, such as a learning management system (LMS). The sign in process for the LMS can be challenging for some students if they must manage multiple sign ins for the LMS and other programs. This might be especially true if there are multiple factor identifications, frequent password changes, special password requirements that some children have a difficult time remembering. This could be made more complicated when multiple family members share the same device. Teachers will need to teach specific practices for managing and remembering passwords as well as what to do and whom to contact when passwords are forgotten. Once children enter the LMS and/or other password-protected programs they need to be able to locate their assignments and other saved work as well as learn how to submit. Generally, the more steps that children must take to locate work, do work, and submit work, the more chances there are



for access breakdowns and for children to become frustrated and abandon their work.

Unfinished assignments might result in low grades and the appearance of learning deficits or low achievement.

Cybersecurity is also a looming issue in digital access because once security is breached, bad actors have access to student information and data, but students may not have access to online instruction and services to which they are entitled while investigations occur, and new applications and programs are vetted. A content analysis of cybersecurity breaches in the U.S. found that most occurred because of a failure enabled by a vendor with whom the victimized school had a relationship (Levin, 2021). This means that school officials need to exercise ongoing vigilance in their relationships with vendors in learning all they can about how the vendor protects school data and prevents cyberattacks. However, the task can become daunting when compared to the already overwhelming administrative duties and the ever-changing IT landscape, meaning teachers may never quite be independent or fully comprehend these issues without help from the very vendors who want to ensure sales. Importantly, cyberattacks can happen regardless of school location or size.

Accessing Video Conferences

For video conferencing platforms, many of the same access guidelines also apply. These platforms were not made for education and particularly not for children (Suduc et al., 2023). Children do not always know how to log on, how to enter a room, and then how to navigate the essential features of the conference, including generating a transcript, captioning, public and private chat, using breakout rooms, muting audio/video, raising hands, and reacting in other ways (Lim & Kaveri, 2024). While it might be difficult for educators to conceptualize that children would not know how to use all these features or that they would not know how



to use them in ways that teachers want them used at times teachers want them used, this is often the case. For example, even if children use video conferencing tools to talk to relatives or friends, they might move around within a room or from room to room and show a family member items and/or tell stories. They are the center of attention. Calls are short. If they drop, you might not call back. These are very different circumstances and expectations from school. Regarding security, Levin (2021) reviewed the security of video conferencing software and found that it was vulnerable to a special kind of threat called *class invasion* where malicious actors enter a video conference and place images in front of children that are considered violent and/or pornographic. Some video conference applications that contract with schools have taken steps to prevent class invasions, but it is still important to have ongoing updates from vendors about efforts they are making to keep their applications safe (Levin, 2021). When class invasions occur, parents could become frustrated and become reluctant to send their children to video conferences. Children could also become traumatized and not attend or engage, which ultimately will cause differences in access to instruction. If a class invasion occurs, a teacher may have no choice but to end the video conference immediately. Levin (2021) concluded that it was not a good idea for a teacher to spend time trying to decide if a student is causing mischief or an outside invader; the images will not abate on their own; the teacher should just stop the video conference. Next, students and parents should be notified that a class invasion occurred and then they should be provided information about who they can contact if they have questions or concerns and then when and at what new link or via what new video conferencing service, they can enter a video conference next time one is held.

Implications



Teachers in rural places often do not have the internet infrastructure for students that other communities do (Becker, 2000; Catalano et al., 2021; Running Bear et al, 2021). While it is expected that funds might be on the horizon, someday, for infrastructure, it often takes years to build these structures (New Mexico Center on Law and Poverty, 2021). Teachers can be part of important conversations about where the internet infrastructure is placed in their communities, with an emphasis on ensuring that schools as well as families and children in the most need of help to acquire digital connections can access the internet (Rice & Argüello de Jesús, 2024). However, it seems unreasonable to ask teachers to be the brokers for the internet in these communities by themselves—other local leaders with information technology expertise must do much of the work. Crucial to these plans is the realization that even though many of these communities are rural, they are not all the same rural. For example, some Indigenous Tribal Nations might have to take longer to choose to design internet infrastructure that meets their needs and does not leave them vulnerable to having cultural knowledge taken and used without permission. Other communities need to ensure they can access resources that are scarce like water and the internet. When communities question how new technologies in their communities could affect local ecologies, it seems important to do more than reassure them that all technologies will result in fair opportunities to receive education.

Once the internet infrastructure is in place, teachers can plan what types of devices and other equipment they want to purchase within their budgets for various grade levels and subject matter (Rice, 2024b). Given that for some of the children, the device that children have might be the only one in the home that is not a mobile phone for some families, they have to think about how to frame stewardship negotiations to ensure that children have access to devices in good condition that they need for work, while also considering what wear and



tear can and should look like (Tremmel et al. 2020). Educators could also design check-ins for families where they could learn about how the devices were faring, from parents' and children's experiences. This is important since for some families the device(s) the school provides might be the only device that accesses the internet other than a mobile phone.

Basic questions for information gathering and to prompt families, might include:

1. How many school-issued devices do you have and what type are they (e.g., laptop, tablet, accessories, etc.)?
2. What is needed for the devices to be in operating condition on a consistent basis?
3. Who is the adult or older child in the home responsible for maintaining the devices and the family internet access?
4. Do these devices consistently connect to the internet without trouble?
5. Do any of these devices need immediate repairs?
6. Do these devices all have working charging cords/ports?
7. Do parents and children have a functional understanding of how the device works?

Teachers in some communities also must consider that there might be some families that do not want a device or who might want a device but cannot be the primary stewards of it for various reasons. Teachers in these communities could consider what might be done to develop programs where someone could do a home visit to check on the device or make a phone call to ask questions, whichever is most appropriate (Rice & Carter, 2016). However, it is important to visit a family in such a way that does not make the family feel that they are in trouble or subject to additional surveillance.



Once devices, distributions, and stewardships have been decided, teachers need to be informed about how take careful steps to ensure that LMS and other major systems, including video conferencing can be accessed with single sign-on features, information about safe passwords that children can remember, and information about how to get help when passwords are forgotten. They also could develop strong plans for regular review of privacy and safety for all programs and are proactive about guarding against class invasions with strategies like requiring waiting rooms, having students introduce themselves in the chat even if their cameras are not on to verify all participants are legitimate, linking video conference sign-on information with emails and so forth (Levin, 2021).

Emergency and Occasional Online Learning

In case of emergencies or occasional online learning days, such as for inclement weather, it is crucial to plan for digital access. School districts should not assume that all students have access to devices, except for perhaps, a mobile phone (Rice, 2024b; UNICEF, 2020). It is not conducive to learning to have a family of five trying to use one parent's cell phone to do their online learning on a snow day. For a major disaster, like a wildfire or flood, it may take several days to arrange online learning—not just because of distributing devices but because of the need to ensure the internet is up and running and that platforms and other services can be accessed.

Cybersecurity risks may increase during disasters and occasional learning days because there is more chaos, and teachers might have less of an idea of who is supposed to be in their learning programs and video conference sessions (Levin, 2021). Also, there may be individuals attempting to join the class with mobile phones whose names will not match class rolls and people might be spread outside of the local community because they evacuated.



Therefore, it seems even more critical to be able to act promptly if there is a major security threat, such as a class invasion. Teachers need to be periodically reminded of procedures for granting entry to programs and for logging out properly. Also, there needs to be some discussion about what makes sense for reasonable exceptions and what proper reporting procedures are.

Instructional Access

Teachers and children are using an increasing number of digital applications that are mostly handed to them without comment or evaluation (Rice & Ortiz, 2021a). A report by Instructure (2024) found that teachers were using 49 different technology tools per year and students were using 45, with some overlap. Given the findings of this report, teachers should consider taking an inventory of how many digital materials teachers are asking students to use, what materials like worksheets are being digitized, whether there are exceptions, and what these new requirements mean for mobile applications that monitor, record, and report student behaviors. High-quality digital instructional materials are essential to learning in online and digital environments (Rice & Ortiz, 2021a). Yes, the definition of *high quality* tends to be a matter of discussion. In multiple studies, K-12 students and parents have reported issues with the accessibility of online instructional materials that otherwise met state requirements (Alvarado-Alcantar & Keeley, 2020; Alvarado-Alcantar et al. 2018; Rice & Ortiz, 2021a; Rice et al. 2019). Educators have been working to address these issues by improving the preparation of teachers to evaluate the accessibility of their instructional materials and then either modify the materials or choose materials that are more suitable (Rice & Ortiz, 2020).

Evaluating Materials



In evaluating the digital instructional materials, per Title II of the Americans with Disabilities Act, the materials must meet WCAG 2.1 A/AA checklists. This list is found here: <https://webaim.org/standards/wcag/checklist>. Requirements on this list focus on issues like ensuring proper color contrast, providing captions for videos, writing alternative text (ALT text) for images, coding for screen reader compatibility, and placing text in larger font sizes. Materials are supposed to be purchased with these features. In the past, schools and other agencies were able to identify an accessibility standard on their own. Many online learning providers used included the Quality Matters (QM) Rubric and the Universal Design for Learning (UDL). The QM rubric had required 80% of content to be accessible to qualify the course for their approval. UDL is a set of guidance focused on enabling multiple ways of accessing content, engaging with content, and demonstrating learning (Rose & Meyer, 2006). While both frameworks had been considered acceptable for meeting inclusive guidelines, QM and UDL are not accepted standards for accessibility under Title II—only WCAG 2.1. A/AA is.

Ensuring that materials are accessible is shared work between administrators and teachers. In the past, Title II allowed for institutions to have exceptions when they purchased from third party vendors. This is no longer the case. The materials must meet WCAG 2.1 A/AA standards regardless of whether the school makes the materials, or they purchase them. This is also true for all the web applications schools might use for school-home communication, selling tickets for school raffles, sports, distributing food or other services, scheduling related services like therapies, and similar activities. This includes materials purchased from teacher-to-teacher websites (e.g., [teacherspayteachers.com](https://www.teacherspayteachers.com) if those materials remain digital when given to students).



There are exceptions to Title II requirements for (a) archived web content that students and the public will never see; (b) various pre-existing documents in a system, unless those documents are currently used to apply for, gain access to, or participate in the public entity's services, programs, or activities; (c) content posted by a third party—rather than developed by a third party and sold; (d) documents about a specific individuals as long as these are password-protected or otherwise secured—remember that if these are to be presented to a person who needs accessibility features added, they must be modified by the vendor and/or instructor, and (e) preexisting social media posts, such as on a school website. However, any time there is information that is essential to students and families' access to programs and services, it is important to prioritize a way to make it accessible.

Modifying Materials

When teachers modify materials, Rice and Carter (2015) and Crouse et al. (2018) documented how teachers reformat information, decrease the number of steps required to do tasks, call families to do oral assessments instead of use text-based ones, and solicit parent help to monitor progress that might not be captured in learning management systems as important strategies and adds to teacher labor. Rice (2022) also found that teachers were contextualizing instruction with activities like finding local plants to teach children in the desert about parts of the plants instead of using forest plants the children had never seen yet were more easily available from the stock digital materials that were provided by vendors. Digital tools like cameras and resources on the internet facilitated adjustments for such stock material, yet at extra efforts by educators that are often unseen and not included in assessment of digital instructional materials. Teachers reported a practical need for additional equipment, such as two computer monitors to help organize all of what they needed to show to students to



help them contextualize digital instructional materials while also having a screen with a full view of children, yet despite being a common long-standing need these levels of digital instructional materials are still readily easily available.

