A Guide for Special Education Leaders to Utilize Artificial Intelligence: Students' Perspectives for Future Consideration

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- **The purpose of this qualitative study was to understand, from the perspective of students with disabilities, what special education leaders and their respective classroom educators should consider in the integration of artificial intelligence (AI) features and tools to support individualized instruction.**
- **This study utilized an immersive and interactive personalized learning environment, virtual reality, to engage students with disabilities as they consider AI tools, features, and supports that are currently needed to enhance their learning experience.**
- **The five primary themes for AI integration that building and instructional special education leaders should consider included 1) response options, 2) content, 3) learning environment and virtual characters, 4) visuals, and 5) sound or auditory supports.**
- **As special education leaders seek to determine how best to navigate growing AI tools and how and when to implement, this study, coming from the voice of students with disabilities, offers some immediate and pertinent suggestions within the context of current personalized learning efforts.**

Key words: School Leadership, Artificial Intelligence, Personalized Learning, Virtual Reality, Artificial Intelligence Tools, Artificial Intelligence Implementation, Special Education Leadership.

Infusing Artificial Intelligence Into Personalized Learning for Students With Disabilities

Today's preK–12 classroom is under tremendous pressure. Education leaders and classroom teachers are seeking to address the significant learning loss that appears to be the new normal post the 2020–2021 pandemic (Chen, Chen, & Lin, 2020). Changes in student demographics and variability, advancements in the development and implementation of technology, evolving educational standards, and the ever-changing nature of state and local requirements are just a few of the multitude of challenges facing today's preK–12 learning environment (Hocine & Sehaba, 2023). These changes call for more effective planning to address the instructional, behavioral, and social emotional needs through the integration of evidence-based practices to ensure effective design for all learners. It is through the use of specially designed instruction featuring effective practices that we can ensure the specific and unique needs of all learners, particularly those with identified disabilities, can be addressed. Today's classroom requires a personalized learning approach that includes just-in-time learning avenues and flexible learning and assessment options as well as teacher and student choice embedded within the design of the instructional experience (Hyslop & Mead, 2015).

As school leaders work to address growing student variability, schools continue to infuse innovative technology-based solutions across the preK–12 learning environment. Be it student one-to-one access to a personal device (e.g., ChromeBook), the influx of learning and/or content management systems (e.g., Google Classroom, See Saw, Canvas, IXL, Khan Academy), and/or the growing list of apps and applications (e.g., Grammarly), technology is increasingly synonymous with preK–12 instruction and learning. For struggling learners and their peers with disabilities, the wedding of these digital solutions with a student-centered learning approach offers a more personalized learning framework from which to offer unique, specific, and specialized instruction (Lewis, Garrett Dikkers, & Whiteside, 2017). Personalized learning is an approach that seeks to customize the learning experience for each student to the student's unique skills (Zhang, Basham, & Yang, 2020). Personalized learning is not limited to students with an identified disability; instead, it is increasingly being looked to as a way to address student learning loss and social skill development and to individualize the increasing variability among our grade- and content-level instruction (e.g., fourth grade, chemistry). The growth in innovative technologies offers a transformative approach to special, individualized and/or personalized education. Digital tools allow educators to tailor educational strategies and just-in-time support to the specific student while also addressing the need to instruct a class of 25–30 students simultaneously. Utilizing a strategy such as personalized learning in concert with digital tools is a logical solution to meeting students' individual needs across learning, including content foci, social/emotional, etc.

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Tools That Support Personalized Learning

One tool that can be used by teachers and students in various platforms to further personalize instruction is virtual reality (VR). VR, for example, provides a variety of immersive learning options that can engage the student while reducing potential distractions for learners with disabilities (Zhang, Carter, Basham, & Yang, 2022). Offering interactive simulations enhances engagement and can motivate students, particularly those who often struggle with traditional methods of instruction (Hemsley, Bryant, & Bailey, 2021). VR has also been found to visually represent abstract concepts in a way that makes them easier to understand (Kellems, Yakubova, Morris, Wheatley, & Baer Chen, 2021). Likewise, by leveraging VR technology, educators can create more inclusive, personalized learning experiences that further support safe environments to practice and learn new skills (Carreon, Smith, Mosher, & Rowland, 2022). This is particularly true for social skill development (Mosher & Carreon, 2021). A personalized learning environment such as the VR setting can be more controlled for knowledge and skill development, less intimidating, and safer from negative variables than real-life interactions with peers and adults (Mosher, Carreon, Craig, & Ruhter, 2022).

In addition to VR, artificial intelligence (AI) is playing a crucial role in transforming personalized learning and expanding what is possible for student development (e.g., social skills) among students with disabilities. Whereas the introduction of newer tools, such as ChatGPT, are altering the way AI is defined, AI-powered tools precede many of these newer innovations and have been essential to the success of personalized learning (e.g., word prediction). For example, adaptive learning platforms that automatically adjust the difficulty level of digital learning materials based on the student's performance have been a constant for many personalized learning experiences (e.g., IXL) (Zhou, Van Brummelen, & Lin, 2020). Instant feedback from automated grading of formative and summative assessments has allowed students to understand their mistakes and further engage in their learning (Zhang et al., 2022). In the VR environment, AI enhances the gamification of instructional materials, enhancing engagement while keeping the student motivated and invested in learning. Recent advances in AI tools are further improving intelligent tutoring systems, which, in turn, offer immediate feedback, responsive detailed explanations, and accompanying personalized instruction mimicking what a student might receive through in-person tutoring (Rice & Dunn, 2023). AI algorithms can analyze vast amounts of information, student data, learning preferences, and a host of similar elements that can identify patterns and insights related to student performance, challenges, and subsequent needs (Crompton, Jones, & Burke, 2022). AI learning analytics can further design and customize instructional pathways specific to student learning goals and respective needs.

