*Journal of Online Learning Research* (2024) **10**(3), 349-378

# Exploratory Study of a K-12 Special Education Online Learning Model for Students with Developmental Disabilities

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Equity gaps exist for students with disabilities in educational contexts and these are exacerbated during disruptions to education, such as the COVID-19 pandemic. The pandemic forced swift changes in education with little guidance or time to prepare. Few researchers have explored the effectiveness and critical components of online learning for individuals with disabilities, and particularly for those students pursuing a diploma who are receiving special education services via small group instruction. This paper offers (a) a brief review of the literature regarding online education for students with disabilities, (b) a description of an online learning model employed with elementary, middle, and high school students with developmental disabilities receiving special education via small group instruction and (c) an exploratory examination of the online learning model's impact on student attendance and engagement using direct observation data collected across months and student and teacher social validity. The online learning model addresses technology, attendance, executive functioning, specialized instruction, social-emotional supports, communication and collaboration, and professional development. Student attendance and engagement were found to meet or approach pre-pandemic levels and student and teacher social validity data further validated the pilot online learning model.

*Keywords: Online learning, online education, special education, autism and developmental disabilities, K-12 education*

The COVID-19 pandemic forced swift changes in education with little guidance or time to prepare. In most cases, school systems and educators had to secure technology; develop an online learning model; train educators, students, and parents/guardians; and implement the newly developed online learning programs with few resources and little guidance. The magnitude of educational changes required as a result of the pandemic forced educators to adapt curricula and instructional approaches with limited research informing their practice. Equity gaps for students with disabilities in educational contexts pre-date the pandemic (NAEP, 2022; US Dept. of Ed., NCES, 2024). However, discrepancies were exacerbated by the pandemic, with students with disabilities experiencing greater academic declines and greater disruption to their special education services (Stelitano et al., 2022). Rice and colleagues (2023) reflect, "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., there was not" (p. 2). More than 50% of districts in the United States reported that it was more or substantially more difficult to comply with requirements to provide specially designed instruction for students with disabilities during the pandemic than before (Jackson & Bowdon, 2020). Similarly, 39% of surveyed parents reported their children were receiving no special education services (ParentsTogether Action, 2020). For example, in Averett (2021), one parent of a child with a disability remarked, "No one has talked to me about what services could still be afforded to Jackson, or anything. There have been zero conversations…." (p. 1).

Educators and school-based practitioners must leverage the lessons of the pandemic to develop and refine their own approaches to online learning to inform future educational initiatives and enable timely responses to interruptions in traditional schooling that may occur. Rare phenomena create an opportunity to gain empirical understanding even when stringent experimental designs may not be feasible (Kazdin, 2011; Price et al., 2015); the COVID-19 pandemic presented an opportunity to study approaches that may contribute to future improvements in educating students with disabilities. For this reason, the present study sought to contribute to this literature by (a) presenting a brief review of the literature, (b) describing an online learning model employed with elementary through secondary students with developmental disabilities receiving special education services in a group instructional format, and (c) offering preliminary findings regarding the impact of the online learning model on student attendance, student engagement, and student and teacher social validity.

## K-12 EDUCATION ONLINE LEARNING

Online learning, widely adopted during the pandemic, reflects an educational format where student and teacher engage using technology and are not present physically in the same location (Schwirzke et al., 2018). Online learning has been more commonly employed within higher education but is increasing in K-12 education (Zeng & Luo, 2023). Various terms may be found within the literature including online learning, online teaching, online education, remote instruction, or distance education (Johnson et al., 2023). Hodges and colleagues (2020) coined "emergency remote teaching," to emphasize its temporary nature given the return to in person and/or hybrid instruction after an emergency as compared to planned online learning. Nearly 20 different terms may be found in the literature which vary aligned to the technology employed, reliance on technology, and the synchrony of teaching and learning; a discussion of these is beyond the scope of this paper, but interested readers are directed to Singh and Thurman (2019). The instructional model that is the focus of this study will be referred to as an online learning model, aligned with the term's predominance (Singh & Thurman, 2019).

Despite the broad implementation of online learning programs as a result of COVID-19, the research on online learning in the K-12 educational environment is scarce for special education populations (Martin et al., 2023). Thus, many school systems and educators were left to navigate the development and implementation of online learning without the necessary guidance required to maximize student learning and well-being. Vasquez and Straub (2012) conducted an evaluation of the literature that included 43 published and unpublished studies of online instruction with individuals with disabilities. Only six studies were empirical in nature, and five of these focused on asynchronous instruction with one focusing on synchronous instruction. Synchrony specifies whether the teaching and learning occur asynchronously (i.e., learners and teachers not online simultaneously, use of email, discussion boards, and posted digital content/assignments for interaction) or synchronously (i.e., live; learners and teachers online simultaneously using videoconferencing and chat for real-time interaction) (Hrastinski, 2008). This small sample prevented the researchers from answering questions regarding how best to deliver online instruction for K-12 students with disabilities (Rice & Dykman, 2018), yet the authors noted the impact of scaffolding, Universal Design, accessibility, and the removal of barriers for assistive technology use (Vasquez and Straub, 2012).

To the authors' knowledge, three published empirical investigations regarding K-12 online learning for students with disabilities exist (Aloizou et al., 2021; Black et al., 2022; Kim & Fienup, 2022). Prior to the pandemic,

Black and colleagues (2022) analyzed the performance of 375 K-12 students with hospital-homebound status along with 1,191,508 non-homebound students, both groups attending public, virtual school. Students utilizing hospital-homebound services most commonly are students with a short-term or chronic health disability. Findings highlighted that both groups of students performed similarly across core content, but students with hospital-homebound status completed courses at lower rates. Aloizou et al. (2021) evaluated the impact of an educational gaming platform and video conferencing with students diagnosed with autism during the pandemic in Greece. Results demonstrated positive student goal and skills achievement and student interest and motivation, with more positive results evidenced for students with lower support needs. Finally, Kim and Fienup (2022) evaluated the impact of a checklist and contingent, preferred, virtual student reward on student completion of educational activities during the pandemic. Using a multiple baseline design across three participants, student completion of educational activities demonstrated an immediate increase for all participants.

