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Assistive Technology in Kyrgyz Education: Teachers' Knowledge and Perceptions

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The importance of providing equal access to education for students with disabilities within an inclusive education system was highlighted by the Cabinet of Ministers of the Kyrgyz Republic in the 2023 "Accessible Country" state program. Recent literature has supported the significant role of assistive technology (AT) in meeting the needs of students with disabilities within an inclusive setting. However, this indicates a necessity for teachers to be knowledgeable and skilled in using AT. In order to meet the goals of the Accessible Country program, the current study aimed to explore teachers' AT knowledge and skills, their perspectives toward AT use, and their perceptions of AT in K-12 settings. Data were collected from 262 teachers via survey. The results indicated that the schools had more low-tech AT and less mid-tech or high-tech AT, and that teachers had an awareness of the benefits and importance of ATs in education. However, the teachers have limited AT knowledge and skills, in addition to their pedagogical knowledge of AT integration in the special education context. Also, the teachers held a neutral perspective about the use of AT in special education. The teachers reported AT training needs, lack of available time, lack of support, lack of motivation, low teacher salaries, and lack of resources as barriers to the use of AT in the Kyrgyz education system.

Introduction

According to data from the National Statistics Committee of the Kyrgyz Republic (2023), there were more than 200,000 people in Kyrgyzstan with some form of disability, which accounts for 3% of the national population. However, this information is likely an underestimate since the data only includes those who have undergone an assessment for a disability, and typically that applies only to individuals with the most severe disabilities. The number of those aged 18 years old or less with a disability total about 35,000, which is representative of 17.5% of the total population of Kyrgyzstan with a disability and 1.5% of the total number of children in the country. Since 2016, the number of children in Kyrgyzstan

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with some form of disability has increased by 11.3%. In 2023, the Cabinet of Ministers of the Kyrgyz Republic approved a state program named "Accessible Country" that aimed to provide equal access to education, healthcare, and work to all people in Kyrgyzstan with a disability. The Cabinet stressed there being "a need to create a more inclusive, more effective and equitable education system that takes into account the needs of children with disabilities" (Kyrgyz Republic Cabinet of Ministers, 2023, p. 20). A situational analysis of children and adolescents with disabilities within the Kyrgyz Republic showed that having a disability was not seen as a reason for a child not receiving an education. However, negative attitudes of professionals toward children with disabilities, and lack of necessary conditions were the most cited reasons (UNICEF, 2021).

Recent literature has stressed the significant role of assistive technology (AT) in providing equal access to education and meeting the needs of students with disabilities (SWDs) (Başer & Arslan-Ari, 2023; Bouck, Maeda, & Flanagan, 2012; Irwin, Arslan-Ari, & Morris, 2023). AT is defined as any product, equipment, or system that "help[s] maintain or improve an individual's functioning related to cognition, communication, hearing, mobility, self-care, and vision, thus enabling their health, well-being, inclusion and participation" (World Health Organization, 2024). AT improves the educational experiences of SWDs in both academic and extracurricular activities within an inclusive education environment (Park, Bagwell, Bryant, & Bryant, 2022). However, the effective implementation of AT within educational settings can be significantly influenced by the teachers' AT knowledge and skills, as well as their perspective regarding the use of AT (Park et al., 2022) and any misconceptions they may hold about the effectiveness of AT (Atanga, Jones, Krueger, & Lu, 2020; Kundu, Bej, & Dey, 2020; Parette & Scherer, 2004). The majority of the published research has explored the perceptions of teachers in developed countries such as the United States, Canada, and the United Kingdom, with only a few research studies having focused on developing countries in Asia. The current study aimed to address this gap in the literature by examining teachers' AT knowledge and skills, and their perceptions regarding the use of AT in a developing country located in Central Asia. The following questions guided this study:

- What perceptions do teachers hold about their own AT knowledge and skills?
- What perceptions do teachers hold about the use of AT within special education?

Background

The integration of technology into education is inevitable amidst the demands of 21st century skills. As technology has become more readily available in today's classrooms, a parallel focus emerges on the utilization of AT to support the diverse needs of learners, particularly with the growing inclusion of SWDs in the general education settings (Chambers, 2020; Fernández-Batanero, Montenegro-Rueda, Fernández-Cerero, & García-Martínez, 2022; Zilz & Pang, 2021). This increased demand makes AT an essential tool in enabling SWDs to participate more actively within inclusive environments (Chambers, 2020; O'Sullivan, McGrane, Long, Marshall, & MacLachlan, 2023; Satsangi, Miller, & Savage, 2019) and in providing equal access to curricula as their peers without disabilities (Floyd, Galyon, & Floyd-Norris, 2020; Satsangi et al., 2019). Park et al. (2022) highlighted that the use of AT in special education can "enhance the quality of education for these students in both curricular and non-curricular activities in inclusive settings" (p. 1). Liman, Adebisi, Jerry, and Adewale (2015) also stated that "the place of assistive technology devices in inclusive education can never be underestimated" (p. 31), since it helps SWDs to be more independent and confident, which stresses the importance of AT within inclusive classrooms. Therefore, the use of AT is

of critical importance to enhancing educational curricula and instruction, as well as facilitating improvements in SWDs' social development and communication, thereby promoting inclusion in the classroom (Chambers, 2020).