Engaging Parent Assistance

Parents work to provide children access to instructional materials, and they often value the experience of being able to support their children online when they choose virtual/hybrid learning (Rice & Ortiz, 2021a). This is true even when they have suggestions for improvement. Parent efforts that are reliant on job skills and English language abilities included finding new materials, modifying materials from teachers, and offloading some physical tasks to their own bodies (e.g., typing for the child or reading the text aloud to the child) to give the child more time and cognitive space to think about the subject matter. Educators sometimes conceptualized this as cheating or overhelping. Black's (2009) research found that when some parents helped children in online coursework, children did worse overall in the class. While this study has sometimes been used to say "see, parents shouldn't help," it might mean that parents can figure out when their children are struggling, and they are metaphorically trying to bail water so that the children do not sink in the online setting. In that same study from Black (2009), for families with multiple children, parents were only helping the children when they thought they were struggling; they were not forcing their assistance on all the kids in the home.

It is important to contextualize parent help in virtual learning with understanding that during the pandemic, parents who formed communities and helped each other help their children had children who logged on more and who reported liking online learning (Domina et al., 2021). Moreover, these families doing these proactive things were more likely to be



White and well-educated. Ortiz et al. (2021) reported that 70% of parents indicated that their children needed help with at least 80% of their schoolwork. This seems like parents are needing to do too much potentially because course design and materials are to be accessible to young people. In such cases, schools need to help. Some of the need for help might be coming from instructional materials or curriculum that is not meeting the students' needs because the tasks are not described well and/or because there are too many steps for young people to keep track of. It could be another matter of more learner support, which will be addressed in another section. School officials could spring into action with offers of support when they notice or suspect parents are helping, instead of saying, "don't help." Another strategy is to regularly ask parents "how much are you helping?" and ask parents what help they want. Leaders of virtual/hybrid learning have to consider whether they are designing practices and messaging or even inadvertently rewarding what resourced parents do to help while shaming or punishing what less-resourced parents are trying to do to help. Instead, Domina et al. (2021) and Ortiz et al. (2021) have recommended access to support networks for all parents.

Instruction and Text Complexity

Other issues that are important for K-12 online learning that will not necessarily fall into WCAG 2.1 A/AA are the text complexity demands within the online text. In a traditional text, there are words on a page that are assigned a grade level or score of complexity based on an algorithm. Historically, these were formulas that were calculated based on letters per word, words per sentence, sentences per paragraph (Fajardo et al., 2013). Obviously, these were not attuned to cultural or geographic differences for children. Today, vendors use algorithms to determine reading levels that are proprietary and not always shared with the public. They can be about aspects such as how abstract a word is, what role the word is playing in a sentence,



how words in a paragraph help the reader connect to previous ideas in previous sentences and paragraphs, and how much the text continues to refer to the critical ideas in it (Cain & Nash, 2011; McNamara et al., 2011). Some formulas may also include information about average reading performances from children who have recently used their products. Again, it is unclear whether and how these formulas consider variations in cultural and geographic background.

Reading formulas that explain reading fail to account for a digital learning environment where digital instructional materials can be hyperlinked to other materials where the subject matter being shared and/or text complexity being used changes rapidly. For instance, there might be a carefully crafted digital text about the *Declaration of Independence* and how it was written. But if there is a link to the Declaration, the child will be sent to a *1,320-word sentence* that is complex and dense. When students come to this denser material, they may not read it all, and they might give up on the assignment entirely, and/or they might find their way to another site that is not on the subject matter topic (Rice & Deshler, 2018). Also, in some online environments, an algorithm that neither children nor educators have control over will choose the next reading for them. Sometimes this next reading is based on some perception of what they might benefit from educationally according to the software of platform designer who may not necessarily be an educator, but out on the open internet, algorithms choose what readers read next based on what will increase engagement with a website or lead to a purchase (Swart, 2021). Considering these challenges, when evaluating digital instructional materials, it is important to consider not only the text complexity of the materials that are on the landing pages and the instructional pages. Educators must also consider the text complexity problems that are introduced for hyperlinked pages, help pages,



and/or exploratory pages. Instructions that accompany text might also help (Rice & Deshler, 2018).

Another challenge is that digital reading is shallower; reading online impedes the long-term memory or meaning of what is learned (Delgado & Salmerón, 2021). This means that readers will comprehend less of the same text when read online versus in a print format, even if they stay on the right webpage. This was true even after statistically compensating for mind-wandering for both the print and online groups. What this means is that digital texts need to be even easier to comprehend than are normally offered by educators or digital platforms, with even more support for children than for printed versions. In another study of reading English as a foreign language, Yu and colleagues (2022) found that reading comprehension on a mobile application was poorer than reading print, although participants were still determined to continue to use their phones to read for so-called convenience. During an emergency, people consider mobile phones to be more convenient. Studies of emergency online teaching find that both students and teachers use their phones for online learning during these times (Crompton et al., 2021).

Finally, regarding reading material, one aspect of reading that cannot be imputed into a formula very well, if at all, is what a reader brings to a text as background knowledge. These individual contextual reference realities include learning experiences and/or prior reading patterns and comfort of reading English are part of a child's social or cultural language preference. Reviews of research indicate that the importance of background knowledge varies by text and by reader, with weaker or less experienced readers needing to have more background knowledge for complex text; conversely, texts that are less complex require less background knowledge (Smith et al., 2021). Therefore, evaluating materials to determine



needed background knowledge is important. Rice and Argüello de Jesús (2024) wrote about conversations with educational technologists who insisted that planning for background knowledge was merely a matter of making sure children in urban settings had access to texts about sneakers and finding universal topics that kids like, such as sharks. Even if a topic like sharks is popular, that does not mean that children are familiar enough with it for the topic to support their learning. Instead, educators might consider what children holistically bring to digital learning activities, including their comfort with digital devices and their comfort with a subject matter, their teacher and/or even the online learning modality. Young people on the open internet for learning or personal motives already have unavoidable algorithms vying for their attention using the most manipulative visual and audio means possible without the slightest regard for their mental health, the impact on their cognition, their emotional well-being, or their potential as engaged citizens (Pellegrino & Stasi, 2024). Educational resources chosen by educators should be thoughtful while considering how to learn what children will bring to text instead of making what they will glean from it as the primary concern.

Implications

Education is a sector where products are purchased and then the buyer has a responsibility to ensure they work properly for another set of users. There are steps that can be taken to make digital instructional materials more accessible for schools that plan to use various forms of virtual learning (Rice & Ortiz, 2021a). Three steps they can take immediately include educating their teachers and other in-house content creators about what materials must meet the WCAG 2.1 A/AA standard for Title II, even if they are already using QM rubrics or UDL checklists for their courses. Second, the educational leaders—including administrators and potentially department heads, librarians, and related individuals—need to



revisit all their contracts with vendors and make sure that these vendors will meet WCAG 2.1 A/AA standards as part of their agreement with the school. For vendors who cannot meet their standard, a request for proposals with accessibility requirements will have to go out, school leaders will choose a different application, and/or the contract cannot be renewed. It seems odd that in the educational technology market that educators must do so much testing and checking and retrofitting of what they buy, and they do so largely without complaint. Educators and families may wish to preview materials.

Unlike the long lists of Common Core Curriculum Standards where suddenly, overnight every instructional material met the standard, the WCAG 2.1 A/AA checklists are generally measurable and observable—the lists are quite extensive. For items that are more difficult for people, who for instance, do not have hearing or sight accessibility needs, schools can recruit and compensate individuals with these needs to test materials and give feedback before buying. However, compliance is unlikely to result from hiring reviewers with authentic accessibility needs alone. A person who is blind reviewing a website will not know what they cannot navigate to on a website because they cannot see it; similarly, a person who is deaf will not know what they are supposed to hear and did not. Reviewing web materials really must be a collaborative effort. There are also manual means of testing. One popular method is to put the computer mouse in a drawer or turn off the track pad and see if you can move around the website with only the arrow keys. If you can, the website is probably accessible. Another method is to use Google Chrome and right click on items with the mouse to find the “inspect” link and get information about the code. This will tell what ALT text is present and how information is organized.



Some vendors may provide a Voluntary Product Accessibility Template (VPAT) tool to clients that lists accessibility features. When a vendor has a VPAT, it is generally considered a sign of good intentions to care about accessibility (Smith & Harvey, 2014). However, it is important to understand that having a VPAT does not mean that the product is accessible because the VPAT may indicate that the product is not (Zuniga, 2022). This is like the confusion about the *What Works Clearinghouse*, where there are some products and strategies that are listed as *not working* to warn educators, but then companies advertise presence in the clearinghouse without saying that the reason they are in the clearinghouse is because they are a non-working product. It also might matter who fills out the VPAT to determine the amount and quality of information. The engineers often know more about the accessibility features than the marketing department, for example.

Finally, teacher educators can support teachers planning to review their existing digital instructional materials to ensure they are accessible. The prioritization of this review might revolve around determining what materials students and families with definite accessibility needs will need to use first, such as emergency information (Tremmel et al., 2020). Second, it might be worth considering which classes, grades, or services most students with higher accessibility needs are in or are anticipated to be in and updating those materials first. Third, the school should focus on what materials everyone is required to use because the courses are required, such as English courses or certain math courses. Those might be updated ahead of courses that fewer students overall take. Finally, courses in online schools are often updated on a schedule by grade or subject area. Courses that are due to be updated soon can be updated on schedule. Courses that are many years out may need a special convening. Generally, it is better for a school to review their applications and programs and agree to a



certain number that is not overwhelming to teachers. This could vary by schools, but might be as many as 12, but probably will not be more than that. Parents may also like not having to keep signing up for accounts that collect their data and send them endless amounts of emails, follow them algorithmically on social media, and otherwise invade their privacy. Educators at a school can periodically revisit the number of applications they use to ensure accessibility and evaluate how well the programs and applications are helping them meet their goals.

Emergency and Occasional Online Learning

For instances where online learning is done on an emergency basis or due to inclement weather or something similar, it remains important to provide access to instruction. A cornerstone of this access will still be accessible digital instructional materials (Rice, 2024a). One major difference for the emergency or occasional planning will be that schools might not have long-term contracts with any vendors just for this purpose. They will have the same contracts with digital vendors for in-person learning and for an LMS that will be put into service for a snow day in most cases. It may take a serious disruption to draw many new vendors. Therefore, it is important to ask questions during the selection of those digital materials and that learning management system while choosing and configuring them: What will this look like when/if we must use it to teach online during an emergency or because of inclement weather?