Although students with disabilities are engaging in online learning, data to inform understanding of student outcomes and achievement continues to lag in comparison to the literature for students without disabilities (Greer et al., 2014; Rice & Dykman, 2018). Rice and Dykman (2018) noted, "The fact that key policymakers and implementers do not feel comfortable administering policy about online learning because they cannot acquire accurate data pictures is troubling…students are in danger of being denied FAPE" [Free Appropriate Public Education; 1996] (p. 200). For example, in a review and analysis via a panel of experts of online schooling during the pandemic for students with disabilities, Morando-Rhim and Ekin (2021) noted the extensive and widespread negative impact on specialized services for students due to shortened school days and challenges accessing online instruction. They noted that students with disabilities were absent at higher rates and experienced greater course failures and incomplete assignments. Students with greater support needs, such as those with more extensive communication or learning differences, were encouraged more often to return to in-person due to challenges schools acknowledged in delivering online services to these students. Additional vulnerabilities presented for students with disabilities in earlier grades as well as those approaching transition from school. Research that contributes to effective online learning experiences for students with disabilities in K-12 environments is essential to anticipate and prevent barriers to educational inequity.

## ONLINE LEARNING VARIABLES

In a recent systematic review of 251 studies, foundational considerations and essential components of K-12 education were analyzed (Johnson et al., 2023). Three factors were identified as contextual considerations for K-12 online instruction: educators' knowledge and preparation for online instruction, technology infrastructure and support, and students' developmental needs and abilities (Johnson et al., 2023). Their analysis of the extant research gleaned seven key pillars of an evidence-based approach to designing and delivering K-12 education in online formats: connected learners (i.e., community of connected learners and connect coursework to students' lived experiences), evidence-based course design (i.e., means through which the course content is provided to learners), active learning (i.e., learning activities in which students engage with course content and other students), assessment (i.e., formative and summative assessment), individualization and differentiation (i.e., tailoring instruction and learning activities to meet individual student and class subgroup needs), supportive learning environment (i.e., supportive course and personal/home environments), and accessibility (i.e., technology tools to support all students). Despite the emergence of these variables, the authors note that this literature base remains limited for students with disabilities, other health issues, or other underserved backgrounds (Johnson et al., 2023).

The key pillars outlined by Johnson et al. (2023) align to the critical components of the proposed online learning model, which is the focus of the present study. The review of the literature that follows aligns to the critical components of this online learning model: (a) Foundational access and online instructional platforms and tools; (b) attendance systems; (c) executive functioning and skill-building supports; (d) rigorous specialized instruction; (e) social emotional: motivation, well-being, and connectedness; (f) communication and collaboration, and (g) professional development and monitoring. Across these components, the research will be discussed aligned to general applications as well as for students with disabilities.

### Foundational Access and Instructional Platforms/Tools

The technology infrastructure and support noted as a contextual consideration within the review by Johnston et al. (2023) aligns to the access to technology and necessary tools deemed foundational within the present model to build organizational capacity. Prerequisites for online learning included reliable and affordable internet connection and access to technology

(Bergdahl & Nouri, 2020; Kaden, 2020; Sari & Nayir, 2020). Systems and infrastructure must be developed to reach students without internet access in order to maintain expectations and accountability for learning (Sari & Nayir, 2020). Technology needed includes access to platforms that allow video and audio; full and small group capabilities; online tools and platforms with secure data privacy agreements; and online tools to support asynchronous chat when video tools lag or crash (Bergdahl & Nouri, 2020). For students with disabilities, engaging in a review of the student individualized education plan (IEP) and revision, if needed, to reflect the transition to online learning; a plan to provide related services; and to ensure accommodations were delivered as outlined in the IEP was encouraged (Center on Online Learning and Students with Disabilities [COLSD], 2016 as cited in Ortiz et al., 2020; Ortiz et al., 2020). Additionally, Tindle et al. (2016) indicated that family support for learning and use of devices and other learning platforms was critical for students with disabilities.

### Attendance Systems

Attendance functions as an essential prerequisite for students to benefit from instruction with absenteeism producing long term negative consequences (NCES, 2009). However, many students failed to log on or access the available learning opportunities during the pandemic (NYS Dept. of Ed., 2021). The challenge of chronic absenteeism, or students missing more than 10% of a school year, increased on average during the pandemic across all states studied in a 39-state sample (Malkus, 2024). Evans et al. (2024) found that across 11,017 school districts, chronic absenteeism increased to approximately 30%, nearly doubling pre-pandemic levels. Therefore, tools for monitoring and recording attendance (Bergdahl & Nouri, 2020) and systems to promote attendance are critical. However, few researchers have explored reliable methods to promote virtual student attendance or guidance for educators as they develop their own attendance systems.

### Executive Functioning Skill-Building and Supports

The importance of executive functioning skills within online learning during the educational shifts brought on by the pandemic can't be understated, due in part to the pandemic's disruption of critical learning routines, the addition of steps needed to complete and submit assignments, and increased stress and anxiety, among a host of additional variables (Educational Resources Inc., 2024). Clear course expectations, accessible course materials and consistency across courses (Khan et al., 2017) support students. Sari and Nayir (2020) recommended that students should be offered the capability to re-access course material at a later time/date, a recommendation that was particularly well aligned to pandemic learning conditions. Student self-assessment and peer assessment to promote self-regulated learning skills,

including time management and progress monitoring skills (Wang, 2020) are encouraged. The critical role of student-self-regulated learning or a student's ability to manage their own learning behaviors, a task that is likely to be required more often in online settings, was highlighted by a number of researchers (Carter et al., 2020; Johnson et al., 2023). Despite the general guidance, few recommendations were found specific to the executive functioning needs of students with disabilities during online learning. However, Cavanaugh et al. (2013) noted that online modules must be developed to guide students on how to navigate and be successful in online courses and scaffolded supports must be integrated into instructional activities (Vasquez & Straub, 2012).