Types of AT

ATs can be divided into three categories; (a) no-tech or low-tech ATs, (b) mid-tech ATs, and (c) high-tech ATs (Chambers, 2020; Dell, Newton, & Petroff, 2017). No or low-tech ATs generally do not require batteries or electricity, making them easily accessible without need for extensive training. They are frequently used in daily life due to their low-cost features. Pencil grips, raised line paper, graphic organizers, and clipboards are examples of no or low-tech ATs. Mid-tech ATs are technologies that have electrical components and require either a battery or regular charging and are generally easily accessible at an affordable cost. Examples of mid-tech ATs include basic calculators, screen magnifiers, audiobooks, visual timers, reading pens, adapted keyboards, and communication boards. High-tech ATs are technologies that are often computer-based and require some form of training, as well as time and effort in order to learn how to use them efficiently. High-tech ATs are therefore more costly, and as such less easily accessible. Text-to-speech software, word production software, virtual reality, and eye-tracking systems are some examples of high-tech ATs.

In general, low-tech ATs are more frequently used than high-tech devices because of their availability, ease of use, and low cost both to purchase and operate (Alshehri, 2023; Flanagan, Bouck, & Richardson, 2013). Although teachers appreciated the benefits of high-tech ATs, they may not always utilize them in the classroom due to a lack of high-tech in some schools, a lack of awareness of the existence of appropriate high-tech ATs, or a lack of knowledge and skills to use them (Chukwuemeka & Samaila, 2020).

Benefits of AT

The widespread use of AT in special education has attracted the attention of the researchers and their effectiveness has been widely explored in the literature. Recently published experimental studies have provided evidence-based data on the benefits of AT in special education. These studies have demonstrated that the variety of ATs (e.g., smart pens, speech-to-text software, and computer-assisted instruction, etc.) have improved SWDs' mathematical skills (Ok, Bryant, & Bryant, 2020), reading levels (McKenzie & Arslan-Ari, , 2024), reading fluency (Ronimus, Eklund, Pesu, & Lyytinen, 2019), writing skills (Ok, Rao, Pennington, & Ulloa, 2022), and notetaking skills (Joyce & Boyle, 2020). Additionally, ATs have reported to promote SWDs' motivation for schoolwork (Svensson et al., 2021). In a systematic review conducted by Fernández-Batanero et al. (2022), the use of ATs had a significant impact in terms of increasing the inclusion of SWDs in education, as well as reducing if not eliminating their individual functional limitations.

Teachers' Perceptions of AT use in Special Education

Qualitative research has provided the teachers' experiences and observations related to the use of AT in education. Benefits of AT usage reported by teachers include empowering students to advocate for themselves (Perelmutter, McGregor, & Gordon, 2017), increasing students' school motivation (Alshehri, 2023; Arslan-Ari & Başer, , 2022), making learning more fun and permanent (Çay, Yıkmış, & Sola Özgüç, 2020), enabling SWDs to be competitive with their peers (Irwin et al., 2023), fostering SWDs' independent engagement in academic tasks (McKenzie & Arslan-Ari, 2024; Nordström, Nilsson, Gustafson, & Svensson,

2019), increasing attention during lessons (Nelson, Poole, & Muñoz, 2013), accelerating how quickly students acquire information and demonstrate their comprehension (Alshehri, 2023), enabling personalized learning pace (Atanga et al., 2020), assisting SWDs in overcoming emotional and cognitive obstacles (Irwin et al., 2023), enhancing speech and language development (Nelson et al., 2013), and facilitating independent access to instructional materials (McKenzie & Arslan-Ari, 2024). Additionally, teachers have noted that the use of ATs in special education can facilitate ongoing learning, increase students' self-confidence, foster active learning, and assist in the cognitive development of students as well as improving developmental skills such as mathematics, reading, comprehension, writing, language, and eye-hand coordination skills (Arslan-Ari & Başer, 2022). In addition to the benefits of AT for SWDs, teachers have also noted that the use of AT can also be beneficial for themselves; enabling them to make better use of instructional time within the inclusive classroom (McKenzie & Arslan-Ari, 2024).

Although the employment of AT in the classroom has been identified as a high-leverage approach (McLeskey et al., 2017) and serves as a foundation for developing inclusive classrooms where SWDs have access to the same instruction and learning opportunities as their peers without limitations (Fernández-Batanero et al., 2022), teacher do not use AT effectively due to several challenges. In the literature, teachers have reported facing three types of challenges, which are (1) student-related, (2) institutional, and (3) teacher-related challenges.