In these cases, more responsibility also rests on teachers to choose digital instructional materials on their own that are usable for one day, several days, or several weeks that are accessible. Therefore, materials will need to be accessible at the time of purchase. Evaluation of material must also consider how reading comprehension declines online, reading is complicated by hypertext/links, reading issues are not solved by multimodal components



alone, and that many students, particularly in emergency and occasional situations will be *reading on their phones* and they will be doing it poorly (Delgado & Salmerón, 2021). Teachers being disappointed about this will not change this fact. It is better to consider an outside of potential emergency or occasional lessons that can be easily done with minimal dense text reading and to consider that it might be completed mostly or completely on a mobile phone. Also, teachers need to consider that they might have to teach with a mobile phone, so when they are planning emergency or occasional lessons ahead, asking the question, *Can I teach/monitor/assess this with my phone?* is an important question. Teams of teachers might want to collaboratively plan sets of lessons for grades and subjects for these purposes. It is also difficult to estimate or predict the emotional toll major disasters would take on teachers, children and families and even otherwise well-designed materials would just not be sufficient to overcome the trauma.

Learner Support

A range of adults that are or could potentially support a child working in a digital setting are part of the virtual education (Adigun et al., 2023; Rice et al., 2018). These adults include teachers, and service providers within the school and external to the school. They also include foster parents, grandparents and daycare providers, babysitters, older siblings, and even adults like aunts and uncles, *compadres* or God parents or neighbors. Parents or other helping adults prioritize different types of engagement than teachers do when supervising children, and they are better positioned to notice some types of engagement over others (Ortiz et al., 2021). In revising activities and materials, teachers might be better positioned to advantage the students who can watch peers and finding ways to engage with them during digital learning (Zhang, 2018). Even when using accessible digital instructional materials, learners need educators, non-educators, and peers to provide cognitive, emotional, and social



support for learning (Borup et al., 2020). Because teachers are not physically proximate to the students, they must plan lessons that can be accessed through combinations of synchronous and asynchronous instructional methods. In turn, this shifts the opportunities for peer interactions, and the increased reliance on those who are in physical proximity to the student, such as parents or other helping adults to assist in monitoring persistence and achievement through the course (Rice & Ortiz, 2022; Zhang, 2018). For children who speak and learn in languages other than English, research has suggested that their families have fewer connections in the community for gaining support (Domina et al., 2021).

Teacher Preparation for Learner Support

Almost 15 years ago, some researchers called for increased attention to teacher education and high-quality field experiences in online learning (Kennedy & Archambault, 2012). At this time, there were few to none that were available. Teachers learned to teach online once they found an online teaching job or received an assignment to teach online. In terms of meeting the needs of children who needed additional support in an online learning program, teachers decided for themselves that they were going to try to learn to help children since there were few resources at the state or local level to assist them with professional learning (Burdette et al., 2013; Rice, 2017).

Since the COVID-19 pandemic caused school building closures and there were no other options for field experiences during that time, a review of literature revealed increased access to teaching and observing in the emergency online teaching setting; however, these experiences have likely faded with the return to mostly in-person learning (Woo et al., 2023). For teacher educators in special education, a survey of 100 special education teacher educators from various institutions in the U.S. revealed concerns that the online learning modality would



be too restrictive of an environment for many students, meaning that opportunities to learn from and with peers might be too few without deliberate effort on the part of teachers (Smith et al., 2016). These same teacher educators also admitted that they rarely taught teachers about online learning. No newer study of as many special education teacher educators exists on this topic. However, Wall (2024) surveyed 67 online middle school teachers in California more recently. Those teachers reported receiving no specialized training for online learning or serving students identified with disabilities in pre-service preparation.

Types of Engagement as Support

A key aspect to doing teaching online and in any educational environment is to have interactions with learners that support their learning. Educational researchers use the term *engagement* to describe the effort and energy that the learners invest to learn concepts presented in the learning environment (Fredricks et al., 2004; Hughes et al., 2008). The three major types of engagement commonly discussed in research are: (a) behavioral, (b) cognitive, and (c) emotional. These are required in in-person learning environments as well but operate in slightly different ways online. The digital instructional materials alongside maneuvers by the teacher to instruct, clarify, organize, monitor and/or pace the learning support these three types of engagement. Online instruction that is highly engaging and contains high levels of learner support will simultaneously attend to multiple types of engagement (Rice & Ortiz, 2021b).

Behavioral Engagement

Behavioral engagement occurs when learners take measurable and observable actions to learn the content (Zimmerman & Schunk, 2011). In an online setting, the learners open pages, click on links, give answers, write comments, submit assignments, use emojis, and do



similar activities to demonstrate behavioral engagement. When digital instructional materials are accessible, learners can behaviorally engage with the materials as many times as they want (e.g., watch or listen) without having to have a teacher explain a concept multiple times (Chiu & Churchill, 2015). These materials include pre-recorded videos, screencasts, games, simulations, and interactive web pages. Children can also slow down the video and/or audio and sometimes put it in a different voice or register. The UDL framework argues that learners should choose from various instructional materials that all contain the same information according to preference, instead of having to use every type of instructional material in a lesson (Rose & Meyer, 2006). However, merely providing many materials and activities does not result in universal engagement, since students can also be overwhelmed by many choices (Shapiro, 2008). A teacher might have to consult with a learner to help them choose the best materials for them to use. It is also possible for a child (or someone who is *not* the child) to do the actions that signal behavioral engagement online without a clear understanding of the lesson (Archambault et al., 2013). Therefore, an LMS with only behavioral information dashboards or notification systems for teachers and parents may be insufficient for determining whether learning is occurring and/or determining whether achievement is happening. Teachers and parents will need to understand the limitations of behavioral engagement data.

Cognitive Engagement

Cognitive engagement is “the expenditure of thoughtful energy needed to comprehend complex ideas in order to go beyond the minimal requirements” (Finn & Zimmer, 2021, p. 102). Cognitive engagement and behavioral responses, often co-occur, such as a raised hand (behavioral) accompanying asking a poignant question (cognitive) or responding to a writing



prompt (cognitive) is accompanied by the submission of the response (behavioral). Cognitive engagement is more likely to occur when students have as much relevant information as possible about a concept as opposed to a simplified definition or an incomplete explanation (Sanders & Makosta, 2016).

Worked examples and simulations also support concepts learning with digital materials, particularly for subjects like math and science (Roblin et al., 2018; ter Vrugte et al. 2017). A worked example is a type of learning instrument where a learner can watch an instructor do a problem or task from start to finish, usually with narration of their thinking and processes. In virtual/hybrid learning, a video worked example can be watched multiple times, and libraries of examples can be curated for them and when children are learning in an online school, they can review these videos at their convenience.

For example, teachers usually understand that it is useful to avoid the abstract and instead focus on the concrete. However, this is very difficult in practice since even manipulatives are technically abstract. Potentially, a better way to think about this concept is that children need examples that are *familiar* to them. For example, a teacher could use dividing a book in two pieces to talk about the concept of half, but it is better to use the example of a cookie because people divide cookies in real life for a reason—to share them (Willingham, 2021). Teaching online brings this problem into full view because, while it is possible to have sophisticated simulations and graphics of cookies, an in-person teacher can *bring real cookies* to teach about the concept of division and the children can all eat cookies together. This constraint where there is an inherent abstractness about online examples means that ensuring familiarity is even more important. In virtual/hybrid learning, teachers provide direct learner support for cognitive engagement with synchronous small group instruction



(Crouse et al., 2018). Additional cognitive support occurs in an online environment when peers collaborate online and there are opportunities for peer feedback (Tonks et al., 2020/2021). Research in online environments has found that when young people are able to watch what teachers or other learners do cognitive tasks, this helps them understand the task themselves (Zhang, 2018). This might be the case because it increases children's familiarity with the task and with the objects associated with the task.

Emotional Engagement

Emotional engagement demands “task-facilitating emotions such as interest and the absence of task-withdrawing emotions such as distress” (Reeve, 2012, p. 150). Sometimes, students respond negatively to what is happening during online learning instruction. When children are consistently in emotional distress, they are unable to engage cognitively and behaviorally (Nabi, 1999). Negative responses can emerge from subject matter that is traumatic to them inherently, such as watching a video where a grandparent passes away when their grandparent recently passed away. Or the negative responses can come from the perception that the subject matter is too difficult for them to learn. For example, a child might feel that they are not good at math and so, even opening the math lessons will be distressing. Moreover, online content can contain powerful visual media that, in turn, provides more opportunities for students to experience a range of emotional responses (Lim & Childs, 2020). Children's emotional responses to this powerful content might be difficult to predict. For example, children might laugh at the World Trade Center towers falling into rubble because they are not old enough to understand the historical significance of this moment in history and it might just look like a cool building falling to them. Chemicals that are released in the reward area of the brain often come in response to sensational online content, which will



cause some children to seek out images and experiences that are exciting to them (Giedd, 2012). Captivating images and videos will be more interesting than school assignments. Where teachers can use software to detect and redirect students, there still might be some children who can use a phone or another device or find a workaround to find their way to a preferred site. While children might believe that they are multitasking in these circumstances, research indicates that neither the children or adults can multi-task—they merely switch between tasks and therefore have gaps in their understanding (Giedd, 2012).

Emotional responses are also linked to the perceptions of rewards on online activity, including learning. In online learning, there are various ways to introduce rewards besides awarding points, such as with emojis, memes, songs/sounds, and praise that is both written and recorded as audio or video (Stevens & Rice, 2016). Varying online content and activity between applications and programs with human interaction might provide opportunities for children to have different types of opportunities to experience emotional rewards in ways that might prevent outcomes some parents might worry about, in terms of becoming too accustomed to the habit-forming features that programmers build into applications and programs (Gillespie, 2019; Liu & Luo, 2015).

Parents and Other Helping Adults' Roles

Non-teacher mentors that children rely on for doing their learning include parents, caregivers, and other legal decision makers as well as other family members, such as grandparents (Rice et al., 2019). According to research, these caregivers play less of a role in cognitive support than they do in providing behavioral and social/emotional support to children. This is probably because these non-teacher adults are not usually subject matter experts. Even when parents consider themselves to be *doing the work of teachers* in an online



environment, often what they are describing is behavioral support for doing things like making sure that all the pages of the lesson are clicked, and the assignments are submitted (Rice & Ortiz, 2021a). One mother talked about digitally raising her child's hand for him so he could answer questions (Rice & Ortiz, 2023).

Therapies and Related Services Supports

Children who qualify through the Individuals with Disabilities in Education Act (IDEA, 2004) may also have related services as learner support. These supports can vary widely depending on children's needs and what the team in charge of developing their service plan determines. Some of these possible related services might include therapies for help with speech or physical needs. A child should not be assigned to a teletherapy situation merely for the fact of being enrolled in an online program (Rice & Ortiz, 2022). The decision of whether to provide therapies or other related services should be determined based on whether that modality fits the child's needs. Some children may prefer and derive equal or more benefit from teletherapies, but other children might not.

Some of the reasons they might not include the following issues: (a) internet access and bandwidth for them and the therapist; (b) the fact that therapies are appointment-based, which different from many other aspects of online learning that can happen whenever the child and family would like to do it; (c) the objects required for therapies like occupational therapies are difficult to deliver to the child in a timely manner or they are difficult for the family to keep track of or keep safe; (d) the child need a consistent therapist and there is too much turnover in the teletherapist market in a certain area; (e) no trained person is available to be the on-site assistant required for therapies like physical therapy; and (f) some specific need articulated in the disability plan cannot be met or accounted for in a teletherapy setting.



