Skills and Standards of Selection and Use of Assistive Technology among Saudi Teachers of Students with Intellectual and Developmental Disabilities

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Abstract
The purpose of the current study is to explore the standards that teachers take into consideration when selecting and using assistive technology (AT), in addition to their knowledge and skills in this area. A quantitative-descriptive survey design was used and a convenience sample of (79) teachers of students with intellectual disabilities and autism spectrum disorder (ASD) participated in the current study. Based on the four main areas of the SETT Framework (student, environment, tasks, and tools), teachers reported a lack of consideration for most of the standards in each area. Among other findings there are statistically significant differences were found between teachers' standards of the SETT Framework, with teachers who had previous professional development in AT reporting higher standards. Moreover, generally, teachers with more years of teaching experience reported having more knowledge and skills in AT usage. These findings suggested that providing teachers with sufficient professional development sessions on the use of AT would be of great help in increasing the effective strategies of the selection and use of AT with students with disabilities.

Keywords: Assistive technology, special education teachers, intellectual disabilities, autism spectrum disorder, professional development, mainstream schools

مهارات ومعايير المعلمين في استخدام واختيار التقنيات المساعدة مع التلاميذ ذوي الإعاقات الفكرية والنمائيةفي المملكة العربية السعودية

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ملخص البحث

هدفت الدراسة الحالية إلى استكشاف معايير المعلمين عند اختيار واستخدام التقنيات المساعدة) **AT**(في ضوء نظرية **SETT**، بالإضافة إلى مهاراتهم في استخدام هذه التقنيات مع التلاميذ ذوي الإعاقات الفكرية والنمائية. تم استخدام المنهج الوصفي المسحي لتحقيق أهداف هذه الدراسة، حيث شارك ٧٩ معلما ومعلمة في الاستجابة على أداة الدراسة)الاستبانة(. استنادا إلى المجالات الرئيسة لنظرية **SETT** حول معايير استخدام واختيار التقنيات المساعدة وهي الطالب **Student**، والبيئة **Environment**، والمهام **Tasks**، والأدوات **Tools**، توصلت النتائج إلى وجود قصور في الأخذ بعين الحسبان لعدد من المعايير ضمن هذه المجالات الرئيسية. كما أظهرت النتائج وجود فروق ذات دلالة إحصائية بين متوسطات استجابات المعلمين والمعلمات حول معايير استخدام واختيار التقنيات المساعدة تبعا للحصول على برامج للتطوير المهني حول التقنيات المساعدة، فيما لم تظهر النتائج وجود فروق ذات دلالة إحصائية تبعا لاختلاف الجنس، وعدد سنوات الخبرة، ونوع إعاقات الطلاب. وتوصلت النتائج أيضا إلى وجود فروق ذات دلالة إحصائية بين متوسطات استجابات المعلمين والمعلمات حول مهاراتهم في استخدام التقنيات المساعدة تبعا لعدد سنوات الخبرة والحصول على برامج للتطوير المهني حول التقنيات المساعدة، فيما لم تظهر النتائج وجود فروق ذات دلالة إحصائية تبعا لاختلاف الجنس ونوع إعاقات الطلاب. في ضوء نتائج هذه الدراسة، قدمت بعض التوصيات التي قد تسهم في تحسين ممارسات المعلمين والمعلمات فيما يتعلق باستخدام التقنيات المساعدة مع التلاميذ ذوي الإعاقات الفكرية والنمائية.

الكلمات المفتاحية: التقنيات المساعدة، معلمي التربية الخاصة، الإعاقات الفكرية، اضطراب طيف التوحد، التطوير المهني، مدارس الدمج.

Skills and Standards of Selection and Use of Assistive Technology among Saudi Teachers of Students with Intellectual and Developmental Disabilities

With the rapid increase in the number of students with various disabilities, along with the necessity of placing them in inclusive settings, there has been a fundamental concern regarding how to overcome potential difficulties and provide this group of students with access to the regular curriculum in a way that best suits their abilities in such an environment. Researchers have found that assistive technology (AT) has been shown to bridge this gap and by passing some of the challenges that students with diverse abilities face when learning in inclusive education schools (Dixon, 2011; Heath, 2018; Johnson et al., 2013; Wood, 2015). For instance, incorporating AT into classrooms in which students with disabilities are placed could provide a vehicle for their access to the general curriculum alongside their peers (Messinger-Willman & Marino, 2010), help them express their needs and wants (Cook et al., 2011), and enhance their academic performance (Akpan et al., 2014; Smeak, 2014).