First, teachers may encounter student-related challenges, such as students' limited AT knowledge or skills (Ahmed, 2018; Arslan-Ari & Başer, 2022; Atanga et al., 2020), students' lack of willingness to use AT (Flanagan et al., 2013), their fear of stigmatization (Lamond, 2023), and limited communication skills (Arslan-Ari & Başer, 2022). Second, teachers may face institutional challenges such as a lack of administrative or technical support (Alshehri, 2023), lack of parental support (Arslan-Ari & Başer, 2022; Chambers, Jones, Reese, & Wilcox, 2022), limitations due to the high cost of some ATs (Vanderpuye & Okai, 2023), lack of available ATs (Alshehri, 2023; Chukwuemeka & Samaila, 2020), lack of necessary funding for ATs (Alshehri, 2023; Atanga, 2020), inadequate evaluation and planning for AT integration (Ahmed, 2018), inadequate infrastructure (Çay et al., 2020), and insufficient time available to plan and implement AT in the classroom (Alshehri, 2023). Lack of ATs and support have been stated as the primary challenges faced by teachers in developing countries (e.g., Alshehri, 2023; Vanderpuye & Okai, 2023). Besides the availability of AT in schools, teachers in developing countries also expressed concerns related to poor classroom infrastructure, with limited or no Internet or computer access, a lack of electrical outlets in classrooms, or just physically small classrooms (e.g., Arslan-Ari & Başer, 2022; Çay et al., 2020). The class size and duration are another factor expressed by the teachers in developing countries (e.g., Alshehri,2023; Kutlu, Schreglmann, & Cinisli, 2018). They explained that they cannot implement AT in the classroom since they also need to teach the curriculum to other students in the same classroom within a limited time period (Alshehri, 2023).

Although ATs may be generally available in schools, teachers often do not utilize them to support the education of SWDs (Chukwuemeka & Samaila, 2020; Njikem, 2022). Teachers have stated that the underuse of ATs may be due to several factors related to themselves, since teacher-related challenges have been the most commonly reported. These factors are teachers' attitudes toward AT (Vanderpuye & Okai, 2023), teachers' perceived usefulness of AT (Lamond & Cunningham, 2020), low computer literacy skills of teachers (Lamond & Cunningham, 2020), teachers' low self-confidence to use AT (Flanagan et al., 2013),

teachers' lack of AT knowledge (Atanga et al., 2020; Saha & Mallya, 2023), and teachers' insufficient knowledge of pedagogical strategies to integrate AT in special education (Albalhareth & Saleem, 2023; Njikem, 2022).

Several research studies have found that teachers possess a positive attitude towards the use of AT, yet they feel a lack of competence in their use (Njikem, 2022; O'Sullivan et al., 2023) as well as the necessary pedagogical skills and competencies required to properly integrate AT into the classroom for SWDs. Atanga et al. (2020) reported that taking an AT course in college and reporting proficiency with the use of technologies were both associated with higher levels of self-reported AT knowledge. Also, insufficient AT training at teacher education colleges can render teachers feeling unprepared to implement AT in the classroom even if they have the interest or inclination to do so (Atanga et al., 2020). The current literature has highlighted inadequate teacher training as the primary root cause behind teachers' lack of AT knowledge (Alshehri, 2023; Atanga et al., 2020; Thomas, Peeples, Kennedy, & Decker, 2019). Teachers have recommended that AT training be provided as a solution to enhancing the effective use of AT in the classroom (Albalhareth & Saleem, 2023; Alshehri, 2023; Atanga et al., 2020). The successful implementation of AT can be hampered by teachers having inadequate AT knowledge or skills, or regarding its integration into educational practices for the education of SWDs (Park et al., 2022; Schaaf, 2018). In this sense, the current study aims to provide much needed analysis to help understand the current situation of AT usage in developing countries in Asia, and teachers' need to integrate AT to better support the education of SWDs within the inclusive classroom.

The majority of published research has been conducted in the United States or in Canada, but developing countries in Asia like Kyrgyzstan has not formed part of the picture in the current literature. Teachers' perceptions and experiences about AT use in such countries need to be voiced in order to ensure the effective implementation of AT in support of equal access for SWDs to education in developing countries. Whilst a few studies have attempted to represent the situation in Asia, these were conducted in Saudi Arabia (e.g., Albalhareth & Saleem, 2023; Alshehri, 2023; Sulaimani & Bagadood, 2023), India (e.g., Saha & Mallya, 2023), and Türkiye (e.g., Arslan-Ari & Başer , 2022; Çay et al., 2020; Kutlu et al., 2018), and therefore not part of Central Asia. The current study is therefore seen as the first research to reflect teachers' current AT knowledge and skills, as well as their perceptions of using AT in the context of a Central Asia as well as that of a developing nation.

Methodology

This descriptive study employed a convergent parallel mixed-methods design, collecting and analyzing both quantitative and qualitative data separately in order to take advantage of the benefits of both research approaches (Creswell, 2014). Then, the two set of results were compared and interpreted together (Creswell, 2014).

Participants

The participants were selected using convenience sampling, a method predicated upon the accessibility and availability of individuals to participate in the study (Creswell, 2014). The participants were 262 inservice teachers (76.34% female, 19.85% male, and 3.81% not disclosed). Of those teachers, 35.91% were aged between 41 and 50 years old, with 29.73% aged 30-40 years old, 17.76% aged less than 30 years old, 9.27% aged 51-60 years old, and 7.33% were more than 60 years old. The majority of participants (57.94%) held a Master's degree, whilst 35.32% had a Bachelor's degree, and 3.97% were doctoral graduates. The

majority of the participants (80.53%) were general education teachers, while 19.76% were special education teachers. Ninety-one percent of the participants were public school teachers. Regarding the participants' teaching experience, 22.04% had 6-10 years, 20% had 1-5 years, 17.14% had more than 20 years, 16.33% had less than 1 year, 14.29% had 11-15 years, and 10.20% had 16-20 years of prior teaching experience.