Implications

Teacher work to develop learner supports involves multiple types (Borup et al, 2020). Teacher educators can help teachers learn how to design their materials to ask interesting questions (cognitive engagement), require a recorded response (behavioral engagement) while doing some work for providing support for engagement. However, teachers can also include additional elements, such as inciting children to notice their feelings and share them under various circumstances (emotional engagement) (Geesa et al., 2022). High levels of engagement can also include elements from games, such as earning points, gathering materials, or going on a quest or adventure, and using feedback to make improvements. Even so, there is evidence that adolescent brains can easily be caught up in intense levels of brain reward systems at the expense of their attention (American Academy of Pediatrics, 2016; Kappi et al, 2024; Liu & Luo, 2015). Children do tend to appreciate feedback and responses from teachers, even when it is available from applications and programs (Stevens & Rice, 2016).

Feedback and other support from teachers can include help designing or using interactive task lists (behavioral); partial credit (behavioral); information about performance, including missed items and information about where to find more worked examples (cognitive); and access to upbeat sounds, inspirational images, or a meaningful human response to their work and effort (emotional) (Lim & Childs, 2020; Willingham, 2021). Peers might also be given opportunities to say positive things to one another about their work, ask questions, or share times when they faced a challenge with their online work and then were able to address it somehow with a strategy or help-seeking action (Miller, 2022).



Emergency and Occasional Online Learning

By the nature of emergency learning, emotions will be heightened if children must suddenly move to an online learning modality to receive education (Miller, 2022). Therefore, it will be important to attend to emotional engagement with the lessons that are given, whether these are designed in advance or must be designed quickly. Teachers need to realize that they will be competing for children's behavioral, cognitive, and emotional resources during this time (Crompton et al, 2021). While school might be conceptualized as a lower priority, it can also be an important place of emotional familiarity for many children where the routines and access to kind and beloved teachers will help them feel safe. However, since the ability to engage on various levels might be very low, teachers may want to consider lessons that review important concepts, build procedural knowledge for important skills, and consider what knowledge and skills need to move up through grade levels and across multiple subjects. These will likely be the most useful lessons.

For occasional learning, fewer children will be in emotional distress at not being in school for a day or two, especially if the inclement weather is a snow day. However, teachers again need to consider what they are competing against, not just what children would be doing if they were away from the computer (e.g., skiing) but what children are apt to do instead of their lessons while on the computer (e.g., video games, social media). Teachers should remember the importance of familiarity—not just concreteness—in determining how to design lessons around a topic (Willingham, 2021; Rice 2022). For example, if teachers are competing with the Minecraft online game, a teacher might use a lesson about perimeter, area, and surface area with Minecraft blocks. If there is a snow day, a teacher could build a lesson



where the children must do something with the snow (observe, record, measure, etc.).

Working with familiarity and attending to engagement in all domains should support learning.

Policy Support

Strong policies for online learning should gather information about what enables digital and instructional access for students and what supports their learning and then enable those practices to occur (Barbour et al, 2025). Enabling successful practices is a matter of providing strong procedural guidance as well as ensuring that funding is available for staff and equipment (Kozleski, 2020; Ortiz et al., 2020). Policy decisions create divides in access and support, or they can alleviate them. For example, Churchwright (2018) sought to understand how policies for virtual/hybrid learning operated in Ohio by conducting a close textual analysis along with placement information. Churchwright (2018) found gaps between what policies said about placement for children and what was happening in online schools in Ohio. Misapplication of policies was creating gaps in support for students; instead of writing new policies, Churchwright (2018) recommended learning opportunities for teachers and leaders about policies with strong guidance and then more accountability for accurately applying existing policies.

Vendors as Policy Players

One emerging phenomenon in virtual/hybrid learning that might be challenging is that so much instruction is provided by vendors where students work asynchronously, or away from teachers. Within the asynchronous approach, data-gathering mechanisms of programs and applications are not transparent (Stahl & Karger, 2016). Even when teachers and parents receive information about progress, information might be incomplete because of a need to preserve the integrity of the items in the activities, or the proprietary rights for formulas used. Recommendations for remediation are often to use a vendor's program more. Teachers cannot



see what exactly a child did while working and therefore cannot provide any *just in time* instruction. Instead, the child must drill on the program until they start responding to items correctly (Boninger et al, 2020). States that gave permission for online schools to operate using all or mostly asynchronous vendor curriculum must consider the implications of this. There may be policies they want to reconsider about how materials are chosen and how the teachers they have are leveraged to serve children. Rice and Ortiz (2020) pointed out how policies had enabled how achievement was perceived in their work surveying teachers in six virtual schools about their knowledge of accessibility in these highly asynchronous online learning schools. When information is collected as part of service plans for children, policies are needed that put thought into what sensitive data about health or disability status might be given to vendors and what might happen if that data is sold or breached (Levin, 2021; Stahl & Karger, 2016).

Applying Policies from Legislation

Policies should allow students to demonstrate abilities and strengths. For example, several studies that have shown how some children come to the virtual/hybrid learning environment because have unconventional needs—such as a physiological preference for doing school work late at night instead of during the day—or because they have serious medical needs that necessitate doing school work in very small segments (Black et al., 2022; Day et al., 2022; Fernandez et al., 2016; Tonks et al., 2020/2021). These accommodations could not be made in an in-person setting, even in an alternative in-person setting, such as evening school very easily. However, when policies are made, they are often conceptualized with students working mostly a typical daily schedule, with typical to moderate health needs, if any, and with no expectations there are family constraints. For example, there might not be



an adult at home who is able and willing to provide enough help for the child to perform in such a way to appear persistent and achieving.

Enrollment Policies

Historically, in such cases where the child was unable to garner some type of access or enough learner support, policies have allowed for the child to be turned away from virtual/hybrid learning completely (Stahl et al, 2017). The language used in such cases included “online learning is not a good fit for *your* child.” When Rice and Carter (2015) interviewed teachers and administrators in virtual/hybrid schools, there was a concession on the part of administrators that they were willing to tell children who needed or might need services through programs like the Individuals with Disabilities in Education Act (2004) that virtual/hybrid learning was a setting of choice and therefore, if the child could not make things work, they would have to leave. The problem with this procedure—whether a formal policy of the school or not—was that as a public-school entity, the schools did not have the right to turn away a child because the child had or might have needs for special educational programming. In cases where the virtual/hybrid program was a part-time program and not the school of record, there might be some arrangement made with the local school to provide funding for services if the coursework was something that the child’s educational team determined was needed for success (Ortiz et al., 2020). Some states had made laws saying that children with disabilities could be turned away from their part-time or optional online programs, but it is unclear as to whether these would have stood up to a robust legal challenge.

In the meantime, parents became aware of the explicit and sometimes implicit non-preference for their children who had certain types of needs, challenges, differences,



disabilities, exceptionalities, and so forth. In one study, parents reported calling schools to use their cultural capital and general savvy to determine if a school would accept their child with specific needs (Ortiz et al., 2021). In a different study, parents reported hiding needs children had or avoiding making requests to the school because they were afraid their child would have to leave the school (Rice & Ortiz, 2023). Although the work at the online school was intensive for them, they preferred the online school to the in-person school.

When the COVID-19 pandemic caused school building closures for extended periods of time across the U.S., initially there was not an option to sort which children would be *a good fit* for emergency remote work and which ones would not be so. Often, this remote work was supported by digital means, although it is possible to do distance learning that is not online or heavily digital (Barbour, 2022). During this time, there were policy discussions about what must be done to serve children who qualified for services under IDEA (2004) or might be qualified with proper identification procedures. These conversations occurred because several states were considering not providing any learning at all—so that they could also evade providing special education services—arguing that no learning was the current general education setting (Rice & Pazey, 2022). To try to avoid these issues, a federal mandate was made to require these special services under the logic that the money had already been allocated for them for the year (US DOE, 2020).

While there were critiques of this decision stemming mainly from teachers' lack of familiarity with providing online education, the decision is what resulted in what attempts there were to provide services (Rice & Pazey, 2022). In a national study of 1287 parents of children 5-12 years old about their satisfaction with services during the pandemic, Spencer et al. (2022) found that parents whose children received supports/services virtually were more



likely to be dissatisfied than those whose children received supports/services in-person, after adjustment for child's age and emotional, mental, developmental, behavioral, or physical condition. The researchers believed the dissatisfaction stemmed from the fact that many supports and services that moved into virtual settings were not properly reconceptualized for the virtual settings and/or many services and *hours/minutes of services were reduced* when they were moved to the virtual modality. An important finding from the study was that when parents were able to get services, they were generally satisfied with them. Even services that were unideal were preferable to no services.

Virtual/hybrid schools may cease the practice of refusing entry to virtual learning when negative attention comes to the issue. However, enrolling the students and then waiting for them to fail and leave also has ethical and perhaps eventual legal implications. In considering future large-scale online learning efforts where children are served under IDEA, Rice and Pazey (2022) made the following suggestions based on the government-sponsored studies they reviewed. Schools need to (a) plan first for a Free and Appropriate Education, (b) support the development of the Least Restrictive Environment (LRE) across modalities, and (c) support teachers in meeting student learning goals and providing services.

Free and Appropriate Education

Students served under IDEA are entitled to FAPE (IDEA, 2004). This requires schools to expect children will come to the online setting with various needs, rather than planning generally and then adjusting. The guidance offered during the pandemic was an attempt at a public consensus that students with disabilities, differences, or specific challenges that affect their learning should retain services regardless of what is happening politically and socially because children who qualify for special educational services deserve the dignity of an



education and to have their health needs met. While families can help and often want to, procedural guidance should not look to them as the primary providers of FAPE in online learning environments (Ortiz et al., 2021; Rice & Ortiz, 2021b).

Least Restrictive Environment

To determine what is an LRE within various online learning environments, there needs to be ongoing conversations about where the general educational children are and what experiences they are having, alongside what services are needed. According to IDEA (2004) students can only be removed from general education environments when the nature or severity of the disability precludes the school's ability to satisfactorily provide instruction in the general education classroom for the student, *even with* supplementary aids and services. This does not mean that the school can hone in on what is easily available only and say *sorry, we don't offer that* to everything else. School officials are supposed to arrange services that are calibrated to help and see if they work (*Endrew v. Douglas County Schools*, 2017). For example, if a family needs an accessible keyboard or headphones or help with scheduling and routines to participate in a synchronous learning session with peers, educators at the virtual/hybrid school can plan to provide these and monitor the utility of the items (Alvarado-Alcantar & Keeley, 2020).

Conversations about the restrictiveness of environments, will need to be ongoing. For instance, instructional assistants that provide special education support in a virtual/hybrid setting might be helpful but little research exists about this to date. Some assistants might be paid using special education funding and their services might be listed on an individual students' plan. Where this is the case, school leaders need to make certain that these assistants are doing what they are indicated for in the plans, instead of playing roles such as general



monitoring for the *video kids* and the *classroom kids* for the teacher. Also, in a hybrid situation, access to general education peers would technically include both online and in-person peers. So, there would need to be some way for the children to interact across modalities during the day (Zhang, 2018). Some children may need placements that are very restrictive within virtual/hybrid learning. Placements that deny children access to peers should be avoided unless (a) good faith efforts to maintain placement in the general education classroom have been made, (b) the student has not been able to make academic progress, and (c) the LRE provision for removal has been met (Education Law Center 2020).