Advances in AI tools and the continued need for responsive personalized learning environments pose opportunities, particularly for students with disabilities (Martin, Zhuang, & Schaefer, 2023). Although a it is growing area of research, recent AI literature reviews (Chen et al., 2020; Laupichler, Aster, Schirch, & Raupach, 2022; Ng, Lee, et al., 2023; Ng, Su, Leung, & Chu, 2023; Salas-Pilco, Xiao, & Hu, 2022; Sanusi, Oyelere, Vartiainen, Suhonen, & Tukiainen, 2022; Su, Zhong, & Ng, 2022; Tan, Lee, & Lee, 2022; Wangenheim, Hauck, Pacheco, & Bertonceli Bueno, 2021) have identified four key areas in which AI can improve upon current educational technology, and these include visuals, auditory, content, responding, and environment utilized. In the area of social skill development, for instance, AI visuals, auditory, and response mechanisms offer ways to create and implement simulated social interactions and real-time and personalized feedback as part of virtual social interactions, emotion recognition training, and a host of additional possibilities. With these considerations, school leaders must continue to consider the role AI will play while seeking student perspectives to determine where and how best to utilize these tools in practice. That is, the learner can often communicate needs or, at the very least, where challenges are occurring and, thus, offer insight on the AI tool that can support the learner's specific need and overall learning preference. This last point is not only relevant to the needs of the student with a disability, but also a potential strategy for leaders and educators as they seek to better understand and identify ways to utilize the growing AI solutions. Looking to the student and allowing the student to communicate needs expands the possibilities in personalized learning for students with disabilities. If AI tool use can be determined on the part of the actual student, its subsequent application will most likely be relevant to the needs of the learner while also reinforcing to educational leaders.

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Purpose of the Study

To determine the needs and preferences of student stakeholders, the authors conducted a study seeking input from middle school students after implementing social skills instruction utilizing a personalized learning platform based in VR. The significance of this study lies in understanding how students with disabilities would improve personalized learning opportunities through growing innovations in the form of AI tool options. This inquiry adds information and insight from the perspective of the student with a disability to further inform the selection of AI tools/programming by educational leaders. To that end, this qualitative study aimed to investigate the following research question: What is the perspective of middle school students as to the areas in which innovative technology, such as AI embedded in VR, may be used to improve social scenarios within a personalized learning experience?

Method

A qualitative study was conducted with 10 schools to explore the perspectives of middle school students learning social skills utilizing AI embedded in a VR system. This study was approved by a research institutional review board prior to all research activity.

Virtual Reality Opportunities to Integrate Social Skills (VOISS) Sites and Participants

Participating schools included 10 middle schools in rural, suburban, and urban districts in Kansas, New Mexico, Virginia, and North Carolina that implemented a free VR intervention (called virtual reality opportunities to integrate social skills [VOISS]) to improve the social skills of students with disabilities or who are at risk of being identified with a disability affecting their social, emotional, or behavioral development. The majority of students were White, followed by Hispanic, Asian, Black/African American, and American Indian/Alaska Native. Their ages ranged from 10 to 12 years old with 33% being 11 years old. English was the students' primary language. More than half of the participant population had a diagnosed disability. Students with disabilities included those identified with autism (8%), attention deficit hyperactivity disorder (ADHD; 13%), a dual diagnosis (ADHD and a learning disability, 8%), an intellectual disability (4%), and a learning disability (25%). See *Tables 1* through *3* for participant characteristics.

Table 1
Student Demographic Information

	n	%
Race and ethnicity		
African American	3	6
American Indian/Alaska Native	2	4
Asian	4	8
Hispanic/Latino	6	13
White	33	69
Gender		
Female	22	46
Male	26	54
Age		
10 years	14	29
11 years	33	69
12 years	1	2

Note. N = 48.

A call went out for participants at multiple conferences where the authors presented. During conference presentations on the VOISS application, the authors recruited participants by sharing information on the need for schools, educators, and students. Recruitment information was embedded in the slide presentations and also shared as handouts during the conference presentation. For example, parents were notified that their child would be randomly selected for one of the research groups, the instruments that would be used with their child for data collection, and the overall purpose of the study. These efforts garnered 10 schools and 285 middle school students who were initially identified. Educators were e-mailed consent forms. Student participants' inclusionary criteria consisted of being 1) middle school age (i.e., age 10 to 15), 2) able to participate in a technology-based intervention, 3) identified by a qualified educator as being in need of a social skill intervention determined by a valid and reliable assessment measure (e.g., Clinical Assessment of Pragmatics, Test of Pragmatic Language), 4) able to complete questions on their perceptions, 5) willing to participate for the duration of the study, 6) educated by an educator willing to oversee technology use, 7) educated by an educator willing to complete rating scales, and 8) able to communicate preferences after participating in the VOISS intervention (i.e., English speaking with a minimum third-grade reading level). Eligibility for special education (SE) services was not a prerequisite for participation though it was documented.