Data Collection

After obtaining institutional review board approval and participant consent, the participants were asked to complete a self-reported survey including five sections: (a) demographics; b) awareness of available AT; (c) AT knowledge and skills; (d) perceptions of using AT; and (e) open-ended questions regarding the participants' perceptions about the use of AT and in teaching SWDs. A definition of AT and the purpose of the study were provided at the beginning of the survey.

The demographics section consisted of 12 questions about participants' demographic and professional background. The section on the awareness of available AT consisted of three questions adapted and modified from the study by Alkahtani (2013) and asked if the teachers had previously requested an AT evaluation for a student of theirs (assuming their school had AT), and what types of AT were available in their school. The AT knowledge and skills section consisted of 15 questions, with respondents asked to self-rate 11 individual areas of their AT knowledge and skills based on a 4-point Likert-type scale (1=Novice, 2=Basic, 3=Proficient, 4=Expert). Five of these statements were adapted from the study by Başer and Arslan-Ari (2023), whilst four statements were adapted from research published by Alkahtani (2013). The participants' perceptions of using AT were assessed by asking them to rate their level of agreement to seven statements that had been adapted and modified from research by Park et al. (2022) using a 5-point Likert-type scale (1=Strongly disagree to 5=Strongly agree). The final section requested a response to five open-ended questions about the challenges faced by teachers of having SWDs in the classroom; and their thoughts as teachers about their own level of AT knowledge, skills, and confidence; barriers faced to the integration of AT; and their perceived advantages of using AT to educate SWDs.

To enhance the validity of the survey, the items were reviewed by researchers in educational technology and special education for content validity. Also, for face validity, the survey's clarity and appropriateness were also checked by the teachers. After the data collection, internal consistency reliability was assessed using Cronbach's alpha. The AT Knowledge and Skills scale had an alpha coefficient of 0.91 and the Perceptions of AT scale had an alpha coefficient of 0.95, both of which indicate excellent reliability.

Data Analysis

Descriptive statistics (i.e., mean, standard deviation, and percentage) were calculated for each question using IBM's SPSS (version 22) data analysis software. Pearson product-moment correlations were conducted to examine the relationships among teachers' perceptions of using AT, and the number of AT courses completed, the number of AT seminars/workshops attended and years of teaching experience. Inductive analysis (Creswell, 2014) was utilized to analyze the qualitative data from the open-ended questions using NVivo 14. First, the research team read through the participants' answers to the open-ended questions to familiarize themselves with the qualitative data. Then, they worked together to code the participants' responses collaboratively. Rather than coding independently and comparing the codes afterwards, both researchers jointly conducted the data analysis process.

During this analysis process, codes were created through discussion and negotiation of any discrepancies until the research team reached a shared understanding and arrived at a consensus. Open, in vivo, and descriptive coding were used to create the codes (Saldaña, 2015), with pattern coding then employed to identify similarities and patterns in the data and to then create categories and overlapping themes (Saldaña, 2015).

Results

Quantitative Findings

Awareness of Available AT

The majority of the participants (48.53%) reported that their school had low-tech ATs, whereas 30.88% mentioned high-tech AT, and 20.59% stated that mid-tech ATs were available at their school. In total, 64.66% of the participant teachers had previously requested a student AT evaluation, and 67.21% reported students as having access to AT within their schools.

AT Knowledge and Skills

Teachers rated their level of AT knowledge and skills for each topic presented in Table 1 using a 4-point Likert-type scale. As can be seen from Table 1, all of the teachers' ratings ranged between (1) novice and (2) basic, which means that they perceived themselves as being novices, with a low level of AT knowledge and skill. The overall mean for their AT knowledge and skills was 1.68, with a standard deviation of 0.54.

Table 1. Inservice teachers' AT knowledge and skills

	M	*SD*
MS operating system accessibility features	1.96	0.84
MAC operating system accessibility features	1.58	0.76
Variety of low-tech assistive technologies for students with disabilities	1.53	0.76
Variety of mid-tech assistive technologies for students with disabilities	1.51	0.69
Variety of high-tech assistive technologies for students with disabilities	1.52	0.73
Making MS Word documents accessible for students with disabilities	1.84	0.89
Making PDF documents accessible for students with disabilities	1.80	0.87
Making MS PowerPoint presentations accessible for students with disabilities	1.89	0.88
Creating accessible videos for students with disabilities	1.77	0.86
Creating accessible websites for students with disabilities	1.64	0.83
Using software tools to check website accessibility for students with disabilities	1.60	0.85
Overall	1.68	0.54

When the teachers were asked to rank their overall level of AT knowledge according to a 5-point Likert-type scale, they rated themselves as having between little and some knowledge (M = 2.69, SD = 1.05). On the other hand, based on a 5-point Likert-type scale ranging from 1=Not at all prepared to 5=Extremely well prepared, the teachers perceived themselves as being (2) poorly prepared to (3) somewhat prepared to provide AT services to students with disabilities in their schools (M = 2.71, SD = 1.21).