Moving in and Out of Online Learning Environments

To ensure instructional continuity for all students, policies are needed that help teachers, children and families move in and out of online learning (Rice & Carter, 2015). This is true whether children are moving to online learning because of a widespread social crisis, a family crisis, or where there is no crisis—just a preference to learn online. Key activities for transition include information about scheduling and routines, device distribution and internet access, and health information where applicable (Rice & Zancanella, 2022). Also, school officials tend to prioritize ensuring that they can communicate with families through various channels such as emails, phone messages, and applications; they are less vigilant about ensuring that families have pathways for communicating information to school officials. There need to be specific procedures available for families to report accessibility issues, share information about children’s needs, and express concerns. Then, schools need to follow up and respond to these communications. The two-way communication and follow-up are especially important for moving in and moving out of online learning settings. Tremmel et al. (2020) found that successes in providing services for rural special education were attributed to



school officials to their ramped-up efforts to not just send information but also receive it from families.

Vendors that sell educational instructional materials need to be held accountable for the products that they create and sell to schools. In 2021, the Illinois state legislature passed HB 26, which required that third-party online curriculum made available to enrolled students or the public by a school district must be readily accessible (Office of J. B. Pritzker, 2021). HB 26 also provided that the State Board of Education shall require third-party online curriculum to comply with WCAG 2.1 A/AA. This means that in Illinois, the state was ahead of the new federal Title II rule. It might be helpful for states to make their own laws and set their own standards for how they would like online learning to operate since states understand more about their infrastructure for the internet, their various urban/suburban/rural communities and their own curriculum standards.

Implications

Educators who are involved in policy making can take Churchwright's (2018) approach and locate the existing policies at the state level and compare them to what is happening in the schools that have questionable persistence and achievement patterns. Evaluators must first determine whether the policies are problematic or whether the policies are not being followed because of inadequate guidance (Rice & Payzey, 2022). Depending on the outcomes of this inquiry, new guidance must be drafted and procedure shared. Crucially, it will be important to consider the range of learners and the fact that they will come to the learning setting with many challenges and needs. For this reason, it is important to invite multiple perspectives to policy, guidance, and procedure-making activities and tasks (Rice & Zancanella, 2021). Policy evaluators will want to deliberately invite the students themselves



and parents and other helping adults (e.g., grandparents) to share their experiences of doing online learning together. They will also want to arrange for meaningful multi-way communication between schools and families (Tremmel et al, 2020). Another important action is to consider the relationship with the vendors in the policy making process (Rice & Ortiz, 2021a). When contracts are made with vendors for them to provide large amounts of the instruction, they become major policy players. Ensuring that materials are accessible is important, but teachers need to pay attention to how the materials are shaping other aspects of school life, such as what access there is to teachers and peers, how much time is spent doing work, what topics, examples and pacing are following, and more (Alvarado-Alcantar et al, 2018).

Emergency and Occasional Online Learning

There need to be policies and procedures in place for emergency and occasional online learning before there is such a need (Rice & Zancanella, 2021). Currently, more than 30 states have state laws that allow for some occasional online learning due to inclement weather for emergencies. Schools need to set aside funds for supporting student learning properly if they must use emergency or occasional online learning (Morones, 2014). There also needs to be designations in student service plans for individuals and plans for schools that discuss what supports are needed and how the online setting will be moved into and moved out of online learning afterward (Rice & Payzey, 2022). This is true even for inclement weather. For example, if there is a snow day and the student cannot complete the work because they do not have the internet, what support will the school offer the child to complete the work, other than saying *students will have three days to make up the work*? In considering how to make guidance that is specific, but flexible enough, teachers can apply policies more accurately and



more information will be available about how and whether to modify policies for future events.

IEP Development

Students who have been identified with disabilities through the Individuals with Disabilities in Education Act (IDEA) (2004) have access to planning teams that can help them articulate the specialized instruction and or related services that are calibrated for the children's success. The plans are called Individualized Education Plans (IEPs). Members of the planning teams include teachers—general education and special education—administrators and/or district representatives, parents, psychologists, therapists, social workers, and the child themselves. Some accommodations and supports that are listed on an IEP will not apply at all, as often, or as easily in the online setting as in an in-person one. For example, a common accommodation listed is preferential seating where a child sits close to the teacher and/or close to the electronic board in an in-person classroom. In a virtual/hybrid setting, children are seated in their own homes or other locations looking at a screen for their work. Often, the purpose of preferential seating is to help the child pay greater attention to the teacher. Therefore, a team might focus instead on deciding what would help a child attend to instruction in an online setting instead of trying to decide what might be a theoretical equivalent of a preferred seat.

Other potential missteps for determining accommodations and supports might occur as online schools develop routines of common supports and add them to IEPs without strategic consideration as to whether certain accommodations are needed, or teams fail to notice crucial links between what testing and other information reveals about children's needs supports that should be given (Mellard et al., 2020). For example, a child's testing and anecdotal records might indicate that they have verbal processing differences, making listening comprehension



challenging. When that is the case, it may not make the most sense to provide an accommodation list that includes reading test items aloud to the child. What might make more sense is ensuring that instructions and tasks appear *in written form* for the child. Another possibility would be to ensure that the child has access to both verbal and written information simultaneously (e.g., captions) so that the child can use the caption support as they need it.

Where information must be verbal, the child might benefit from multiple opportunities to hear the information, have it electronically slowed down, or be taught strategies for listening and remembering. The child might experiment with what is most useful. There is also some evidence that this type of multimedia layering can be useful for some tasks, but not for others in digital learning *and* that what learners bring to a task for background knowledge might have some bearing on whether and when to layer media (Skulmowski & Xu, 2022). What is crucial is that the specialized instruction is a matter of intentional planning and matching between the children's strengths, needs, and their environments to the best of the team's efforts. Moreover, as additional information becomes available about specific children and their learning in online schools, teams can adjust the plans that favor the children's emotional stability and academic progress.

A question that might be asked is: *Should accommodations and supports that are designed for the in-person learning setting be deleted from IEPs when a child moves to online learning?* Not necessarily. There is potential to disservice families by removing accommodations, supports, and perhaps other services that might be needed immediately if the child suddenly returns to in-person learning, including hybrid learning, or there are sufficient shifts in technology that make the accommodation, supports, and other services or some form of them, viable and necessary. It would be potentially unethical to remove support



for in-person learning when a child moves online if it was known at the time that the child intended to return to in-person learning. This might be the case for children who are doing online learning as part of a disciplinary procedure like suspension or who are in state care or custody.

There is a need to design online learning policies and procedures that vary between typical online learning and emergency and/or occasional online learning (Rice & Zancanella, 2023). The Department of Education (2021c) recommends IEPs that delineate what accommodations, supports, and services will be provided when the child is learning in the in-person setting and which ones will be provided when the child is learning in an online setting. Additional distinctions might also be made for when the child is learning in an emergency and/or occasional online learning program versus a fully online school. The needed accommodations, supports, and services for a fully online school do not need to be conceptualized until the child enrolls in that setting. However, plans for emergency remote learning are important, in addition to plans for occasional online learning, such as for inclement weather when students live in states that allow for such days to be observed (Morones, 2014). Some states allow more days than others; the number of allowable days can be considered when making the plans.

What might be surprising to some is that even though some children were already learning online in online schools during the COVID-19 pandemic, there were still disruptions in those virtual schools due to illness, due to family circumstances changing, due to teachers having to shift, perhaps to start teaching their own children at home when before they were sending them to school, and due to rapid turnover and shifts in available educational technologies to meet sudden surges in demand (Rice & Ortiz, 2021b). Since an emergency



will be disruptive whether children are attending school in person or they are already online, it is crucial to build emergency contingencies into student IEPs. Often, these plans are made as part of services provided under IDEA (2004). However, some online schools make learning plans for all students. These plans might include information about the following topics.

1. Additional equipment needed for emergency online learning (e.g., hygienic masks for students or those who work with them, even special masks with see-through mouths for students who need this)
2. Learning goals that should shift in substance or priority in the event of an emergency
3. Strategies for ensuring access to peers in online, and/or hybrid learning
4. Additional support services that might be necessary or that might also change in modality (e.g., teletherapies)
5. Guidance about accessibility needs for digital instructional materials
6. Procedure for parents to request additional support

The latest federal guidance suggests not waiting until there is a crisis to plan for student learning across modalities:

To help ensure the continued provision of FAPE, IEP teams can identify how the special education and related services included in a child's IEP can be provided if circumstances require a change from in-person learning. A proactive method that an IEP Team may implement as a strategy for preparedness in the event of future long-term school closures is developing a contingency plan. (USDOE, 2021, p. 6)

While the conventional wisdom was that students who were receiving special education services needed to return to in-person learning sooner than their peers, some



students with certain health conditions may need to learn online longer than other students or remain at home indefinitely (Black et al, 2022). Determining what services are needed for learning across modalities will make efforts to bring all students to and from fully online learning smoother.

Prior to the COVID-19 school building closures and extended loss of services and basic instruction for many students, compensatory services had been associated with a specific failure of the school to provide FAPE within an LRE. The U.S. Department of Education encouraged the use of compensatory services to address needs arising from COVID-19-related lapses in services or access (USDOE, 2021). Online schools and programs and in-person schools and programs have been required to collaborate to determine how they will share funding responsibilities for students' services when/if additional emergencies occur.

Schoolwide Planning

There also needs to be support for the development of schoolwide planning for inclusive online/hybrid/digital learning (Kozleski, 2020; Running Bear et al. 2021; Smith et al., 2016). The planning for all students to be successful in digital learning cannot belong to the special education teacher, the technology teacher, or the building level administrator. Teachers need to understand how to use online and digital technologies to teach all students (Kennedy & Archambault, 2021). This is true whether the school is running an online program with most instruction delivered over the internet, or a program that uses digital resources and might only be remote for inclement weather certain days of the year or due to emergencies (Crompton et al., 2021).

Conceptualizing schoolwide plans and individual adaptations for emergency online learning (e.g., snow days) regarding needs, access, and support is necessary (Daftary, 2022;



Hirsh et al., 2022; Kozleski, 2020; Rice & Pazey, 2022; Rice, 2022; Rice & Zancanella, 2021; Running Bear et al., 2021). These plans can be included on current IEPs or some other type of individualized learning plan if a school offers it. The plan needs to say what the student's situation is in terms of biopsychosocial needs and then document digital and instructional access away from school and what types of support—particularly learner support that already exists—to help the student in an emergency. It might be helpful to write a plan for expected periodic remote learning days that happen time-to-time and something unexpected that may not ever be used or used often (e.g., floods, fires, and/or hurricanes).