Of the 285 middle school students who were originally identified, 152 students met the study inclusionary criteria, and their parents were provided the consent and assent information. Once students were identified, a parent packet was sent via e-mail (as a pdf packet) and sent home as a paper copy via their child. The documents included step-by-step procedures of the proposed study, information about elements of the intervention, and a frequently asked question guide resource to ensure parent understanding of the proposed study. Overall, the consent and assent forms for students and their guardians explained the scope of the research, the agreement to participate, the research question, and study procedures. From the group of 152 students, 120 students and their parents agreed to participate in the study. All student participants were provided with a technology-delivered communication intervention. However, interviews were only given to students until saturation was achieved, which resulted in 48 students being interviewed.

Student participants were ages 10 to 12 years old (M = 11), the Clinical Evaluation of Language Fundamentals-5 Pragmatic Profile (CELF-5 PP; Wiig et al., 2013) language rating scale was given to each student's teacher to complete to identify strengths and weaknesses as a basis for intervention recommendations in expressive, receptive, and pragmatic communication. The CELF-5 PP has sensitivity and specificity above .9. Test–retest reliability scores for index and composite scores ranged from .83 to .90, and it met our following qualifying criteria: 1) valid and reliable research supporting use, 2) evidence of the applicability for students of varying groups (i.e., ethnicity, disability), 3) implemented over time with middle school students, 4) evaluated in more than four peer-reviewed journals, and 5) well-established norms (Wiig et al., 2013). The CELF-5 PP is an individually administered, norm-referenced measure composed of several tests (e.g., sentence comprehension, word structure, pragmatic profile). Each test can be administered as an independent test (Wiig et al., 2013). The pragmatic profile was chosen due to its ability to accurately measure application of each of the targeted communication skills within the technology-delivered intervention. The CELF-5 PP was given the day before

Figure 1
Screen Shots of the VOISS Intervention

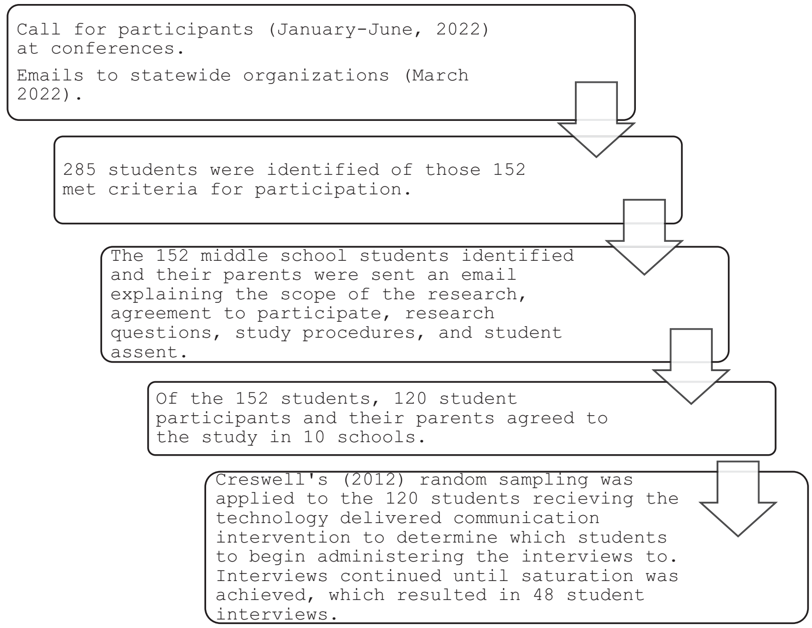
training for the intervention began (which is approximately one to two weeks prior to the intervention start). Student participants' mean pragmatic language delays fell in the moderate low (below average) range by educators (M = 76.2, SD = 34.1) and students (M = 74.5, SD = 28.59), indicating a clinically significant need for instruction in reciprocal social behavior to ensure appropriate daily social interactions.

Adult participants included three SE teachers, six classroom teachers, and one school counselor. The educators' ages ranged from 35 to 70 years old (M = 53), and their years in education ranged from 4 to 43 years (M = 20). All 10 educators were familiar with the technology students were using to view VR scenarios.

Use of VOISS

VOISS was developed by experts in SE and the social and emotional instructional field (Mosher et al., 2022). In VOISS, participants are presented with social skill scenarios in which they interact with same-age peer avatars and adults observing and taking part in problem-solving through authentic social situations. VOISS scenarios take place in numerous school environments including (a) the classroom, (b) playground, (c) bus, (d) hallway, (e) cafeteria, (f) gymnasium, (g) library, (h) office, (i) field trips, and (j) neighborhood streets. A student is provided with both direct social skill instruction with assessment and natural consequences as well as reteaching and observational learning within this personalized learning environment. Participants are presented with social situations in which they must either select a correct multiple-choice response, orally respond to a request, or move based on the directives provided. For example, a participant may be presented with a friend who wants to exclude another student from joining their game. The participant must then interact and determine how to

Figure 2
Summary of Recruitment Process



respond and react in the specific situation. The program provides direct instruction on the upcoming skill, choice selection on what the participant could do, natural consequences of that choice, and then feedback and suggestions to help the participant navigate the social situation (Carreon et al., 2022). *Figure 1* offers illustrations of selected VOISS scenarios.