A significant number of the teachers (42.46%) reported not having previously taken any college-level courses related to AT. In contrast, 37.70% indicated having completed one or

two courses, whereas 13.10% had taken three or four courses, and 6.74% had taken five or more courses on AT. Similarly, a majority of the teachers (42.86%) had not previously attended any workshops, webinars, or other training specific to AT, while 38.49% had received prior training once or twice before.

Although most of the teachers had not previously attended any courses or received any training in AT, 29.03% of the teachers expressed significant interest in receiving training and professional development in the area of AT. However, the majority (46.16%) stated that they were not interested at all in receiving training on AT, while 25.81% responded that they were unsure and would have to think about it. As to the teachers' preferred method to learn about AT, 37.32% mentioned hands-on instruction within a group setting, whilst 33.01% said workshops or conference sessions, and 2.87% stated a preference for learning by way of formalized courses.

Perceptions of Using AT

Table 2 presents the descriptive statistics for the teachers' perceptions of using AT according to a 5-point Likert-type scale anchored from 1 = Strongly disagree to 5 = Strongly agree. The overall mean was 2.98, with a standard deviation of 0.88. This finding reveals that the teachers held a neutral perception about the use of AT in special education. Notably, items 4 and 5 related to special and general educators' familiarity with AT received the highest ratings (item 4, M = 3.23; item 5, M = 3.20). The teachers believed that both special and general education teachers should be familiar with AT. The mean for item 1, "Students need to learn to function without AT because the devices could negatively affect their skill development," was found to be 2.65 (SD = 1.18), revealing the teachers' awareness of the importance of the AT in educating SWDs.

Table 2. Inservice teachers' perceptions

	M	*SD*
Students need to learn to function without AT because the devices could negatively affect their skill development.	2.65	1.18
AT devices enable students to access the curriculum and enhance their learning.	3.06	1.18
Using assistive technology requires so much extra time and slows the pace of learning for the class.	3.16	1.09
Special educators need to be familiar with assistive and instructional technologies.	3.23	1.26
Every educator needs to be familiar with assistive and instructional technologies.	3.20	1.24
AT can facilitate the inclusion of students with disabilities in general education classrooms.	3.03	1.24
AT devices stand out and might stigmatize students by signaling disability.	2.94	1.16
Expensive AT devices take potential resources (e.g., money and time) away from other students.	2.85	1.17
Overall Mean	2.98	0.88

Pearson product-moment correlations were conducted to examine the relationships among teachers' perceptions of using AT and three variables: the number of AT courses completed, the number of AT seminars/workshops attended, and years of teaching experience. The results of the analysis showed that there is no significant relationship between teachers' perceptions of AT use and either the number of AT courses they had completed, $r(226) = .00$, $p = .995$, or the number of AT seminars or workshops attended, $r(226) = –.06$, $p = .353$. However, teachers' perceptions of AT use were significantly and positively correlated with years of

teaching experience, $r(218) = .21$, $p = .001$. Teachers with more years of instructional experience tended to report more positive perceptions of AT use.

Qualitative Findings

As a result of the inductive analysis, four main themes emerged: (1) teachers' AT knowledge, skills, and confidence, (2) challenges of AT integration in special education, (3) benefits of AT use, and (4) teachers' attitude towards AT use.

Teachers' AT Knowledge, Skills, and Confidence

The teachers' level of AT knowledge, skills, and confidence varied. Most of the teachers (n = 56) perceived that their AT knowledge, skills, and confidence were at a good level, whilst an average level was mentioned by 17 of the teachers, and 19 stated having no knowledge, skills, or confidence in the use of AT in the classroom. On this, some of the participant teachers' comments were as follows:

> "I believe in AT, but my knowledge about AT is average." (Arsen)
> "My education is probably not enough to use AT" (Mirbek)
> "When I attended special education courses, I learned that disabled children should study together with non-disabled children. But I don't know what tools to use." (Regina)

While most of the teachers perceived themselves as having a good level of AT knowledge, skills, and confidence, Aylin stated that: "Education of pedagogues themselves is not enough. It is necessary to teach them and providing technology also requires financial resources." Another teacher stressed the importance of support, saying that "Inclusive education has been introduced in each school, but the means used and the [right] conditions have not been created. For example, [there are] no medical personnel or psychologists."

Challenges of AT Integration in Special Education

The teachers expressed their opinions about the challenges faced integrating IT in special education as (a) teacher-related challenges, (b) financial challenges, (c) lack of AT resources, and (d) student-related challenges.

The most mentioned challenge (n = 18) was related to the teachers. The respondents reported that teachers do not know about the available ATs, nor how to use them. On this, Murat stressed there being "a need for AT training." In addition to AT knowledge and skills, it was mentioned that teachers do not know how to effectively integrate AT into special education and do not accept the benefits that AT offers to SWDs. On this, Asan stated that "The benefit [of AT] is questionable. It [benefit of AT use] needs to be accepted by the teachers."

Teachers' lack of time (n = 3) was mentioned as a challenge for AT integration. In an example statement, Mirlan commented; "I do not have enough time." Other teacher-related AT challenges mentioned were a lack of motivation, low salaries, and psychological readiness. On this, Aygul stated that, "Due to the low salaries, teachers are not motivated to use and to learn AT.". Related to the readiness, Saliha said, "we are not mentally ready".