### Rigorous and Specialized Instruction

Many aspects of quality instruction in a face-to-face environment retain their importance in a virtual environment: Instructional content should be presented in a variety of ways (Daniel, 2020; Khan et al., 2017); high levels of student engagement should be sought (Panigrahi et al., 2018; Sari & Nayir, 2020); teachers should check for student understanding (Kaden, 2020) and provide timely and meaningful feedback (Gallien & Oomen-Early, 2008); and content should match student needs (Lynch, 2020), be relevant to students' lives (Güneş & Alagözlü, 2020), and be individualized based on student responses (Means et al., 2009; Sari & Nayir, 2020). Lessons should be divided into short segments (Cavanaugh et al., 2004; Khan et al., 2017) and include summaries of what was learned at the end of each lesson with previews for upcoming lessons (Wang, 2020). Thoughtful evaluation and monitoring (Ahmed et al., 2020) including the use of effective assessment methods (Khan et al., 2017) are supported. Online tools for interaction to promote the exchange of ideas (Khan et al., 2017) including small group collaborative learning and discussion have been recommended. Johnson et al. (2023) highlights the important roles of evidence-based course design, accessibility, active learning, assessment, and individualization and differentiation. Finally, practices to develop reciprocity and cooperation among students to increase peer collaboration and peer support should be utilized (Wang, 2020).

For students with disabilities, differentiated instruction and Universal Design for Learning (UDL) are supportive (Cavanaugh et al., 2013; Coy et al., 2014; Johnson et al., 2023; Vasquez & Straub, 2012). Differentiated instruction reflects efforts to meet the individual needs and interests of students while maintaining the same academic expectations, or to teach differently and avoid one-sized-fits-all teaching (Stanford Center for Teaching and Learning, n.d.). UDL is a teaching approach that eliminates barriers to learning, thereby making learning accessible to all. Instructional materials

should be adjusted for student skills and abilities, particularly reading level (COLSD, 2016 as cited in Ortiz et al., 2020) and student progress should be closely monitored to allow for teacher intervention when difficulties arise (Crouse et al., 2018).

### Social-Emotional: Motivation, Well-being, and Connectedness

Many students experienced social-emotional difficulties during the pandemic, with school-aged children experiencing higher levels of anxiety and depression as compared to pre-pandemic levels, in addition to increased inattention and social isolation (Sayed et al., 2024). For all these reasons, efforts to provide emotional care and support to students (Lynch, 2020) and reassure students and parents (Daniel, 2020) are recommended within online learning. Fostering community and developing a student-centered environment (Khan et al., 2017) with respect for diverse student talents and learning needs in a safe and engaging online learning environment (Wang, 2020) promotes inclusivity within these online learning efforts. Certain instructional aspects were also associated with enhanced student motivation, connectedness, and well-being: Inclusion of synchronous and asynchronous instruction to promote communication and feedback, embedding varied means for students to participate, adjusting lesson materials to be more engaging, motivating students verbally, incorporating games and frequent reinforcement, encouraging empathetic and perspective-taking behavior, teaching and reinforcing patience and resilience, promoting student autonomy as learners, and maintaining their motivation for learning (Güneş & Alagözlü, 2020; Kaplan-Rakowski, 2020; Sari & Nayir, 2020; Szabo et al., 2020, Wang, 2020). The review by Johnson et al. (2023) highlighted that students should be connected, have a sense of community, have learning connected to their own experiences, and served via supportive learning environments. For students with disabilities, schools must foster safe climates and caring communities for learning by considering student needs when developing curriculum and school policy (Cavanaugh et al., 2013). Doing so allows students to maintain social networks (Ameis et al., 2020), develops social interaction skills, and extends opportunities for learner-to-learner engagement (Crouse et al., 2018).

### Communication and Collaboration

Open communication fosters the student and caregiver's educational investment and should allow for maximum caregiver involvement and participation in supporting virtual learning (Ortiz et al., 2020). Ongoing student-educator communication that is frequent (Cavanaugh et al., 2004), collaborative (Gallien & Oomen-Early, 2008; Whelehan, 2020), and across multiple

formats enables progress monitoring and timely modifications to instruction (Welehan, 2020). Whenever possible, students should be involved in decision-making processes related to their online work (Smith et al., 2016). Wang (2020) also recommended that educators communicate high expectations for learning, requirements for learning tasks and activities, and rules for classroom communication and interactions. Virtual office hours may be beneficial to answer questions (Gallien & Oomen-Early, 2008), guide student learning, and provide feedback and encouragement (Wang, 2020). Communication also promotes interdisciplinary collaboration and regularly scheduled opportunities for collaboration are supportive (Kaden, 2020; Bergdahl & Nouri, 2020). The authors were unable to identify additional research on communication and collaboration regarding students with disabilities.

### Professional Development and Monitoring

Educators' knowledge and preparation for online instruction was identified as a contextual consideration for K-12 online learning within a recent review of the literature (Johnson et al., 2023). Yet, professional development for teachers to serve students with disabilities in online capacities is often provided via consultation with administrators and other educators as opposed to provided proactively and universally in a consistent manner (Rice et al., 2023). Instead, Rice et al. (2023) noted that the professional development opportunities were "few and far between," available in some settings for those interested to utilize; however, these opportunities overemphasized policy or legislative requirements in lieu of how to most effectively serve students with disabilities online or focused on technological learning. Despite these inherent limitations, the literature offers some recommendations regarding the professional development supportive for educators serving students with disabilities online. For example, efforts to support and prepare educators to design and deliver online learning is supported through clear roles and responsibilities (Yang & Cornelious, 2005), meaningful professional development including technology assistance and training, instructional design and delivery, and online instructional methods for teaching online (Sari & Nayir, 2020; Yang & Cornelious, 2005). Recommendations also encourage training via web-based platforms with opportunities for follow-up discussion (Rice et al., 2023).