Participants navigate the scenarios by touching a screen or mouse or using a head-mounted display or hand controller. Each scenario varies in length and contains a variety of multiple-choice, oral, and directive participation. In the event of a wrong selection or response, a natural consequence is provided, and the narrator explains why the response was unexpected. The participant receives reteaching and can select a new response.

All scenarios and skills within VOISS were developed by experts in the SE field and checked by experts in SE skill acquisition for fidelity and reliability (Carreon et al., 2022). Further, the scenarios were written by teachers in the field of SE across the United States. The scenarios were then checked for reliability and fidelity by professors from various institutions of SE across the country in the field of SE (Mosher et al., 2022). Finally, current research attests to the effectiveness of this personalized learning experience to improve students with disabilities' knowledge, skills, and ability to generalize social skills in the classroom setting (Zhang et al., 2022).

Procedures

Research was conducted in two phases. Although not the focus of this report, the first phase focused on the use of VOISS as a social skill curriculum and compared student social skill knowledge and skill with another social skill intervention to determine the social validity of each intervention (Mosher et al., 2024). The second phase, which is the focus of this report, was a qualitative study in which a group of participants were interviewed about VOISS as a VR-based tool and what areas of improvement might innovative tools (e.g., AI tools) offer the VR-based personalized learning experience. In phase 2, a total of 48 students were interviewed to provide comments on the VR scenarios and how innovative technology (e.g., AI) may improve each scenario. *Figure 2* provides a summary of the recruitment process utilized for both phases of research. *Table 1* provides the student demographics of all participants.

All phases of research included students attending school in private, public, and charter schools (see *Table 2*). All educators in the 10 schools

Table 2
School Demographic Information

Characteristic	*n*	%
Location		
Rural	3	30
Suburban	4	40
Urban	3	30
State		
Kansas	2	20
New Mexico	1	10
Virginia	4	40
North Carolina	3	30
Type of School		
Public	5	50
Charter	1	10
Private	4	40

Note. $N = 10$.

Table 3
Participant Eligibility and School Plan

Reported disability	*n*	%
Attention deficit hyperactivity disorder (ADHD)	6	13
Autism level 1	3	6
Autism level 2	1	2
ADHD & learning disability	4	8
Intellectual disability	2	4
Learning disability	12	25
At-risk with no diagnosed disability	20	42

Note. $N = 48$.

reported adequate access to technology and broadband internet in their classrooms. All student participants reported extensive (i.e., three or more years) experience utilizing the technology delivering the intervention (i.e., Chromebook, iPad) in their classrooms.

All student participants were identified as being in need of a pragmatic language intervention by their school's identification process and were receiving intervention instruction in this area. Thirty-eight percent of student participants were on formalized plans for their social, emotional, communication, or behavioral needs. Participants' mean pragmatic language delays fell in the moderate-to-low (below average) range as measured by the CELF-5 PP ratings by educators ($M = 76.2$, $SD = 34.1$) and students ($M = 74.5$, $SD = 28.59$), indicating "deficiencies in reciprocal social behavior that are clinically significant and lead to substantial interference with everyday social interactions" (Constantino, 2012). *Table 3* provides the reported disability category for participants as well as documented support plans.

Researchers conducting the study had experience utilizing AI and VR and have completed research on AI within education. The researchers conducting the interview had a doctorate (Ph.D.) in SE. This expertise provided a solid foundation for establishing the themes necessary for systematically analyzing the data. To safeguard against the bias of a sole interviewer for data collection, two coders observed randomly selected sessions to ensure fidelity of implementation coding for a minimum of 34% of sessions for reliability purposes. Two trained coders also thematically coded all qualitative questions responses with a third coder coding 35% of the student responses to ensure agreement by coders of themes.

All 48 student participants in phase 2 were asked an interview question and responded both in words and in writing, utilizing a Chromebook and paper and pencil to answer questions in writing with their educator serving as scribe when needed. Written responses were then compared with verbal responses to ensure agreement. Each participant responded to the following questions about each one of the 26 scenarios in the expressive communication domain: 1) What did you like about the scenario? 2) What would you like to change in the scenario? 3) How could innovative technology, such as artificial intelligence, improve this scenario? Participants, during the semistructured interview, were able to explain their written responses, but no prompting was provided if they did not choose to do so. Within-case and cross-case analyses occurred. During the within-case analysis, a list of themes was developed in addition to those determined from the literature base (visuals, auditory, content, responding, and environment utilized) based on student responses to the questions. These themes added the theme of timing, which, in the interviews, was related to

Table 4
Number of Students Recommending Changes Across Scenarios per Theme

Theme	Students recommending changes	Scenarios referenced per theme
Changes to response options	29	25
Changes to content	28	26
Changes to environment or characters	21	21
Changes to visuals or graphics	19	18
Changes to auditory	17	16

content; movement, which was related to characters and environment; and response options, which was related to responding. After the cross-case analysis, additional codes were merged with the initial list of themes and coding began on the following list of themes: visuals, auditory, response options, movement of characters and feel of the environment, and content and timing.