Implications

Teacher education about policy can include attention to six questions that they intend to ask teachers. These questions can also be used to discuss and develop plans for during professional learning:

1. If we are providing synchronous learning, how will we design a schedule and activities that attend to children's attentional capacities? *This might include more activity from the children than the teacher, activities that build on familiar ideas, not just concrete ones, and streamlining the number of applications and programs to a few very useful ones that children can become expert in using.*
2. How will we ensure access to services, such as special education, American Indian Education, English as a second language, and therapies for which children have qualified? *This will require building these services into school scheduling first alongside other crucial activities before adding in general movement between activities and classes.*



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3. What do we need to think about differently for intervention, referral, and identification schemes for additional support and other services? *Intervention and identification work should still be occurring in online educational settings. Parents can see the children working and might increase their referrals, so educators need to expect that parents will make more referrals than in an in-person setting. Teachers will have to plan for distributing educational assistants.*
 4. How can our online lessons for emergencies focus on crucial subject matter that will repeat vertically (across grade levels) and horizontally (across subject matter). *Co-planning the instructional materials or reviewing with vendors will be important strategies for teachers to ensure that materials meet state requirements and students' needs.*
 5. What processes and procedures will be in place for virtually gathering children into the online space in the event of abrupt school closures or major disasters? *This might include direct phone calls to parents, online notices, use of mobile apps, or even email where addresses are available. Multiple methods of contact will probably be necessary. If children are given a central virtual place to meet, an education needs to ensure that the virtual room operates according to expectation. Remember that children who are already learning online will still be adversely affected by a disaster.*
 6. What holistic care and support routines can be built into the instructional day to help children and teachers bear the traumas they may be experiencing. *Holistic learning can help children with belonging in the digital learning space as we understand that most children do have some traumas which brought them out of*



the in-person school and to the online one. While it is not necessary or appropriate to therapeutize the children in the classroom, making space for children to express feelings and for children to share is important. There are many practices teachers can use that do not require a specific curriculum but include some intention to have a routine that inspires patience and peace for all.

Emergency and Occasional Online Learning

For emergency and occasional learning, there are also important questions to ask about how to develop service plans that are attuned to children's needs and not merely automated plans developed to create a need to constantly use digital applications and programs.

1. If we are providing synchronous learning, how will we design a schedule and activities that attend to children's attentional capacities? *This might include more activity from the children than the teacher, activities that build on familiar ideas, not just concrete ones, and streamlining the number of applications and programs to a few very useful ones that children can become expert in using.*
2. How will we ensure access to services, such as special education, American Indian Education, English as a second language, and therapies for which children have qualified? *This will require building these services into school scheduling first alongside other crucial activities before adding in general movement between activities and classes.*
3. What do we need to think about differently for intervention, referral, and identification schemes for additional support and other services? *Intervention work that was underway will likely not apply in extended emergency learning. Also, intervention work conducted during the emergency time may not be useful for*



long-term planning outside of that context. Parents can see the children working now and might increase their referrals, so educators need to plan for this increase. Teachers will have to plan for distributing educational assistants or understand how the assistants have been assigned in a digital setting.

4. How can our online lessons for emergencies focus on crucial subject matter that will repeat vertically (across grade levels) and horizontally (across subject matter). *These may include studying the phenomenon causing the emergency from various subject matter perspectives, reviewing crucial skills from earlier in the year, or providing more scaffolds than usual for new content.*
5. What processes and procedures will be in place for virtually gathering children into the online space in the event of abrupt school closures or major disasters? *This might include direct phone calls to parents, online notices, use of mobile apps, or even email where addresses are available. Multiple methods of contact will probably be necessary. If children are given a central virtual place to meet, an education needs to ensure that the virtual room operates according to expectation.*
6. What holistic care and support routines can be built into the instructional day to help children and teachers bear the traumas they are experiencing. *Children might perish in a disaster. They also might lose parents or caregivers. Economic uncertainties might emerge. Family tensions might increase. During these times, it is important to provide time for children to share concerns, tell stories, sing, and learn ways to express themselves and share hope. Sometimes there is an impression that a curriculum for social and emotional support must be scripted and complex. Indeed, there are some scaffolded holistic curriculums that are*



useful. However, there are many practices teachers can use that do not require a specific curriculum, but some intention to have a routine that inspires patience and peace for all.

Ethical Assessment Practices

Students enroll in schools that offer fully virtual learning for a variety of reasons. Some of these reasons include: needing to do credit recovery; an inability to attend school in-person for health reasons, including physical health issues and mental and emotional health issues such as severe anxiety; wanting to earn advanced placement credits through online courses that are not available in their in-person schools; status as young athletes practicing for international competitions; learning as formerly homeschooled with parents who want them to have a more formal curriculum now that they are older; and young parents who have to work during the day or who have no child care until the evening (Beck et al., 2014; Rice & Carter, 2015). The students who desire to enroll in digital learning opportunities represent a variety of racial/ethnic, linguistic, and cultural, and economic backgrounds (Rice et al., 2018; Rice & Ortiz, 2022). The variety of student circumstances requires careful consideration of assessment practices.

The three principles of assessment literacy are that assessments should be useful, meaningful, and equitable (Smith et al., 2004). Useful assessments provide information about children individually and as a group that lead to next steps for instruction and other educational opportunities. Meaningful assessments meet thresholds of validity and reliability. A valid assessment measures what it says it measures. A reliable assessment will measure consistently across learners and raters over time. Equitable assessments are open and appropriate. This means that learners know that they are being assessed and why, and that assessments are suitable for their age and sociocultural situations.



Providing Appropriate Information to Learners

In online learning, it is theoretically possible to do more assessments more often because these can be generated and modified online. However, teachers do not always have the ability or authorization to make and/or modify materials (Crouse et al., 2018). It is also possible to contract with vendors for assessments and to gather information about children stealthily without them knowing. When information is gathered about children to make decisions about their opportunities or to have children's data build products without their knowing and understanding, present challenges to ethical assessment principles (Smith et al., 2004). Informing the learners and their parents about *when they will be assessed* and *how they will be assessed* should be a regular practice (Lokey-Vega et al., 2018; Rice & Carter, 2016). Often children experience the awarding of points as the signifier that something was an assessment (Castañon et al., 2023). Online learning settings may also provide feedback in other ways, such as through visual displays of celebration like banners, information provided by large language models that provide suggestions, synchronous or asynchronous teacher feedback, and there might be options through LMS to simply give credit/no credit instead of a score (Castañon et al., 2023; Stevens & Rice, 2016).

Grading and Assessment

As part of record-keeping, it is crucial to consider what is graded versus what will not be graded. For example, if synchronous help sessions do not garner points, students might begin to feel these sessions are not worth the effort and they might not attend (Castañon et al., 2023). However, granting points merely for attendance at a virtual session also might have complications because they are not measures of learning *per se* (Carter et al., 2020). To devise a scheme of incisive point-giving based on behaviors such as asking a question or writing in



the chat might answer the question for children and parents about how the grade is earned, but parents need to understand that there is a difference between the grade as a measure of compliance and behavioral engagement and a grade as an attempt to represent achievement. Again, these complications with grading and record keeping exist for in-person schooling as well.

What is potentially unique about assessment and grading online is the fact that schools might be able to gather substantial data from a user but still not know *who* generated it (Rice & Carter, 2016). Many children and parents share behavioral tasks in an online setting, and this may be desirable for schools in that parents can participate in monitoring and children receive support when 1:1 support is unavailable in an in-person setting (Rice & Ortiz, 2022). However, discussions about expectations between parents and school on these issues and workload should be respectful and should result in shared understandings and united advocacy for children. Educators need to remember that these agreements will vary and that behaviors will differ while they are deciding what can be graded and what should be assessed in an online educational setting.

Assessment and Technologies of Surveillance

To resolve what some schools might perceive as academic integrity, some schools might want to use surveillance software. These programs and applications might track what websites are visited, how much time is spent on them, and they might have the ability to prevent students from entering sites. Other programs might be connected to video; these applications will watch and record students as they do assessments or other tasks. While surveillance software might seem like a strong answer to ensuring that students do the work they are supposed to do online and do not visit non-preferred sites, investigations of these



programs have revealed numerous challenges (Gilliard & Selwyn, 2023). There are concerns about privacy for those who are not in school, and sometimes schools monitor online activity that is not part of schooling or schoolwork and punish children for it (Broussard, 2023; Hankerson et al., 2022).

Because of the potential for additional exploitation and biases, assessment ethics in online spaces seems to face an even greater burden for including the learners in the design and sharing the outcomes with them to the greatest extent possible (Lokey-Vega et al., 2018; Pulham & Graham, 2018); Tonks et al., 2020). When students participate in assessment design, this might mean they choose who they want to respond to an assessment prompt, but it also means that they might help design entire projects and set goals along the way for how they want to demonstrate and evaluate their learning. This is more than, “Do I want to write an essay or make a video?” It would involve a longer-term project to help children understand how assessment works and how they know when they are learning.

In addition, it is important to make assessments equitable in digital formats by making them accessible. As a start, this means that assessments would meet WCAG 2.1 A/AA checklists. There would also be some consideration for what children are familiar with from the lesson materials and from their cognitive, linguistic, and other life realities (Hu et al., 2017; Lunde, 2020; Maldonado & De Witte, 2022; Straub & Vasquez III, 2012). In this vein, Skulmowski & Xu (2022) were able to demonstrate that issues such as cognitive load could be addressed in digital materials by doing more than just making materials plain and streamlined. For example, learners can benefit more from a digital photograph of an item than from a graphic in many instances, *depending on what they are supposed to do* with the image. This is true even when the digital image is technically more visually cluttered, potentially because a



real image has context and evokes familiarity. Therefore, developing and evaluating assessments that consider the whole context of the task and consider *who the learners are* that will be doing the assessment is important for ensuring that the assessment data are useful and meaningful.

Bilingual Assessments and Other Psychometric Considerations

Finally, online educators can discontinue or avoid assessment practices that have been demonstrated to be unethical and against IDEA in terms of children showing their learning or providing appropriate access to opportunities. These may include (a) psychological evaluations from untrained/unlicensed individuals without parent/legal caregiver permission; (b) assessments for placement that fail to account for multilingualism when children are multilingual; (c) the use of a single assessment, or the use of an assessment for a purpose for which it was not validated in order to make major decisions such as placement; or (d) relying on algorithmically generated assessments (e.g., LLMs/AI) as a source for major decisions or as a sole source of feedback (De Angelis, 2021; Katz et al., 2022; Shohamy, 2011; Tysinger et al., 2014). These recommendations are based on issues with psychometrics and assessing students.

When children speak multiple languages, it is important to consider that a test might evaluate their English vocabulary knowledge instead of what they know about a subject. If the goal is to learn what they know about a subject, some alternative method of assessment in a language they know must be used. Educators can use or they can identify vendors that understand how to separate what is being tested from the extraneous issues like working memory or English vocabulary that children have not yet had the opportunity to learn. Also, psychometric testing in in-person settings occurs in a place where only the authorized tester



and the child are the only individuals that are present. Many decisions about placement for students often hinge on one or two tests that are very important to schools, but families are not made aware of this. It may be more equitable to make decisions about high stakes issues like placement using multiple assessments and assessments that have been designed to capture slightly different aspects of a child's language and learning, rather than a single assessment (Smith et al., 2004).