A considerable number of the participant teachers (n = 16) indicated that lack of funding to purchase AT equipment creates a barrier to the use of AT in special education. Teachers stressed that schools lack funds specifically allocated for AT and that most families of SWDs cannot afford to purchase the equipment either. On this, some of the teachers commented that

"providing [assistive technologies] to students with disabilities requires money" (Nurgul), but that "funds are not provided at the required level" (Ayday).

Ten of the teachers stressed a lack of AT resources as a challenge, including a lack of AT provided to students and poor availability within schools, lack of AT-trained staff (i.e., special education teachers, AT specialists), and a lack of laws and regulations governing the use of AT. On these, some of the participants' comments were as follows:

> "It would be better if there were specialists who know how to use AT" (Ali)
> "There is no law [related to the use of AT]" (Aylin)

Lastly, a few of the teachers reported challenges related to SWDs, and that due to the functional limitations of SWDs, they are not able to learn to use ATs. On this, Murat stated there being "no challenges if students with disabilities can learn AT." Also, they reported that students can be reticent in accepting the use of AT in their education.

Benefits of AT use

The participant teachers had limited prior AT experience and found the integration of AT in education challenging due to several issues, as previously mentioned. However, they considered the use of AT in education as offering significant benefits to students with disabilities. Accordingly, 13 benefits were mentioned by the teachers: (a) facilitating learning; (b) allowing students to receive education equal to their peers; (c) supporting students' skills development; (d) enabling education without exclusion from society; (e) increasing motivation to learn; (f) removing functional limitations; (g) promoting students' independence; (h) enhancing information access; (i) strengthening students' self-confidence; (j) enhancing students' interest in technology and learning with technology; (k) increasing students' interest in learning; (l) promoting self-awareness; and (m) that AT helps facilitate the job of teachers by "saving their time" (Aman) and "making their job easier" (Rinat).

Some of the teachers (n = 14) mentioned that the use of AT aids students' learning, especially when those with disabilities cannot attend school. On this, one of the teachers said, "students can also study online while sitting at home."

The teachers stressed the provision of equal education to all as another benefit of using AT. One teacher stated that, "I think that it will be of the best benefit, first of all, as they [SWDs] get the same education as other children" (Asylbek). Also, the teachers reported that AT allows students with disabilities to receive education without being unnecessarily excluded from society. The following excerpts exemplify these thoughts:

> "It [the use of AT] motivates them [students] to be educated like non-disabled people and to get involved in society." (Alina)
> "[AT] creates a better chance of acceptance by society." (Amir)

Some of the teachers (n = 8) reported that AT helped the development of students' academic skills, with the most mentioned developmental skills being communication, reading, literacy, listening, and 21st century skills. Fatima commented, "Children with disability can express themselves if they use assistive technology". Besides students' academic skills, the teachers explained that AT use increases students' interest and motivation to learn, promotes knowledge access and independence, as well as improving students' self-awareness and self-

confidence. Some of the teachers' statements related to these benefits were as follows:

> "I think the students' self-awareness will improve." (Uson)
> "Students can have access to complete and rich information." (Temir)
> "They [students] can have access to a wealth of information whilst at home." (Argen)
> "Students will feel less timid and shy in front of their friends." (Ayday)
> "It motivates them to be educated like healthy people and to get involved in society." (Zulfiya)

Teachers' Attitude Towards AT Use

Based on the participants' teaching experiences and their AT use in the education of SWDs the teachers reported on both negative and positive attitudes about the use of AT to support SWDs.

Mostly, the teachers commented positively about the use of AT in special education. Ten of the teachers highlighted the importance of AT and expressed wanting to learn about AT in order to support their students. They mentioned that AT could be learned and that its use should be encouraged in schools. On this, Anvar said, "We [teachers] should learn how to use AT, because there is a need for it." In addition, Meryem commented, "It would be good if technology came and was provided free of charge to children with disabilities."

On the other hand, a few of the teachers (n = 3) expressed a negative attitudes toward AT use in special education. Manas mentioned being "against using AT," while Munar commented that AT "is not appropriate to use since students [with disabilities] have some health issues."

Discussion

While there is a clear initiative to make Kyrgyzstan into an accessible country and to enhance inclusion in education so as to provide equal and effective education to SWDs, the needs of the teachers who support these students using AT have yet to be explored in the literature. This study investigated the AT knowledge and skills of teachers, as well as their perceptions of using AT in education. More than half of the respondent teachers mentioned their students having access to AT within their schools. However, schools have more low-tech AT and less mid-tech and high-tech ATs, which aligns with studies conducted in developing countries (e.g., Alshehri, 2023; Flanagan et al., 2013). Albalhareth and Saleem (2023) conducted a research study in Saudi Arabia and found that schools lacked AT. Chukwuemeka and Samaila (2020) highlighted a major deficiency in Nigerian schools regarding high-tech AT; pointing out that such technologies are not only missing from schools, but that teachers are also generally unaware of them and lack the necessary expertise to use them properly. The limited use of mid-tech and high-tech AT in developing countries may be attributed to the high costs associated with purchasing and operating such devices, as well as the training required for effective use.