Burns (2011) noted that effective professional development for online instruction should be held to the same standards as in-person professional development and should be differentiated for teachers' strengths and needs, support application within classes, and include practice and feedback opportunities. Having mentors available to answer questions that arise (Yang &

Cornelious, 2005) and monitoring to ensure quality across courses, materials, and instructors (Burns, 2011) was also recommended. The literature is limited related to professional development and training for educators serving students with disabilities (Ortiz et al., 2020; Rice, 2017); however, the guidance that has been provided may have overemphasized accessibility (i.e., captioning media) and policy or legal requirements at the expense of understanding the needs of students with disabilities (Fichten et al., 2009; Rice et al., 2023).

## PURPOSE

Few researchers have explored the critical components of online learning for individuals with disabilities. Although emerging literature exists evaluating educator (e.g., Catalano et al., 2021; Rice, 2022) and parent (Sakarneh, 2021) perceptions regarding online learning for students with disabilities during the pandemic, fewer empirical investigations of online learning approaches or models have been conducted (Aloizou et al., 2021; Black et al., 2022; Kim & Fienup, 2022) and rarely is student feedback sought. These findings highlight the limitations in the literature regarding online learning for students with disabilities and the many questions that remain unanswered (Greer et al., 2014). This gap in the research may negatively impact outcomes for students receiving special education services, for whom educational inequities pre-date the pandemic. Additional empirical investigations of online learning for students with disabilities are needed as are investigations of the perceptions and preferences of online learning by students with disabilities. For this reason, the present study seeks to contribute to the K-12 education online learning literature by describing an online learning model employed with elementary through secondary students with developmental disabilities in small group instructional contexts. The impact of the online learning model on student attendance, student engagement, and student and teacher social validity via a case study format will be examined. Research questions include:

1. What was the impact of the online learning model on student attendance?
2. What was the impact of the online learning model on student engagement as measured across student responding and student accuracy?
3. What were student and teacher perceptions and preferences related to online learning?

## METHOD

### Participants

Participants included 57 school-aged students in grades four through 12 whose ages ranged from 9-20. Students received special education services which for many also included the related services of speech/language therapy, occupational therapy, mental health services, and physical therapy. All students were pursuing a High School Diploma. Table 1 outlines participant characteristics across Elementary/Middle School (EMS) and the High School (HS) divisions.

**Table 1**
**Participant Characteristics**

| Variable | Percentage of Participants (Total n=57) | |
|---|---|---|
| | EMS Division (4th-8th Grades) | HS Division (9th-12th Grades) |
| Participants | 44% (n=25) | 56% (n=32) |
| Disability Classification | Autism (68%); Multiple Disabilities/MD (18%); Specific Learning Disability/SLD (9%); Other Health Impairment/OHI (4.5%) | Autism (76.5%); MD (17.6%); OHI (2.9%); Intellectual Disability (2.9) |
| Race/Ethnicity | White (44%); Black (40%); Hispanic/Latinx (8%); Multiple (8%) | White (67%); Black (21%); Hispanic/Latinx (6%); Multiple (6%) |

Thirty total staff participated in this evaluation including 28 teachers and/or student case managers and two program administrators, who did not also serve in case management roles with staff. Fifty percent of staff had master's degrees, 43% of staff had bachelor's degrees, 3% of staff had associate's degrees, and 3% of staff had doctoral degrees.

### Setting

Participants attended a non-public, special education school in a large, suburban city in the Mid-Atlantic region. The school is in a high-income geographical area; however, the school serves a variety of public school districts across two states and the District of Columbia. Over 95% of students served in the school were funded by local and state jurisdictions and fewer

than 5% of students privately paid. During the online learning program, participants received services from their/a caregiver's home and teachers and administrators provided services from their homes. Students participated in hybrid learning in both their homes/a caregiver's location and in the school building.

## Periods

Various time periods relevant to the pandemic will be explored including (a) pre-pandemic, (b) online learning, and (c) hybrid learning. Table 2 provides an overview of these time periods. The online learning model is the emphasis of the current investigation and will be described comprehensively below.

**Table 2**
**Overview of Time Periods**

| Time Period | Date Range | Description |
|---|---|---|
| Pre-Pandemic | July 2019-February 2020 | In person instruction was delivered in the school building for five days per week via small groups of 3-5 students to one teacher. |
| Online Learning | EMS: September 2020-February 2021<br>HS: September 2020-March 2021 | Online instruction was delivered for five days per week via small groups of 3-5 students to one teacher. A complete description of the online learning model follows. |
| Hybrid Learning | EMS: March 2021-June 2021<br>HS: April 2021-June 2021 | In person instruction was delivered in the school building for two days per week with online learning continuing for three days per week. In person instruction was delivered aligned to the pre-pandemic with increased and extended outside opportunities for socialization, lunch, and mask breaks. |

Note. Instruction delivered between pre-pandemic and online learning time periods is not included in this study as it served an iterative function, informing the final online learning model that is the focus of the current investigation.

### *Online Learning Model*

The online learning model included several critical components: (a) Foundational access and online instructional platforms and tools; (b) attendance systems; (c) executive functioning and skill-building supports; (d) rigorous specialized instruction; (e) social emotional: motivation, well-being, and connectedness; (f) communication and collaboration, and (g) professional development and monitoring. Students' daily schedules were structured to prioritize synchronous classes for instruction, complemented

by 1-2 asynchronous sessions for completing assignments and opportunities for independent practice. The combination of synchronous and asynchronous learning and the critical components were designed to maintain academic rigor while offering the flexibility needed. Figure 1 depicts the online learning model and each critical component will be discussed in the subsequent section.