While there is much folk wisdom circulating about what will help children who have been doing virtual/hybrid schooling score higher, there are no studies that have found a clear link between a particular testing regime or location. Instead, what we know about testing is that the online testing materials need to be accessible to children and that online school leaders need to work with parents to ensure that testing can occur under the conditions that are least onerous for the children. Educators also need to be able to explain assessments to parents and children in terms of what was assessed and what the results mean for individual children, and children as they are grouped, such as by age or grade. While vendors may not ever reveal all the formula that they use to arrive at their scoring system, teachers still need to be able to know enough about an assessment to understand how to use the results to determine future actions and understand what to disregard about an assessment in terms of its limitations.

Assessments and Large Language Models

Finally, the advent of generative artificial intelligence (GenAI) that includes large language models (LLMs) may provide an opportunity for additional information to be learned about students and/or for children to have access to a new source of feedback about their work. Increasingly, most online instructional materials likely include text from LLMs. It is also increasingly likely that forms of AI, including GenAI and possibly LLMs will be used as



part of the assessment process for general instruction and for assessments that will be used to make high stakes decisions like placement into special education services. Some recent studies with adults have shown that heavy LLM use diminishes the frontal lobe over time (Voigtlaender et al., 2024). Emerging best practices might focus on strategic use of LLMs and other AI—if these are used at all—and that LLMs would *not* be used to generate an initial draft. Instead, at most, the LLM would support the revision of a subsequent draft (Brassington et al., 2024). Currently, this might conflict with how some researchers and teachers in special education might be hoping to use LLMs to circumvent a perceived challenge with helping students with writing difficulties to make an initial draft. What is important to consider is that these agents might provide information, but they are not team members on decision-making teams because they cannot be held legally liable or answer for their decisions and opinions (Rice & Dunn, 2023). It is important to ensure that students are provided due process in decisions that are made about their future so they can have fair opportunities to be successful. This would include knowing as much as possible about the applications and programs that were used to inform the decision about whether to provide services.

Implications

Teacher education about assessment in virtual/hybrid environments should be built on a foundation of useful, meaningful, and equitable as an assessment frame (Smith et al. 2004). Assessments should also consider the unique features of online learning settings as a site for specific ethical issues around helping children share what they learned (Lokey-Vega et al., 2018). Teachers can learn to evaluate their grading practices against their assessment practices for online learning. They might be supported in developing understandings about how to determine what points should be given for and that given the additional need for parent



monitoring and parent support, how parents can be appraised of how and where the points are given for assignments (Beck, Maranto, et al., 2014). Teacher educators might also focus on assessment teaching that considers how points can operate and provide a certain feedback function, but that a grade alone may not suffice for substantive information about what children are learning (Carter et al., 2020).

Second, teacher educators should be helping teachers to consider how to gather more information about surveillance technologies that a school might end up using (Gillard & Selwyn, 2023). Teachers might develop questions about what data about students are being collected and where the data are going (Stahl & Karger, 2016). Teachers also might realize that information might be collected about them as teachers, and since this has never been mentioned to them before, they find it disconcerting (Levin, 2021). Oftentimes, teachers have not had opportunities to consider issues of psychometrics in how children are tested within course curriculum and in testing that identified them for various services when children were multilingual (Smith et al., 2004). This is an issue that pervades in-person learning as well, but for multilingual learners online, there are more algorithms making decisions about children and a more automated curriculum that centers on a so-called neutral or preferred version of American English. Therefore, some children might have assessment situations that will warrant additional review, especially when the assessment will change their grade in a dramatic way and/or there is a high stakes placement decision that will result from the interpretation of the assessment (Viano, 2018; 2023).

Teachers might be very interested in learning to use GenAI and LLMs in terms of student assessment. They might create their own policies—or have policies provided to them— about the use of AI, including forms of GenAI in assessing students that stipulated AI



as a part of the data gathering process. Ideally, humans would be the decision makers and interpreters of information. As teachers used AI more and understood how it operated, they might be able to see more clearly the links between AI and the surveillance tools they are evaluating, with special overlap around bias, meaning that information that AI uses to train that contains biases will replicate those biases with doing assigned tasks (Broussard, 2023). The biases will emerge during scanning to see if a student is cheating, determining who is *most likely to pass or fail an exam* based on demographic characteristics and/or language status and the quality of the feedback an LLM provides to students about their work.

Emergency or Occasional Online Learning

Emergency and occasional online learning for reasons like inclement weather present unique grading and assessment issues (Rice & Zancanella, 2021). This is because often children will not be learning entirely new content unless the school building closures drag on for many months or years. Sometimes for short emergency closures, no grades are given. For longer periods, teachers must make grading part of their planning for their lessons in schools and districts that require grades to be given (Morones, 2014). Also, some schools have policies that makeup work from absences must be submitted within a certain number of days after the child returns to school, often 3 days. However, these policies are for schools where there are only a handful of children absent per day. These policies are for individual students, and not an entire school or district. By grade or subject, teachers might want to build, not some rigid rules, but basic agreements about what grades, assessments, their relationship and how that is communicated to parents might be especially welcome during an emergency instance of online learning. Finally, emergency and occasional situations do not lend themselves to expensive psychometric testing, but an emergency that leads to online learning



over a period of many months might have to eventually resume this type of testing online. Considerations about privacy and multilingualism and/or other characteristics and needs might need to occur. For example, in-person psychometric testing for special education and similar programs will have to arrange for testing privacy when these must be online.



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Appendix A: Essential Components for Virtual/Hybrid learning in K-12 Settings

Essential Components	Implementation Levels				
Instructions: Place an X under the appropriate variation implementation score for each course syllabus that meets the criteria level from 0 to 3. Score and rate each item separately.	Level 0	Level 1	Level 2	Level 3	Rating
	There is no evidence that the component is included in the syllabus, or the syllabus only mentions the component.	Must contain at least one of the following: reading, test, lecture/presentation, discussion, modeling/demonstration, or quiz.	Must contain at least one item from Level 1, plus at least one of the following: observation, project/activity, case study, or lesson plan study.	Must contain at least one item from Level 1 as well as at least one item from Level 2, plus at least one of the following: tutoring, small group student teaching, or whole group internship.	Rate each item as the number of the highest variation receiving an X under it.
1.0 Biopsychosocial Needs					
1.1 Planning for physiological needs (e.g., bathroom breaks; self-assessed needs for body movement; awareness of breathing; self-assessment of visual/audio/proximity stimulations for adjustments; mindfulness check to assess whether focusing mentally is possible on a given day or for a given lesson)					
1.2 Sharing responsibilities for physical safety (e.g., initiating classes with open communication about student feeling and intuition of learner energy status and focus status; assuring optimal intent and attention for full participation; informal safety net reporting for potential emotionally or physically dangerous situations)					



1.3 Attending to psycho-emotional needs (e.g., relational bonding, expression of energies adjustment for learning focus via praise, positive reinforcements, peer suggestions of how to best self-regulate for learning/bonding) 1.4 Recognizing developmental and/or physical differences (e.g., children's smaller hands when navigating keyboards, developmental attention span differences, physical limb differences due to amputation, blindness, deafness, etc.)					
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Essential Components	Implementation Levels				
	Level 0	Level 1	Level 2	Level 3	Rating
Instructions: Place an X under the appropriate variation implementation score for each course syllabus that meets the criteria level from 0 to 3. Score and rate each item separately.	There is no evidence that the component is included in the syllabus, or the syllabus only mentions the component.	Must contain at least one of the following: reading, test, lecture/ presentation, discussion, modeling/ demonstration, or quiz.	Must contain at least one item from Level 1, plus at least one of the following: observation, project/activity, case study, or lesson plan study.	Must contain at least one item from Level 1 as well as at least one item from Level 2, plus at least one of the following: tutoring, small group student teaching, or whole group internship.	Rate each item as the number of the highest variation receiving an X under it.
2.0 Digital Access					
2.1 Orienting learners for their understanding, comfort with, and access to technologies (hardware and software) to guide pace of learning for those in need of support					
2.2 Providing and developing routines for non-shared Internet-ready devices in good condition appropriate for learning					
2.3 Informing children and families about how to access to the Internet from home and/or other public spaces					
2.4 Mitigating access gaps and lack of infrastructure/advocating for infrastructure					



Essential Components	Implementation Levels				
Instructions: Place an X under the appropriate variation implementation score for each course syllabus that meets the criteria level from 0 to 3. Score and rate each item separately.	Level 0	Level 1	Level 2	Level 3	Rating
	There is no evidence that the component is included in the syllabus, or the syllabus only mentions the component.	Must contain at least one of the following: reading, test, lecture/presentation, discussion, modeling/demonstration, or quiz.	Must contain at least one item from Level 1, plus at least one of the following: observation, project/activity, case study, or lesson plan study.	Must contain at least one item from Level 1 as well as at least one item from Level 2, plus at least one of the following: tutoring, small group student teaching, or whole group internship.	Rate each item as the number of the highest variation receiving an X under it.
3.0 Instructional Access					
3.1 Evaluating materials for accessibility and contain features like UDL, which may include identifying resources based on student feedback and observed abilities to overcome materials' inherent limitations					
3.2 Modifying instructional materials to meet WCAG 2.0 A and AA standards and with appropriate language support resources					
3.3 Ensuring materials are responsive to children's lived realities and sensitive to cultural differences, not merely algorithmically personalized					
3.4 Including frequent opportunities for learners to discuss what they see, think, and feel about the digital learning materials as to provide feedback about misalignments between their home language and culture and the learning material, content, and process					



Essential Components	Implementation Levels				
Instructions: Place an X under the appropriate variation implementation score for each course syllabus that meets the criteria level from 0 to 3. Score and rate each item separately.	Level 0	Level 1	Level 2	Level 3	Rating
	There is no evidence that the component is included in the syllabus, or the syllabus only mentions the component.	Must contain at least one of the following: reading, test, lecture/presentation, discussion, modeling/demonstration, or quiz.	Must contain at least one item from Level 1, plus at least one of the following: observation, project/activity, case study, or lesson plan study.	Must contain at least one item from Level 1 as well as at least one item from Level 2, plus at least one of the following: tutoring, small group student teaching, or whole group internship.	Rate each item as the number of the highest variation receiving an X under it.
4.0 Learner Support					
4.1 Understanding and providing support for engagement as they overlap and interlock in various domains (cognitive, linguistic, emotional, social)					
4.2 Activating learners' social systems for support (e.g., parents, social workers, specialists)					
4.3 Designing educative interactions between learners-teachers, learners-peers, and learners-materials					
4.4 Developing strategies internal and external to the curriculum that leverage the linguistic and cultural realities of students as supports rather than deficits—this includes providing meaningful access to peers for academic learning and drawing on community resources					