Having AT in schools on its own is not sufficient for their effective use, with research having shown that teachers may not consistently utilize the available ATs to support SWDs (Chukwuemeka & Samaila, 2019; Kimm, Kim, Baek, & Chen, 2020). One of the primary reasons behind the underuse of ATs in schools is teachers' limited knowledge of how to effectively utilize these technologies (Atanga et al., 2020; Kundu et al., 2020; Kutlu et al., 2018; O'Sullivan et al., 2023). The participant teachers in the current study rated their own AT knowledge and skills at a novice level or having just basic knowledge and skills. Their reported overall AT knowledge and skills ranged from little knowledge to some knowledge,

which was also supported with the participants' responses to the open-ended questions. Some teachers mentioned having no knowledge, skills, or confidence in using AT. This finding aligns with earlier research about teachers' lack of AT knowledge and skills and low self-confidence in using AT, especially in developing countries (e.g., Chukwuemeka & Samaila, 2020; Kundu et al., 2020; Kutlu et al., 2018; Saha & Mallya, 2023) as well as in developed countries (e.g., Atanga et al., 2020; Flanagan et al., 2020). Alghamdi (2022) stressed that teachers who frequently use AT and thereby have familiarity in its use have higher confidence levels in utilizing AT in the classroom.

The current study's participant teachers perceived themselves as being only poorly to somewhat prepared to provide AT services. About half of the teachers had not previously taken any course related to AT and had not attended any workshops, webinars, or training about AT. A lack of AT courses and related professional development for teachers was also mentioned in previous research (e.g., Albalhareth & Saleem, 2023; Alshehri, 2023; Atanga et al., 2020; Thomas et al., 2019). Atanga et al. (2020) highlighted that teachers interested in utilizing AT can feel unprepared to integrate AT due to inadequate AT training during their college-level teacher training despite their expressed interest in the use of AT. Additionally, Lamond and Cunningham (2020) found a substantial and positive correlation between AT expertise and perceived usefulness of AT. Alghamdi (2022) found that the number of courses related to AT and educational technologies relate positively to teachers' confidence level in using AT. Congruent with the prior research, it can be concluded that teachers' lack of AT knowledge and skills as reported in the current study was mainly due to their having received insufficient training, both at the preservice and inservice levels (Atanga et al., 2020; Naraian & Surabian, 2014; Schaaf, 2018).

Besides the AT knowledge and skills of teachers, the respondents also mentioned not knowing how to effectively integrate AT in the special education classroom. This finding is consistent with prior research conducted in other developing countries in that teachers' insufficient knowledge about pedagogical strategies for effectively integrating AT in special education is seen as a challenge or barrier to its use (Albalhareth & Saleem, 2023; Njikem, 2022). A need for AT training for teachers in order to work within inclusive education was also mentioned by teachers in the current study, as it was in research conducted in neighboring countries like Kazakhstan, which shares similarities with Kyrgyzstan (Aubakirova & Mukatayeva, 2017). Numerous studies in the literature (e.g., Alghamdi, 2022; King & Allan, 2018; Park et al., 2022; Thomas et al., 2019) have proposed the inclusion of AT training within teacher education curricula in order to equip newly appointed teachers with the necessary AT knowledge and skills. Aligned to this suggestion, teacher education programs should include a specific AT course which provides the AT content and pedagogical strategies for preservice teachers.

Despite the obvious need for teachers to receive AT training, approximately half of the participant teachers in the current research stated not being interested in receiving such training. Potential reasons for their unwillingness may be due to a lack of support personnel or low teacher salaries which was mentioned as a barrier to using AT. The teachers reported that due to their low salaries, they felt inadequately motivated to learn about AT. In Kyrgyzstan, inservice teachers lack support such as additional personnel or special education assistants that may be the norm in some developed countries (e.g., United States). Therefore, inservice teachers in Kyrgyzstan may experience additional pressure to fulfill what are perceived as extra requirements to use AT in education, and yet another additional responsibility in a job with already overcrowded classes and poorly motivated teaching staff who are often unwilling

to undergo additional training. The participant teachers reported several challenges to the integration of AT in the classroom which may also impact their willingness to receive AT training.

Teachers' lack of AT knowledge and skills was the most mentioned barrier to the effective utilization of AT in the classroom, which also confirms findings reported in the literature (Alshehri, 2023; Atanga et al., 2023; Kutlu et al., 2018; Lamond & Cunningham, 2020; Saha & Mallya, 2023; Thomas et al., 2019). In line with prior research, other barriers that the teachers mentioned include teachers' lack of spare time (Alshehri, 2023; Kutlu et al., 2018), lack of available ATs (Alshehri, 2023; Chukwuemeka & Samaila, 2020; Vanderpuye & Okai, 2023), lack of funding for ATs (Alshehri, 2023; Atanga, 2020), and a lack of support staff (Alshehri, 2023; Lamond & Cunningham, 2020). Additionally, the teachers mentioned their low salaries and inadequate psychological readiness to use AT within an inclusive classroom, and a lack of AT regulation and laws like those seen in developed countries as barriers to their use of AT, which represents one of the contributions of the current study to the literature about AT use in developing countries. Overall, the challenges experienced in Kyrgyz schools are quite similar to those in neighboring countries such as Kazakhstan: Lack of well-trained pedagogical personnel, lack of access to school buildings, lack of training, absence of support services for children with special education needs at different education levels (Aubakirova & Mukatayeva, 2017). Aubakirova and Mukatayeva (2017) also stressed that inclusive education in neighboring Kazakhstan was developing at an insufficient pace.