Study Procedures

Interviews were semistructured to allow researchers an opportunity to clarify responses if needed (Merriam, 2009). However, no prompting was provided if participants chose not to go beyond answering the question posed. The researchers examined the interview protocols used to clarify any answers provided by the three questions that remained unclear or utilized vocabulary unfamiliar to the age group of the researchers. Each interview clarification question provided participants with an opportunity to explain their written response further, clarifying any details and adding additional information, which allowed participants to clarify misconceptions or add additional information for understanding (Patton, 2002).

Data Analysis

This study utilized the following steps to acquire and analyze the qualitative data (Chiu & Chai, 2020):

1) Process for examining data: The research team, which includes authors two and three, and a research assistant familiar with qualitative data and VR used prior literature to generate the initial codes. Authors two and three annotated the data using thematic codes.
2) Reviewing themes: A cycle process was enlisted to determine if any themes should be further split or grouped together.
3) Naming themes: The research team defined each theme to provide a precise and meaningful definition for use.
4) Clarifying themes: All student data was analyzed to ensure the content provided fit the thematic areas.

Interviews lasted approximately 5 to 15 minutes per participant depending on the participants' desire to continue to share information about their written responses. Interviews were taped and transcribed using Zoom software and deleted after transcription to ensure participant privacy was maintained. A total of 48 interviews, one for each participant, occurred over three months with each interview occurring within the week the participant completed the intervention. Interviews were recorded, transcribed, thematically coded, and analyzed. After each interview, participants were provided a copy of their transcripts to review and ensure internal validity (e.g., that the researcher had not misinterpreted a participant's response) (Marshall & Rossman, 2011). Interview credibility was maintained through multiple coders throughout the interview process and data triangulation (Rossman & Rallis, 2016). Confirmability was achieved through cross-referencing participant's written responses with the interview transcripts (Given, 2008).

Results

Results indicated that students had clear preferences on how to improve this technology. Students recommended changes to the VR environment across five main themes, including content, response options, feel of environment or movement of characters, visuals or graphics, and auditory. *Table 4* shows the five themes, the number of students who commented on that theme, and the number of scenarios in which that theme was referenced. Themes are described in the order of frequency of reference by students. Changes to response options was the most frequently mentioned theme, whereas auditory changes was the least.

Change Response Options

Of the 48 students who made recommendations for this study, 29 or 60% suggested the need for changes to be made to 25 different scenarios. Students recommended changes to response options because they either did not find the response they wanted to make in the options given to them or they did not like how the system permitted them to respond. Student feedback about response options included, "I didn't like that it only gave one good answer so it was too easy," "I would have said something related to the subject then say 'nice talking to you guys,'" "I would have been mean back," and "I think it should have more choices." Students who requested a different way of responding said, "I would change me only getting to speak once," "I would have stopped them forcefully," or "I don't like that they don't know if we fully understand what to say."

Change Content

Twenty-eight or 58% of students recommended changes to the scenario content across 100% of the scenarios. Students recommended changes to what was said or done and for what length of time. Students wanting changes to activity in the scenarios said, "I think I would've had a little more things for us to learn about," "I would change the way Elena thinks," "I wish that they were talking about baseball [instead of basketball]," and "I would have Felix say sorry in the end." Students who referenced scenario length felt they were either too long, too short, or ended sooner or later than they preferred. Examples of student comments included "It went on longer than I expected," "I don't like how it was short. I would like to make it longer," and "I don't like how the conversation ended so fast."

Change Environment or Characters

Twenty-one or 44% of students recommended changes to the environment across 21 scenarios. Students recommended changes when character movements did not seem natural, interactions felt awkward, or the environment did not appear as they thought it should. Recommendations around unnatural movements included "People are acting like robots," "The teacher looks like a zombie," "Make the mouth move the exact same time they are talking," and "I don't like how they kept doing the same motion over and over again. I would change so they can do more motion." Recommendations for decreasing awkward interactions included "Make it so that the teacher picks one [student] faster," "I didn't like how they can't blink. I would change where they can blink. I would change so they can look other ways;" and "I don't like how people just walk into the conversation. I would change where people don't jump in right away." Students recommended changes to the environment, including "Before the scenario starts, everything is empty and then people appear and it is kinda creepy," "I liked how there was movement in the background but there wasn't anyone standing in the hallway talking so it doesn't make sense why they said the hallway was noisy," "I would have added more people," "I didn't like the lunch tables," and "I would have added food for my plate."

Change Visuals or Graphics

Nineteen or 40% of students referenced the need to change visuals or graphics across 18 different scenarios. Comments were focused primarily on image quality (e.g., blurry or fuzzy), avatar facial expressions (especially their eyes), and if students were bothered by how objects used in the game behaved differently than expected. For instance, students who did not like blurry graphics said, "The poster was blurry and hard to read" and "I wish I could see the words better." Facial expressions and features were mentioned as concerning by multiple students. Students said, "The teacher's smile is creepy," "They need a more realistic mouth," and "I don't like how they are 'staring' into my soul." Other graphics mentioned included inanimate objects, how people were situated, and overall realism. Students said, "The fries looked flat," "I think you should add hands to me when he/she received the ball," and "Change the graphics to look more real."