Essential Components	Implementation Levels				
Instructions: Place an X under the appropriate variation implementation score for each course syllabus that meets the criteria level from 0 to 3. Score and rate each item separately.	Level 0	Level 1	Level 2	Level 3	Rating
	There is no evidence that the component is included in the syllabus, or the syllabus only mentions the component.	Must contain at least one of the following: reading, test, lecture/ presentation, discussion, modeling/ demonstration, or quiz.	Must contain at least one item from Level 1, plus at least one of the following: observation, project/activity, case study, or lesson plan study.	Must contain at least one item from Level 1 as well as at least one item from Level 2, plus at least one of the following: tutoring, small group student teaching, or whole group internship.	Rate each item as the number of the highest variation receiving an X under it.
5.0 Policy Support					
5.1 Maintaining standards when negotiating with, choosing, or voicing concerns to vendors					
5.2 Learning about relevant federal and state policies related to enrollment and services (e.g., IDEA 2004, Section 504)					
5.3 Designing policies for moving in and out of online learning					



Essential Components	Implementation Levels				
Instructions: Place an X under the appropriate variation implementation score for each course syllabus that meets the criteria level from 0 to 3. Score and rate each item separately.	Level 0	Level 1	Level 2	Level 3	Rating
	There is no evidence that the component is included in the syllabus, or the syllabus only mentions the component.	Must contain at least one of the following: reading, test, lecture/ presentation, discussion, modeling/ demonstration, or quiz.	Must contain at least one item from Level 1, plus at least one of the following: observation, project/activity, case study, or lesson plan study.	Must contain at least one item from Level 1 as well as at least one item from Level 2, plus at least one of the following: tutoring, small group student teaching, or whole group internship.	Rate each item as the number of the highest variation receiving an X under it.
6.0 IEP Development					
6.1 Supporting the development of school-wide planning for online/hybrid/digital learning 6.2 Providing input and follow-through for IEPs for individual children that are attentive to concerns about identifying children 6.3 Conceptualizing schoolwide plans and individual adaptations for emergency online learning (e.g., snow days) regarding needs, access, and support					



Essential Components	Implementation Levels				
Instructions: Place an X under the appropriate variation implementation score for each course syllabus that meets the criteria level from 0 to 3. Score and rate each item separately.	Level 0	Level 1	Level 2	Level 3	Rating
	There is no evidence that the component is included in the syllabus, or the syllabus only mentions the component.	Must contain at least one of the following: reading, test, lecture/presentation, discussion, modeling/demonstration, or quiz.	Must contain at least one item from Level 1, plus at least one of the following: observation, project/activity, case study, or lesson plan study.	Must contain at least one item from Level 1 as well as at least one item from Level 2, plus at least one of the following: tutoring, small group student teaching, or whole group internship.	Rate each item as the number of the highest variation receiving an X under it.
7.0 Ethical Assessment Practices					
7.1 Designing assessment opportunities that are open, meaning that learners are informed that they will be assessed and how they will be assessed.					
7.2 Including learners in the design of assessment opportunities and sharing the outcomes with them to the greatest extent possible					
7.3 Making assessments accessible and ensuring that they accommodate learners' sources of familiarity					
7.4 Discontinuing or avoiding unethical assessment practices. These may include: (a) ensuring appropriate links between grading and assessment, (b) exercising vigilance about assessment and technologies of surveillance, (c) making appropriate application of psychometrics online, especially for bilingual children, and (d) avoiding the sole or major use of AI and large language					



models of feedback or for high stakes decision-making					
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Appendix B: Levels of Evidence for Virtual/Hybrid learning in K-12 Settings

Essential Components	CEEDAR Levels of Evidence	Supportive Research
Biopsychosocial needs: Planning for physiological needs (e.g., bathroom breaks; self-assessment for body movement as needed, awareness of breathing in process; self-assessment of visual/audio/proximity stimulations for adjustments; mindfulness checks to assess whether focusing mentally is possible on a given day)	Limited	Goodley et al., (2022); Harris et al. (2022); Rice (2022)
Biopsychosocial needs: Sharing responsibilities for physical safety (e.g., initiating classes with open communication about student understandings, learner energy status and focus status; assuring optimal intent and attention for full participation; informal safety net reporting potential emotional or physical dangerous situations)	Strong; Limited; Emerging	Alvarado-Alcantar et al. (2018); Chiu & Churchill (2015); Hirsh et al. (2022); Tonks et al., (2021); Rice (2023); Standen et al. (2020); Tysinger et al. (2016)
Biopsychosocial needs: Attending to psycho-emotional needs (e.g., relational bonding, expression of energies adjustment for learning focus via praise, positive reinforcements, peer suggestions of how to best self-regulate for learning/bonding)	Limited; Emerging	Aguilar et al. (2022); Archambault et al. (2022); Cooper et al., (2023); Crompton et al. (2021); Kim & Fienup (2022)
Biopsychosocial needs: Recognizing developmental and/or physical differences (e.g., children's smaller hands when navigating keyboards, developmental attention span differences, physical limb differences due to amputation, blindness, deafness, etc.)	Limited; Emerging	American Academy of Pediatrics (2016); Rice et al., (2019); Rice & Dykman (2018); Shelton & Gezer (2023)
Digital access, Orienting students for their understanding, comfort with, and access to technologies (hardware and software) to guide pace of learning for those in need of	Strong; Limited	Carter et al. (2020); Miller (2022); Zweig et al. (2022)



support (Note: this goes <i>beyond</i> a one-shot orientation course)		
Digital access: Providing and developing routines for non-shared Internet-ready devices in good condition appropriate for learning	Limited	Catalano et al. (2021); Ortiz et al. (2021); Xie et al. (2017); Running Bear et al. (2021)
Digital access: Informing children and families about how to access to the Internet from home and/or other public spaces	Limited; Emerging	Black et al. (2022); UNESCO (2020); Running Bear et al. (2021); Xie et al. (2017)
Digital access: Mitigating access gaps and lack of infrastructure/advocating for infrastructure	Strong; Limited; Emerging	Lamb et al. (2020); Mac Domhnaill et al. (2021); Mack et al. (2022); Mack et al. (2024); Napoli & Obar (2014); Rice & Zancanella (2021); Running Bear et al. (2021)
Instructional access: Evaluating materials for accessibility and contain features like UDL, which may include identifying resources based on student feedback and observed abilities to overcome materials' inherent limitations	Limited; Emerging	Ortiz et al. (2021); Rice & Dykman (2018); Rice & Ortiz (2020); ter Vrugte et al. (2021)
Instructional access: Modifying instructional materials to meet WCAG 2.0 A and AA standards and with appropriate language support resources	Limited; Emerging	Alvarado-Alcantar & Keeley (2020); Basham et al. (2016); Love & Ewoldt (2021); Rice (2017a); Rice (2018); Smith & Harvey (2014)
Instructional access: Ensuring materials are responsive to children's lived realities and sensitive to historical traumas, not merely algorithmically <i>personalized</i>	Strong; Limited; Emerging	Boninger et al. (2019); Campbell & Evans-Campbell, 2011); Drexler (2018); Fernandez et al. (2016); Lim & Childs (2020); Rice et al. (2019); Rice (2024); Swart (2021)
Instructional access: Including frequent opportunities for learners to discuss what they see, think, and feel about the digital learning materials as to provide feedback about misalignments between their home language and culture and the learning material, content, and process	Strong; Limited; Emerging	Carter et al. (2020); Castañón, et al. (2023); Rice (2022); Rice & Deshler (2018); Roblin et al. (2018)



Learner support: Understanding and providing support for engagement as they overlap and interlock in various domains (cognitive, linguistic, emotional, social)	Strong; Limited; Emerging	Aguilar et al. (2022); Alvarado-Alcantar et al. (2018); Beck et al., (2014); Kappi et al. (2024); Liu & Luo (2015); Panjeti-Madan & Ranganathan (2023) Pulham & Graham (2018); Skulmowski & Xu (2022)
Learner support: Activating learners' social systems for support (e.g., parents, social workers, specialists)	Strong; Limited	Carter & Rice (2016); Daftary (2022); Pellegrino & Stasi (2024); Rice (2017b); Rice & Carter (2015); Rice & Dykman (2018); Rice & Ortiz (2021b); Rice & Ortiz (2022); Tremmel et al. (2020); Schultz (2019); Viano (2023); Wall (2024); Woo et al. (2023); Zhang (2018)
Learner support: Designing educative interactions between learners-teachers, learners-peers, and learners-materials	Moderate; Limited	Archambault et al. (2022); Day et al. (2023); Pulham & Graham (2018); Stevens & Rice (2016)
Learner support: Developing strategies internal and external to the curriculum that leverage the linguistic and cultural realities of students as supports rather than deficits—this includes providing meaningful access to peers for academic learning and drawing on community resources	Moderate; Limited	Crouse et al. (2018); Rice & Cun (2023); Rice & Smith (2022); Smith et al., (2016); Rice (2024)
Policy support: Learning about relevant federal and state policies related to enrollment and services (e.g., IDEA 2004, Section 504)	Strong, Limited; Emerging	Burdette et al. (2013); Churchwright (2018); Swenson & Ryder (2016); Running Bear et al. (2021)
Policy support: Maintaining standards when negotiating with, choosing, or voicing concerns to vendors	Emerging	Stahl et al. (2017); Hankerson et al. (2022); Zavala & Reidsma (2020)
Policy support: Designing policies for moving in and out of online learning	Limited	Rice & Carter (2015); Tremmel et al., (2020); Rice & Zancanella (2021)



Service plan development: Supporting the development of schoolwide planning for inclusive online/hybrid/digital learning	Limited; Emerging; Moderate	Smith et al., (2016); Kozleski (2020); Running Bear et al. (2021); Spencer et al. (2024)
Service plan development: Providing input and follow-through for service plans for individual children that are attentive to concerns about identifying children	Limited; Emerging	Dunn & Rice (2019); Dunn & Rice (2022); Kozleski (2020); Rice & Dykman (2018); Running Bear et al. (2021)
Service plan development: Conceptualizing schoolwide plans and individual adaptations for emergency online learning (e.g., snow days) regarding needs, access, and support	Moderate; Limited; Emerging	Daftary (2022); Hirsh et al. (2022); Kozleski (2020); Rice & Payzey (2022); Rice (2022); Rice & Zancanella (2021); Running Bear et al. (2021)
Ethical assessment practices: Designing assessment opportunities that are open, meaning that learners are informed that they will be assessed and how they will be assessed	Limited	Lokey-Vega et al. (2018); Rice & Carter (2016)
Ethical assessment practices: Including learners in the design of assessment opportunities and sharing the outcomes with them to the greatest extent possible	Limited	Lokey-Vega et al. (2018); Pulham & Graham (2018); Tonks et al. (2020)
Ethical assessment practices: Making assessments accessible and ensuring that they accommodate learners' sources of familiarity	Strong; Limited	Hu et al. (2017); Lunde (2020); Maldonado & De Witte (2022); Straub & Vasquez III (2012); Viano (2018)
Ethical assessment practices: Discontinuing or avoiding unethical assessment practices. These may include (a) ensuring appropriate links between grading and assessment, (b) exercising vigilance about assessment and technologies of surveillance, (c) making appropriate application of psychometrics online, especially for bilingual children, and (d) avoiding the sole or major use of AI and large language models of feedback or for high stakes decision-making	Strong; Limited	De Angelis (2021); Friedhoff (2018); Katz et al. (2022); Shohamy (2011); Tysinger et al. (2014)