For AT integration to be effective in supporting SWDs' education, the challenges and barriers identified here should be addressed, and teachers informed about the significant and positive impact of using AT on increasing educational inclusion and accessibility for SWDs. This, in turn, can help reduce some of the individual functional limitations faced by SWDs, facilitating their learning and allowing them to make better use of instructional time within inclusive classrooms (McKenzie & Arslan-Ari, 2024). The current study also revealed that teachers who would live to attend AT training are interested in receiving hands-on instruction within a group setting, expressing an interest in attending workshops or conference sessions. The most efficient route would be to organize seminars or workshops through the Ministry of Education in order that inservice teachers would be appropriately encouraged and have the time to attend.

The participant teachers had a neutral perceptions of AT use in special education, while they still believed that every teacher should be familiar with AT. Teachers' perceptions of AT use were positively correlated with their teaching experience whereas no significant relationships were found between perceptions and wither the number of AT courses and training received. This finding suggested that the teachers with more years of teaching a teacher has, the more experiences with working with the students with disabilities. Contrast to our finding, Lamond and Cunningham (2020) reported a positive correlation of AT knowledge and years of teaching experience in Canada, a developed country. This discrepancy may be attributed to the teachers' low AT knowledge in the current study, as well as the limited availability and quality of the AT professional development opportunities workshops provided to the teachers in Kyrgyzstan. Moreover, unlike many developed countries, there is no required AT courses in the teacher education programs in Kyrgyzstan.

Most of the teachers were already aware of the benefits of AT for SWDs. Congruent to the literature, the teachers in the current study asserted that AT helps facilitate learning for SWDs (Arslan-Ari & Başer, 2022; Çay et al., 2020; Eldeniz Çetin & Geçal, 2017), affords students

equal access to education based on their skills (Arslan-Ari & Başer, 2022; Ok et al., 2020), boosts their motivation to learn (Arslan-Ari & Başer, 2022; Çay et al., 2020; Eldeniz Çetin & Geçal, 2017), promotes students' independence (McKenzie & Arslan-Ari, 2024; Nordström et al., 2019), improves information access (Irwin et al., 2023; McKenzie & Arslan-Ari, 2024), strengthen students' self-confidence (Sola Özgüç, 2015) and interest in learning (Nordström et al., 2019), and promotes self-awareness while saving teachers' time and effort (McKenzie & Arslan-Ari, 2024) as well as enhancing their interest in technology. This finding is considered critical in that teachers' perceptions of technology's importance greatly influence their intention to make use of it (Nelson & Hawk, 2020).

The participant teachers expressed both negative and positive attitudes about using AT in inclusive classrooms. They mentioned being against the use of AT since SWDs may lack the required capability due to their functional limitations. Similar issues were stressed in a study conducted by Nam (2021) in Uzbekistan, which is another developing country in Central Asia. Like Kyrgyzstan, Uzbekistan also does not welcome children with disabilities within mainstream education, referring them instead to specialized institutions. Therefore, the social stigma against people with disabilities should be addressed by educating the country's citizens and by encouraging the parents of SWDs to help their children become more involved in society. On the other hand, some of the other teachers in the current study emphasized the importance of AT in the inclusion of SWDs and expressed they wanted to learn more in order to provide more appropriate support to SWDs in the classroom.

Implications

The study's results have several implications for the administrators of higher education institutions and school principles. First, the findings clearly emphasize the significant need for teachers to receive training on AT and its effective integration in the inclusive classroom. In order to enhance inservice teachers' motivation to participate in similar training, it should become a mandatory requirement for the Ministry of Education as part of the serving teachers' professional development training course curriculum, and that this should be developed as a hands-on, face-to-face type of coaching. Second, there is evidence from the current study that the majority of teachers did not graduate from their college-level teacher training with sufficient AT knowledge and skills. Therefore, preservice teacher education programs must be evaluated and courses related to AT added to the curriculum. Third, the participant teachers reported that the limited availability of AT, their low teacher salaries, lack of personal support, and a lack of spare time as barriers to AT use in the classroom. Therefore, school districts should seek appropriate funding in order to better support serving teachers as a means to overcoming these barriers.

Limitations and Future Research

The current study has several limitations. First, the data source relied upon self-reported survey questions including both Likert-type scale items and open-ended questions. Although self-reported surveys are considered an effective source of research data, the addition of researcher observation and follow-up interviews in future studies could add further valuable insight regarding the teachers' AT knowledge and skills and the integration of AT within inclusive classrooms. Second, the participant teachers all worked within urban schools, which may not accurately reflect the situation in more rural schools. In order to increase the generalizability of the current study, data could be collected from both urban and rural schools in future studies.

Declarations

Funding: *No funding was received for conducting this study.*
Ethics Statements: *The study adhered to the ethical guidelines recognized by this journal.*
Conflict of Interest: *The author(s) declared the absence of any conflicts of interest tied to the research, authorship, or publication of this article.*
Informed Consent: *Before participation, each participant provided signed consent.*
Data availability: *The data collected in the current study are available from the corresponding author on reasonable request.*

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