Change Auditory

Seventeen or 35% of students recommended audio changes for 16 different scenarios. Students said the audio was too loud, too quiet, or not realistic enough. Statements about audio being too soft or too loud included "I can't hear the kid or teacher talk, it's too soft" and "I didn't like how I couldn't hear the teacher's questions and I had to redo it." Statements about audio related to realism included "Add a bit of a background noise so there's more of a reason why she can't hear you," "I disliked the voice," "I would change how the girl was saying hello," and "I don't think the students should wait so long to talk."

Discussion

The findings in this study offer suggestions in how district and building leaders can further consider the future application of AI tools in their schools and districts. Whereas this study focused on VR to further support the social skill development of students with disabilities, findings can also be expanded to broader innovative applications, specifically AI, across student learning (e.g., how students respond). Findings were based on students with disabilities' engagement in social skill development through a personalized VR learning environment structured across a series of social skill scenarios. Five unique themes emerged that align with aspects of personalized learning and, in turn, can be further complemented through the integration of AI tools. The connecting themes of visuals, audio, response options, character realism, and length to further contextualization offer an array of opportunities for AI tool supports discussed in detail as follows.

Student Response

In this study, student response reflected the various response options available for students to use within a personalized VR-based learning environment. Flexible response options offer students choice in their ability to demonstrate their understanding and mastery in knowledge and skills within a subject/content area (Lewis et al., 2017). Within the VR-based simulation, participants shared challenges with two primary considerations. The first was that, although options were offered, the choices were limited and did not represent the way they were processing the social situation introduced within the learning scenario. Thus, the options did not allow the student to answer in the manner in which the student believed was appropriate. Instead, participants felt they were limited in their options and what they could truly answer. Next, participants felt the user interface for choice selection did not permit them to respond in a naturalistic or realistic manner. Part of this was language, what they would have liked to say, and what responses were actually offered. Another was due to the limited options in a multiple-choice structure. Here, learners were limited with the options of either reading or hearing the choice instead of having the added option of verbally responding to the avatar or the scenario. Thus, users could only respond by selecting (through a click of the mouse or touch of the device screen) the answers A, B, C, or D or 1, 2, 3, or 4. Participants were quite direct on the limitations of choices. More importantly, participants were direct on how the interface limited their ability to respond in the vocabulary and in the personal manner to which they aligned themselves as learners and as individuals within the social situation. Thus, whereas the personalized VR-based learning experience offered multiple pathways, provided direct and immediate feedback to choices participants made, shared the correct and incorrect response, was supported by just-in-time feedback from a virtual social coach, and included similar essential elements of personalized learning, students required more (Zhang et al., 2020, 2022).

Participants in this study wanted to respond to the VR-based learning scenarios. They were engaged and shared limitations within the personalized learning environment. Building leaders and classroom educators should take note that, whereas students wanted to respond (e.g., motivated, engaged in their learning), the limited digital options frustrated and often prevented them from demonstrating their knowledge and skills within a specific social situation. Students with disabilities, particularly in the area of social skill deficits, believed they were gaining knowledge and skills during the digital learning experience and yet felt hampered or limited in their ability to respond and share what they would do and felt capable in demonstrating. Fortunately, AI tools are beginning to illustrate a capacity to offer dynamic, interactive, realistic, and overall adaptive ways for students to respond to personalized learning. For VR learning, AI tools are adding to the level of immersion regardless of learning platform (e.g., ChromeBook, Oculus headset) by offering realistic and responsive, hands-on experience without real-life restraints (Carreon et al., 2024). Natural language processing (NLP) of language learning offers conversational practice providing instant feedback to what and how a student says something. For example, in the social skill scenarios within this study, NLP tools and features offers students the ability to verbally respond (e.g., their vocabulary, their language) with AI tools learning and then

Table 5
AI Tools Aligned With the Five Themes for Consideration

Theme	AI potential	Tool	Link	Explanation of tool
Visuals or graphics	Traditional graphics can be enhanced through AI Text can be entered to create specific scenarios and other AIs can smooth movements created.	Sync Labs	https://synclabs.so/	Synchronizes lip movement with multilingual audio
		Sora	https://openai.com/sora	Creates video from text
Auditory	Voices can be manipulated to whatever output is wanted by the user. This can also contribute to varying levels of text-to-speech and speech-to-speech. This allows participants to interact with different voices and responses.	FineShare	https://www.fineshare.com	Change voices with word level precision to sound like famous characters, change the style or tone, and add emotion with studio quality audio
		The Meta Voice	https://themetavoice.xyz	Offers text-to-speech and speech-to-speech to create custom, human-like, and expressive speech
Change response options	Large language models allow for more realistic conversations with the avatar within the scenarios. Voices can also be manipulated for certain audio and visual prompts.	Mesl AI	https://meslai.app/	Conversational bot that responds to audio prompts with voice.
		Colossyan	https://www.colossyan.com/avatars-conversation	Avatars trained on scenarios for realistic conversations
Change movement of characters and feel of environment	Generate video to look more realistic. This allows more control over visuals, audio, and facial expressions.	EMO: Emote Portrait Alive	https://humanaigc.github.io/emote-portrait-alive/	Create vocal video avatars with facial expressions from images and audio
		LTX Studio	ltx.studio	Generate video scenes in 3D
Content	Pairing traditional GPT (e.g., ChatGPT, Perplexity, Gemini) with AI video generator has the potential to create scenarios in VR with varying degrees of information and difficulty.	Gemini	https://gemini.google	Large language model, can generate text, translate languages, write different kinds of creative content and varying levels
		Eleven Labs	https://elevenlabs.io/	Text-to-speech and speech-to-speech with the ability to customize voices and change specific fragments