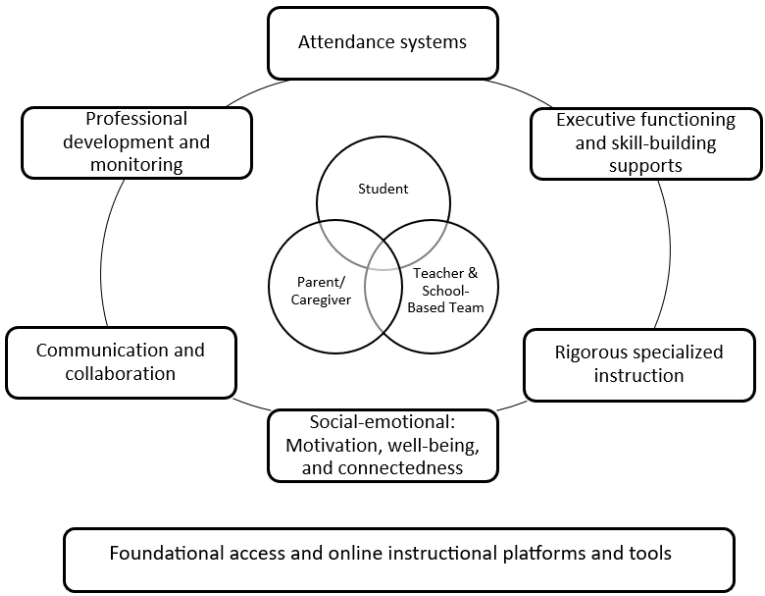


**Figure 1.** Online Learning Model .

**Foundational Access and Online Learning Instructional Platforms and Tools.** School-provided devices were distributed to all families and Wi-Fi hotspots were provided to families without wireless connectivity. Teachers had existing access to school-provided personal laptops and were provided access to additional items such as monitors, webcams for monitors, wireless earbuds, and tablets and styluses (as applicable). Additionally, several instructional platforms and tools were essential to the effectiveness of the online learning model as outlined in Table 3.

**Table 3**
**Programs and Applications for Online Learning**

| Program or Application | Link | Function |
|---|---|---|
| **Learning Management System** | | |
| *Google Classroom* | https://classroom.google.com | Hub for instructional links, materials, grades, and communication |
| **Synchronous Instruction** | | |
| *Microsoft Teams* | www.microsoft.com | Video calls |
| *Pear Deck* | www.peardeck.com | Simultaneous active student responding |
| *Google Docs* | https://docs.google.com | Assignments and assessments |
| *Google Forms* | https://docs.google.com/forms | Assignments and assessments |
| **Asynchronous Instruction** | | |
| *Screencastify* | www.screencastify.com | Teacher video recording |
| *Pear Deck* | www.peardeck.com | Active student responding |
| *Flipgrid* | www.flipgrid.com | Video-based discussion boards |
| *Playposit* | www.playposit.com | Active student responding |
| **Independent Practice** | | |
| *Dreambox* | www.dreambox.com | Mathematics |
| *IXL* | www.ixl.com | Reading comprehension |
| *ReadWorks* | www.readworks.org | Reading comprehension |
| *Discovery Education* | www.discoveryeducation.com | Science |
| **Attendance/Participation Accountability** | | |
| *Remind* | www.remind.com | Communication with student and/or caregiver |
| **Motivation** | | |
| *Class Dojo* | https://classdojo.com | Points awarded aligned to behavioral expectations, points exchanged for rewards |

**Attendance Systems.** Student attendance was monitored, and systems were in place to promote student attendance in the moment and across time. Team members identified students absent after 5 min of class starting and communicated with the designated team member, whose responsibility it was to contact the students and/or parent/guardian directly. If needed, the team member provided support (e.g., re-sending the virtual call link) for the student to join the class/session. Student attendance was documented by team members, which allowed case managers to identify and address patterns of attendance concerns.

**Executive Functioning Skill-Building and Supports.** Executive functioning skill building and supports were provided during one-on-one student-educator sessions, which occurred once or twice weekly for approximately 30 minutes in duration. During these sessions, educators supported students to use alarms, calendar invites, organization/time management systems, and Google Classroom for assignment completion, teacher feedback, and grades. Some students were also provided embedded hyperlinks to synchronous classes within their personalized schedules, and others were supported to use electronic planners to support assignment completion.

**Rigorous and Specialized Instruction.** The core features of the online learning instructional model reflect alignment with a traditional face-to-face model: (a) small group instruction, (b) explicit instruction, (c) delivery of intact learn units, and (d) active student responding. An explicit instruction model involving a sequence of teacher model, guided practice, and independent practice was employed (Archer & Hughes, 2011). Learn units, which measure the interaction between student and teacher (Greer & McDonough, 1999), encompass (a) an opening: teacher-directed attention gaining, clear instruction, embedded wait time, and signal to respond; (b) student response; and (c) closing: teacher feedback including error correction with reteaching when needed. Learn units were a core feature of the instructional delivery approach and a dependent measure for ongoing monitoring. Simultaneous, active student responding (Heward, 1994) methods included, but were not limited to, choral responses, typed responses via the synchronous video call chat box, thumbs up/thumbs down, and other types of responses available through other platforms (e.g., Pear Deck). These opportunities to respond (Sutherland & Wehby, 2001), which occurred approximately once per minute, fostered student engagement, and served as a dependent measure for ongoing monitoring, in addition to ensuring that instruction was engaging and fun.

**Social Emotional: Motivation, Well-being, and Connectedness.** A variety of methods were employed such as (a) a daily morning meeting and virtual recess (e.g., social interaction, group games), (b) use of frequent, positive feedback (e.g., encouragement, praise), (c) a social planning class that students participated in weekly that facilitated student connections outside of school, and (d) use of Class Dojo (https://classdojo.com) as the motivation and feedback system through the online learning model. Student behavior expectations were identified, and teachers used the

Class Dojo system to award points to students. Students accumulated points to meet certain goals and exchanged points for incentives (e.g., skip a class pass, dance party).

**Communication and Collaboration.** Communication systems were essential to the online learning model and served to reliably connect school-based team members, students, and caregivers. Students and teachers interacted during synchronous classes, related service sessions, and via Google Classroom, Remind, and email. Teachers and caregivers communicated once per day to once per week regarding student attendance, student performance, and school events and activities. Finally, school-based multidisciplinary team members collaborated through meetings, email communication, and document/resource-sharing, communicating to (a) develop and provide students cohesive educational programs, (b) monitor and problem solve student attendance, learning, and/or interfering behavior needs, and (c) establish and disseminate procedures and expectations.