further interact with the user for a more realistic and interactive language learning experience. Currently, these tools (see *Table 5* for further examples) offer avatars or bots that provide instant feedback on things such as student pronunciation, grammar, and vocabulary.

Content

Content, in this study, represented the social skill curriculum embedded within each of the 26 scenarios. The scenarios, or the content, was developed to present learners a pathway from which the user was required to make decisions, answer questions, and navigate through the content. Varied learning pathways are essential, and participants in this study reinforced that need. A foundational aspect of personalized learning is a customized learning path allowing learners to work at their own pace with embedded adaptions to offer just-in-time supports when needed (Hyslop & Mead, 2015). This is often based off a digital learning profile created as the student enters the customized learning environment that is then used to designing learning activities and pathways that correspond to the learning needs of the student (Lewis et al., 2017). Likewise, the competency-based nature of personalized learning curriculum is meant to design instruction that will allow for student mastery of the subject matter versus the amount of time a learner does X or Y (Zhang et al., 2020). Participants in this study echoed elements of what personalized learning should contain based on their individualized pathways, including the depth of the learning opportunities, embedded responses on the part of the avatar (e.g., student, teacher), and the type and focus of the examples (e.g., aligned with participant interest) provided (Zhang et al., 2022).

Participant recommendations offer a list of suggestion for building leaders and educators to further consider when identifying effective personalized learning experiences, particularly in the unique area of social skill development. A primary consideration was alterations in the content including both depth, additional time for further learning, and instruction that aligned with their interests and needs. The advancement in the capacity of AI tools is offering solutions to these requests. For example, predictive analytics are an essential element of AI, allowing the learning system to not only predict where the user is struggling, but to proactively adjust the learning environment and materials while embedding additional supports before the user becomes frustrated and subsequently disengaged (Liu, Saleh, & Huang, 2022). AI-driven interaction models can also stimulate additional physical interactions with the learning environment, particularly when combined with VR-based learning (Carreon et al., 2024). This allows for the personalized learning system to be further responsive to how the learner interacts with and engages in the curriculum.

Environment or Characters

Environments or characters, in this study, represented the various school-based environments (e.g., classroom, hallway, cafeteria) and avatars (i.e., educators, students) available within this VR-based personalized learning experience. Realism of the personalized VR-based environment was deemed essential for all participants. Whereas they expressed an understanding, they were part of a classroom, walking through a hallway, or eating lunch at a cafeteria, and all participants shared a need for additional realism within simulated learning. Previous research highlights the benefits of naturalistic settings within personalized, simulated, and game-based learning environments (Rice & Dunn, 2023). Realistic environments foster a deeper connection to the material, positively impacts student engagement, and can assist in not only developing knowledge and skills, but can foster generalization of lessons learned in the virtual environment to the real-world (Martin et al., 2024). Furthermore, as participants shared, a realistic virtual or simulated learning environment can increase self-directed learning (Zhang et al., 2022). They often take further responsibility, recognize the purpose of the goal of the learning experience, manage their time within the personalized learning setting, and seek out resources (e.g., realistic avatars) that will foster their understanding, level of engagement, and overall independence and self-direction when part of this learning experience (Montoya-Rodríguez et al., 2022).

Participants were overwhelming displeased with the level of realism across the virtual environment. However, AI tools are increasingly offering solutions that increase the level of realism. Building leaders and classroom teachers need to continue to explore these AI-based options that can lead to students' ability to generalize learning knowledge and skills back to the real-world setting and all of its associated demands. For example, AI can create highly detailed and dynamic learning environments (e.g., classroom, student characters, teacher avatars), including school environments, that can adapt to the user's actions (e.g., student responses, choices they make in the virtual world), which, in turn, provides a more immersive learning experience.

Participants also noted the need to further improve realistic aspects of the avatars embedded within the various VR-based scenarios. Through the use of AI-based tools, avatars/characters can be designed to respond to a student's action and, in turn, alter the learning experience or the learning pathway, requiring students to adapt their thinking and their overall approach within the virtual learning experience. For example, AI tools can evolve based on a students' decisions, creating an alternative learning experience that is more personalized to how they're responding to their needs. As the participants shared in this study, environments and the characters associated with these environments are essential to their level of engagement but, more importantly, to learning outcomes associated with these personalized learning experiences. *Table 5* offers additional examples of AI tools that are adding to the naturalistic opportunities for individuals within the personalized learning environment.