**Professional Development and Monitoring.** Professional development was provided to teachers to support the transition to and implementation of the online learning model. Training formats included asynchronous training modules, synchronous training, and ongoing meetings. Training content spanned instructional practices aligned to synchronous or asynchronous formats, content area-specific instructional practices, instructional decision-making, technology and tool use, accessibility, and student case management and well-being. Meetings served as a vehicle for ongoing supervision, training, and collaboration. Monitoring of teacher instructional variables occurred to inform training and support needs in an ongoing manner.

## Dependent Variables and Data Collection

### *Student Daily Attendance*

During online learning, students were considered "present" if they did one of the following: (a) joined a synchronous video call with a teacher or related service provider, (b) submitted at least one assignment during the day, or (c) engaged in communication in any form (e.g., email, Google Classroom post) with a teacher or related service provider that day. Conversely, a student was considered "absent" if they did not engage in at least one of the preceding behaviors. During hybrid learning, students were considered present if they physically attended school on-site, regardless of the duration they were onsite.

### *Student Engagement*

Student engagement was evaluated through direct observation and included evaluation of student responding and student accuracy. Student engagement was measured for each student two to three times per month through 10-minute observations. **Student Responding** was defined as a student response within 10 seconds of a teacher-presented instruction and non-responses were defined as instances in which the student did not respond to the teacher-presented instruction within 10 seconds. Percentages

were calculated by dividing the total number of student responses by the total number of student responses with the total non-responses and multiplying by 100. The program criterion for student responding was 80%. **Student Accuracy** was defined as a correct student response within 10 seconds of a teacher-presented instruction and inaccurate responses were defined as instances that a student responded incorrectly within 10 seconds following a teacher response. Percentages were calculated by dividing the total number of accurate student responses by the total number of accurate and inaccurate student responses and multiplying by 100. The program criterion for response accuracy was 80%.

## Data Analysis

### *Student Daily Attendance*

The monthly aggregate of all students' daily attendance across divisions was calculated. First, the monthly average daily attendance for each student was calculated by dividing the total number of school days the student was present within the given month by the total number of school days within that month and multiplying by 100. For example, if the student was absent two days within the month of September and there were 19 school days in the month, the student's average for daily attendance would be calculated as (19-2)/19 * 100 = 89.47%. Then, the aggregated monthly average of student daily attendance for a given division was calculated by determining the average of all students' daily attendance within a given division for a specified month. For example, ($S_1$ Monthly Average of Daily Attendance + $S_2$ A Monthly Average of Daily Attendance + $S_x$ Monthly Average of Daily Attendance = X%...)/Total Number of Students in Division * 100.

### *Student Engagement*

Similarly, the monthly aggregate of all students' engagement across divisions was calculated for both responding and accuracy. First, the monthly average responses for each student was calculated by totaling the percentages across each measure for a given month and then dividing the total by the total number of observations and multiplying by 100. For example, if the student was observed three times within the specified month (i.e., 85%, 87%, and 86% responding), the student's monthly average responding would be calculated as (0.85+0.87+0.86)/3 = 0.86*100 = 86% responding. Then, the aggregated monthly average of student responding for a given division was calculated by determining the average of all students' monthly responding within a given division for a specified month. For example, ($S_1$ Monthly Average of Student Responding + $S_2$ A Monthly Average of Student Responding + $S_x$ Monthly Average of Student Responding = X%...)/ Total Number of Students in Division * 100. This process would be repeated for student accuracy.

## RESULTS

### Daily Attendance

The average daily attendance during online learning was 99.6% for EMS and 99.3% for HS divisions. During hybrid learning, daily attendance fell slightly to 99.0% for EMS and 98.1% for HS divisions.

### Student Engagement

The impact of the online and distance learning models on student engagement, including student responding and student accuracy is depicted in Table 4.

**Table 4**

**Average Student Responding and Accuracy**

| Phase | EMS Division | | HS Division | |
|---|---|---|---|---|
| | Average Responding % (Range = %-%) | Average Accuracy % (Range = %-%) | Average Responding % (Range = %-%) | Average Accuracy % (Range = %-%) |
| Pre-pandemic (Comparison Phase) | 88.4 (85-92.5) | 84.2 (78-98) | 89.2 (88-91) | 82.1 (78-85) |
| Online Learning | 73.8 (68-79) | 67 (64-71) | 90.3 (88-97) | 80.3 (74-83). |
| Hybrid Learning | 85.8 (83-87) | 78.8 (74-83) | 88 (83-93) | 75.7 (72-79) |

Note. Criterion for responding and accuracy is 80%.

### Social Validity

Social validity reflects the extent that participants experience the intervention's aims, procedures, and outcomes as acceptable and meaningful (Wolf, 1978). Social validity was rated by students and teachers regarding various aspects of online, hybrid, and in person learning.

#### *Students*

Student perceptions and preferences were evaluated through an anonymous survey using Google Forms. Accommodations were provided to all students who required them including read aloud (i.e., staff member reading the questions aloud), scribe (i.e., staff member writing the student's spoken aloud response to open ended questions), and speech to text (i.e., assistive technology converted the student's spoken responses to open ended questions into text). Sixteen EMS students and 16 HS students elected to

complete the social validity survey. Based on student responses, most students across divisions rated a preference for in-person learning (53%, n=17) and rated hybrid learning and online learning nearly equally as the second most preferred. Variables that students reported most frequently related to a preference for in-person learning included seeing friends (48%, n=10), seeing teachers (33%, n=7), and learning-related variables (e.g., easier to learn, preferred classes; 19%, n=4). Responses related to a preference for online learning were more idiosyncratic and included learning preferences (n=2; "I can study more at home…"; "Easier"), one respondent noted decreased social demands (i.e., "I liked not having to see all my friends and classmates so much," and four responses were related to increased flexibility: "Following my schedule without teachers reminding me or bells to help me get to classes on time;" "1 Sleep, 2 Don't have to go to school on time;" "I don't have to take the bus;" and "Play games." Students who preferred hybrid learning reported enjoying the balance between the different learning formats, "There [are] pros and cons to both. Learning from home means I don't have to worry about getting to school, I can just hop on my computer when ready. Physical school allows me to be able to talk to teachers easier" and "It gave you a little break when you stayed home and you could sleep in a little bit longer, while at school, you got to see your friends and some teachers in person." Students identified a variety of components that they believed supported their learning during online learning such as Peardeck (65%, n=24), Chromebook/Computer (54%, n=20), Google Classroom 46%, n=17), related service sessions such as speech/language therapy or occupational therapy (38%, n=14), study halls with teacher (35%, n=13), synchronous classes (32%, n=12) and family/someone to help me in the home (32%, n=12), social planning class (29%, n=11), classes with homeroom teacher to work on executive functioning skills or complete assignments (24%, n=9), and Flipgrid (22%, n=8).