Visuals

Participants in this study communicated an understanding that the virtual world represented a school setting and included the various aspects of what would be part of their real world. Building leaders and educators should be reinforced that simulated environments, such as VR, offer the personalized learning experience additional outlets for students to gain knowledge and skills, practice, and additional instructional opportunities to then generalize into the real world. However, this opportunity comes with an increased expectation on the part of the user that the virtual/simulated world is realistic. Again, AI tools are responding to this need with a more responsive learning environment. Multiple AI tools (including the sample offered in *Table 5*) are being developed that offer users' photorealistic images, 3D models and environments, animations to improve realism, visual effects, and a host of features to further personalize content creation. For example, AI tools can assist in generating detailed 3D environments for VR and general simulations that reduce development time and effort while offering increasingly varied and realistic rendering of classrooms, individuals/avatars, and the various elements required for simulating a real school environment. AI animations are making it easier and, in many cases, more economical, to animate characters (e.g., student avatars) and objects (e.g., French fries) to create realistic movements (e.g., eye movement, walking) and representation. Currently, these tools (see *Table 5* for further examples) can create complex visual effects that simulate natural phenomena in a virtual environment (e.g., student movement in the hallway) while also generating dynamic and realistic backgrounds.

Auditory

Sound and what the sound sought to represent within the personalized learning experience was essential to students' sense of realism and their overall satisfaction with the VR-based learning. Auditory output is essential to students with disability learning (Lewis et al., 2017). Research has found that effective auditory supports improve comprehension, increase learner independence, further personalize the pace of learning (e.g., students control to match their pace of learning), and improve overall student focus and subsequent engagement (Zhang et al., 2020). Participants in this study were critical of the sound quality (e.g., volume) and sought more realistic sounds (e.g., background noise that represented a school setting). Furthermore, students requested choice in avatar voices and controlling when and how they responded. They would have liked to change the voice, increase or decrease volume, and overall have the ability to further manipulate the auditory options presented in the personalized learning experience. Their perspective further aligned with what previous research has echoed but extended via students with disabilities' personal perspective.

The auditory needs of the participants are an additional area of which building leaders and classroom educators need to be aware and further process. This is particularly relevant for social skill learning in which one's speech, tone, volume, and similar attributes are essential in learning as well as applying in the real world. AI tools are advancing what is possible, particularly in the area of voice interactions. These AI interactions can provide emotional nuances and further emotional connections and support emotional expressiveness. Expanding this emotional interaction offers a more personal connection and expands student engagement. Likewise, AI tools that are responsive to voice interactions can play a significant role in language learning, for instance, by extending conversational practice in a natural learning environment that is realistic and yet virtual or simulated for students with disabilities. This voice-enabled interface allows users to communicate with AI systems embedded within personalized learning environments as if they were talking to another peer or teacher making the sound and auditory more relevant and also more accessible regardless of the limitations of the traditional input device the student may be using.

Implications for Practice

The findings from this study emphasize the importance and the potential of AI tools to extend, further support, and engage learners with disabilities in the growing area of personalized learning. As building leaders and associated educators are increasingly looking to alternative ways to address learning loss and similar demands facing today's classroom, students with disabilities are sharing how and when innovations via AI tools can improve their learning. Personalized learning provides the opportunity for self-paced, individualized instruction aligned to the specific needs of students and yet requires a level of independence and embedded supports to promote student engagement if it is to improve learner outcomes. Educational leaders and classroom practitioners need to be purposeful in where to invest time and resources in integrating the increasing application and availability of AI tools.

SE leaders and collaborative educators should consider ways to further engage students with disabilities in determining ways to improve personalized learning experiences, particularly through the application of AI tools. Student perspectives based on effective elements of personalized learning may lead to further identification of where to innovate via the application of AI tools to improve the delivery of individualized instruction and learning opportunities for students with disabilities.

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Recommendations for Future Research

This study included a small sample of students with disabilities engaged in a limited set of personalized learning scenarios. The participant pool could be expanded through the inclusion of individuals with disabilities representative across the many categories served in our preK–12 learning environment as well as expanding student diversity through the inclusion of diverse racial, gender, socioeconomic elements, etc. Future research is also needed across the following distinct areas. The first area to consider is the inclusion of varied personalized learning platforms (e.g., learning management systems) that extend beyond virtual or simulated learning environments. A second consideration would be research that includes the addition of specific AI tools and subsequent student use to determine their perspective and the impact of such tools on the five themes associated with this research. With the addition of AI tools, future research should measure the impact of these additions on student use, perspective on learning, and associated student outcomes. Third, the addition of AI tools associated with the essential elements of personalized learning (e.g., self-pace, data-driven decisions) would be helpful to understand.

Final Thoughts

Study findings show that asking students with disabilities their perspective on ways to improve personalized learning through the use of a virtual or simulated learning platform can identify the need for and use of growing AI tool innovations. Accordingly, SE administrators and their classroom colleagues have an opportunity to further determine ways to utilize AI tools and further invest time and resources to improve personalized learning. This is especially helpful in an environment that is expressing caution in the use of AI tools while simultaneously looking for innovative ways to address the growing demands of the learning needs of students with disabilities. Study findings offer suggestions for AI tool application while reinforcing the advantages of utilizing student perspective in future decision making.

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