### *Teachers*

Informal teacher social validity data were collected via an online, anonymous survey. Thirteen teachers responded to the survey and, of those, five taught in EMS and eight in HS. Thirty-eight percent of respondents had taught for four to five years (n=5), 23% had taught for two to three years (n=3), 15% taught for each for one year (n=2), 15% were in their first year of teaching (n=2), and 8% taught for more than 10 years (n=1). Teacher responses, based on a five-point Likert-type scale, were, for the most part, equally distributed in response to how easy (rating of 1) or challenging (rating of 5) they found teaching during online learning, with most respondents (41%, n=7) rating a 3 "Neutral." Similar results were found for hybrid learning. Teacher perspectives on the importance of the various online

learning model components were evaluated (where 1 = Not Important and 5 = Essential). All model components were rated a mean score of 3.9 or greater, suggesting teachers found all components to be "somewhat essential" (scores of 5 reflected ratings of "essential"). Access to instructional devices, platforms, and tools was rated as the most essential (M = 4.8), followed by attendance systems (M=4.5), executive functioning skill-building and supports (M=4.5), communication and collaboration (M=4.4), professional development and monitoring (M=4.3), rigorous and specialized instruction (M=4.3), and social-emotional: motivation, well-being, and connectedness (M=3.9).

## DISCUSSION

Educators, administrators, and lawmakers may consider the lessons of the COVID-19 pandemic to develop and refine future approaches to online learning. Schools are likely to continue to employ online learning formats in response to emergencies, to replace innocuous "snow days" (Rice & Barbour, 2023), or to expand the scope of educational offerings available to all or select groups of students such as students with disabilities. Through reflective analysis of past approaches as well as research- and community-informed guidance, students with disabilities may benefit from more timely and effective responses to interruptions in traditional schooling. Rarely has access to schooling for students with disabilities arisen from the "goodwill" of systems; instead, committed actions of invested individuals, families, and professionals has driven policy (Basham et al., 2016, p. 76).

Effective policy should be informed by the scholarly literature, along with input from individuals and communities. The literature regarding online learning for students with disabilities was limited prior to the pandemic and remains sparse. These gaps in the literature promote inequities for students with disabilities present prior and further exacerbated by the pandemic. Therefore, the present study sought to describe and explore the impact of an online learning model employed with elementary through secondary students with developmental disabilities receiving special education services in a group instructional format. Research questions encompassed the impact of the online learning model on student attendance, student engagement (student responding and student accuracy), and student and teacher preferences and perceptions. Critically, the preliminary findings of the study suggest the potential impact of the online learning model on student attendance and student engagement, with average student attendance at 99% or more during online learning and student engagement learning levels approximating or approaching those measured prior to the pandemic.

Efforts that promote student attendance increase the probability that student learning will occur. Despite widespread chronic absenteeism during the pandemic, this online learning model maintained high attendance rates in both the online and hybrid learning phases. Similarly, preliminary findings suggest that the online learning model supported student engagement, with levels of student responding and accuracy reflecting those observed pre-pandemic for HS and approaching criterion levels for EMS. Whereas many studies have noted the failure of schools to provide students with disabilities specialized instruction, findings from this study highlight that students were not only present at school at pre-pandemic levels but were engaging in the rigorous and specialized instruction.

High school students engaged at higher levels of student responding and accuracy as compared to EMS students during online learning. HS students responding was at or above criterion levels whereas EMS student engagement approached criterion levels. The greater difficulty that EMS students experienced engaging in distance education as compared to high schoolers may be due to (a) skill deficits with use of technology and online instructional platforms, (b) poorer online learner readiness skills (i.e., student ability to engage and participate in teacher-directed instruction in an online format), (c) shorter endurance for online learning, (d) different or fewer motivational systems as compared to those available during face-to-face instruction, and/or (e) teacher difficulty monitoring student engagement with instruction (e.g., determining if students were engaging on different web browser tabs or applications on their devices) and redirecting students back to the task as compared to face-to-face settings where teachers may have been able to provide redirections or proximity control to support engagement during face-to-face learning.

Students reported challenges regarding social and learning variables during online learning that influenced their preference for face-to-face learning. However, students identified components from online learning they found helpful and that addressed their social and learning preferences and needs. Teacher perspectives further validated the online learning model, rating all model components except one at “somewhat essential” (rating of 4) to “essential” (rating of 5) with the lowest rated component, social-emotional: well-being, connectedness, approaching a rating of somewhat essential with a mean rating of 3.9.

### Limitations

Various limitations exist within this study. First and foremost, although the study offers an empirical investigation of an online learning model employed with students with disabilities in a special education context, the evaluation is not experimental. Student attendance and engagement were

not compared to either an interparticipant or intraparticipant control. For this reason, this study is exploratory in nature and, therefore, the presence of a causal relationship between the online learning model and dependent variables cannot be determined. Despite this limitation, rare phenomena, such as the pandemic, create an opportunity to gain empirical understanding even when stringent experimental designs may not be feasible (Kazdin, 2011; Price et al., 2015). As the current researchers did not believe it ethical or legal to deny students from high-quality online instruction for the purposes of experimental control, a case study was used in this exploratory investigation of the potential impact of the online learning model on student attendance, student engagement, and social validity.

As many researchers examining online learning for students with disabilities have noted, non-peer reviewed and unpublished literature exists on this topic, which, if published, would further contribute to a literature base much in need of answers (Greer et al., 2014). Although the research-to-practice gap (e.g., Korthagen, 2007) is more commonly cited, many educators "in the trenches" would convey their frustration with the practice-to-research gap, whereby educators and practitioners do not have the resources or flexibility to research and publish the innovative and high-quality practices they are employing. For these reasons, the current researchers sought to offer this preliminary investigation, despite its limitations, in the hopes that it may contribute to the emerging literature regarding educating students with disabilities via online learning.

Additionally, the current study was conducted in a non-public special education school in a high socioeconomic status level area, which may have contributed to greater availability of caregivers in the home to provide additional support to students as needed during online learning as well as to access to the requisite technology (e.g., Wi-Fi, devices) and environmental aspects (e.g., quiet place to engage in online learning) that supported their learning. Additionally, the school has a dense student-teacher ratio and employs a high number of Board Certified Behavior Analysts® who serve in leadership and case management capacities within the program. These behavior analysts were responsible for overseeing the implementation of the face-to-face and online learning programs, including the data collection and decision-making. These factors may have implications for the generalizability of the preliminary findings presented in this study. Finally, interobserver agreement (IOA) was not evaluated for student engagement measures, which would have enhanced the reliability of the preliminary findings offered in this study. However, all observers were previously trained in this observation system that was consistently used within the program prior to and during the pandemic.

## Future Research

The present study does not allow for determination of a causal relationship between the online learning model and the dependent measures as a result of its case study nature. Therefore, future research should evaluate whether a causal relationship exists between the online learning model and student attendance and engagement using experimental methods. Additionally, the current online learning model reflects a multi-component package. It is unclear which components of the package were responsible for the positive effects on student attendance, student engagement, and perceptions of social validity. For this reason, future research may employ a component analysis of the multi-component model to inform a more resource efficient package. Finally, the social-emotional well-being of students and staff is critical to evaluate and monitor, particularly during disruptive times in education. Future studies of the online learning model would benefit from direct measurement of well-being to ensure the impact of the online learning model on the whole student is considered.

## Implications

This evaluation aimed to explore lessons learned during the pandemic by investigating an online learning model for elementary through high school students with disabilities using quantitative and qualitative methods. These preliminary findings suggest that the online learning model positively influenced critical student outcomes of attendance and engagement, with levels exceeding, meeting, or approaching those observed in pre-pandemic levels, face-to-face contexts. Despite the exploratory nature of this project, these findings are notable for a few reasons. This study contributes to an emerging literature base regarding the effectiveness of online learning for students with disabilities, using empirical quantitative and qualitative data collected over several months across 57-school-aged participants. Educators and administrators in wide ranging educational settings may consider contributing to this practice-to-research gap by examining their own educational innovations. Educators and administrators may use the model offered in this paper as a point of comparison to their own approaches to online learning for students with disabilities. Evaluating or comparing using qualitative and quantitative methods will not only enhance the effectiveness of their own programming but contribute to much-needed answers to enhance educational offerings for students with disabilities in online formats.

The online learning model employed a small group instructional approach serving a student sample with more than 73% of students served under the educational classification of autism. This differs from much of the published literature, which often describes these students as receiving one-on-one instruction with an adult/teacher due to the high level of structure,

well planned, and repeated learning opportunities afforded (Taylor & DeQuinzio, 2012). Despite the effectiveness of one-on-one instructional formats , group instructional contexts can offer a similar number of opportunities to respond, are less resource intensive, and align to the mandate for least restrictive environment (Yuan & Wang, 2023). Similarly, all participants in this study were pursuing a high school diploma, thus, receiving specialized instruction aligned to the general education curriculum. However, little guidance exists regarding how best to serve these students diagnosed with autism who are pursuing a high school diploma (Orsmond et al., 2020) and the published literature overemphasizes approaches to non-academic instruction. Finally, incorporating social validity from both student and teacher participants ensures the perspectives of students with disabilities and educators are not overlooked at the expense of other measures of "effectiveness" (Lestremau Allen et al., 2024). Therefore, the current project stands at the intersection of several underexplored areas— providing small group instruction aligned to the general education curriculum in an online format to students primarily classified under the category of autism, while soliciting their perceptions of the experience.

Educators, administrators, and policymakers are encouraged to consider whether and how this multi-component online learning model may be replicated or adapted within their own contexts to promote student attendance and engagement during times of interruption to K-12 education. This model may also offer novel solutions to address educational inequities faced by students with disabilities. Students with disabilities deserve educational experiences that are planful, intentional, and research informed. In "Preparing K-12 Schools for a Pandemic Before it Occurs," Christensen and Alexander (2020) detail one school's intentionality via its annual Distance Learning Day to prepare educators, students, and others to transition more seamlessly to needed online instruction. In this way, this online learning model, may aid educators, administrators, and policymakers to develop and prepare an effective online learning model to serve their students with disabilities that aligns with their community's values and needs. Such models may lead to flexible, yet effective online learning approaches that anticipate and prevent barriers, promote engagement, and facilitate learning and well-being.

During times of disruption, in education or otherwise, flexibility and compassion are paramount. Maintaining high expectations for students with disabilities requires innovative, researched-supported approaches that emphasize inclusivity and equity. The online learning model described in this study adapted critical program features of face-to-face instruction and supplemented to address new or different needs present in the online learning context. This resulted in an approach that ensured students and staff were provided structure and systems of support, which served to maximize student learning and well-being during an unprecedented time of challenge and uncertainty.

## ACKNOWLEDGEMEMENT

The co-authors would like to thank Dr. Jodi Duke and Dr. Carol Rogers-Shaw for their review and helpful feedback and insights regarding an earlier version of this paper. Similarly, thanks to the reviewers for their important feedback to improve this paper. Finally, thanks sincerely to all the colleagues who worked tirelessly during the implementation of this online learning model and to the students and families who were essential partners and collaborators.

## DECLARATIONS

The authors declare no conflicts of interest.
The authors declare no funding associated with this study.
The authors declare that permission to collect data for this study was granted by the institutional review board of The Ivymount School.

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