The integration of AT in environments with students with special learning needs has become more critical, particularly when those students are expected to learn alongside peers in an inclusive classroom and have access to the general curriculum. The extent to which students with disabilities need AT devices and services in inclusive settings varies from student to student based on many factors, one of which is the type and degree of disability. The more significant and complex the disability is, the greater the need and demand for AT would be. Researchers have argued that individuals with disabilities who are considered to be most in need of AT devices and services are those who have severe intellectual and developmental disabilities (Lancioni et al., 2012; Weber & Demchak, 1996). Students with severe intellectual and developmental disabilities usually experience communication issues (Jones, 2017) and other significant difficulties in classrooms including difficulties with learning, reading, writing, and participation in activities (Cannella-Malone et al., 2015; Lancioni et al., 2012). Furthermore, teachers often experience great challenges in classrooms with students with these types of disabilities due to the complexity of their learning needs (Jones et al., 2015). Previous studies have shown that AT can assist these students in expressing their wants and needs (Cook et al., 2011), and that AT devices and services are effective in classrooms across different curriculum areas (Dyal et al., 2009; Parette et al., 2009; Reichle, 2011; Stasolla et al., 2013). This, of course, indicates a great need for increasing the use of AT devices and providing further related services for students facing such complex issues to overcome the challenges and reduce the achievement gap.

Teachers' Knowledge

Teachers are an integral part of AT usage with students with disabilities. Michaels and McDermott (2003) pointed out that there has been an agreement among researchers that special education teachers' knowledge and skills in using AT with students play a critical role in the success of students with disabilities. Despite this, the integration of AT into classrooms with students with disabilities has been challenged by numerous factors, one of which is teachers' lack of knowledge (Abu-Alghayth, 2020; Ajuwon & Chitiyo, 2016; Chukwuemeka & Dominic, 2020).

Bausch and Hasselbring (2004) indicated that the knowledge and skills that teachers should have to be able to use AT effectively and successfully with their students are: (a) evaluating referred students for AT; (b) matching the appropriate AT devices to the students; (c) discussing and consulting with colleagues; (d) providing training sessions for students, families, and colleagues on AT devices; (e) collaborating with Individual Education Plan (IEP) team members; (f) purchasing devices; (g) collaborating with colleagues regarding the inclusion of students with disabilities in general education settings; (h) making adaptations and modifications to the curriculum; and (i) following up on the use of AT.

Planning for AT Usage

It is critical to adopt a plan or strategy when selecting and using AT with students with disabilities to make the AT usage effective. This is because using AT and providing tools or devices alone will not help reach the desired outcomes (Lancioni, 2017). The SETT Framework, its name an acronym for student, environment, tasks, and tools, has been considered a guideline for teachers, families, and service providers to plan for AT usage (Zabala, 1995). The SETT Framework can help answer essential questions about the use of AT with students with disabilities: Who needs AT? Which AT should be used? What data should be gathered to make decisions? Who should make the relevant decisions? (Zabala, 2020). Team members should carefully discuss and answer several questions under each of the four elements of the SETT Framework to gather data that assist their understanding of how to select and use AT with students. The following figure shows the questions that should be asked when implementing the SETT Framework for the selection and usage of AT.

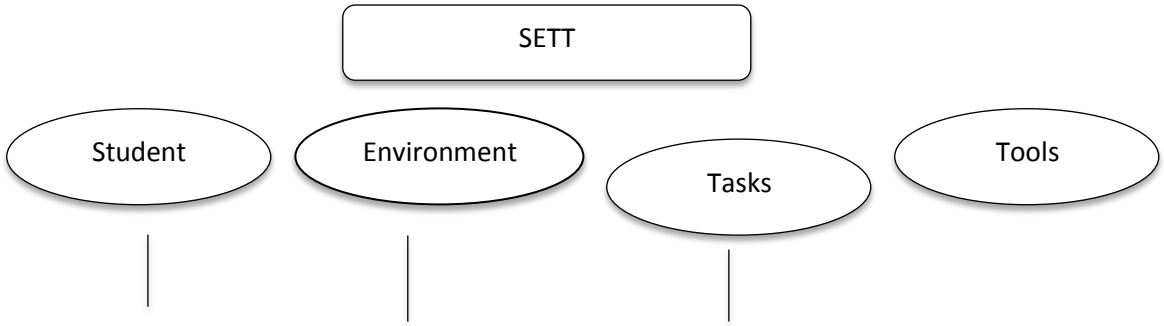
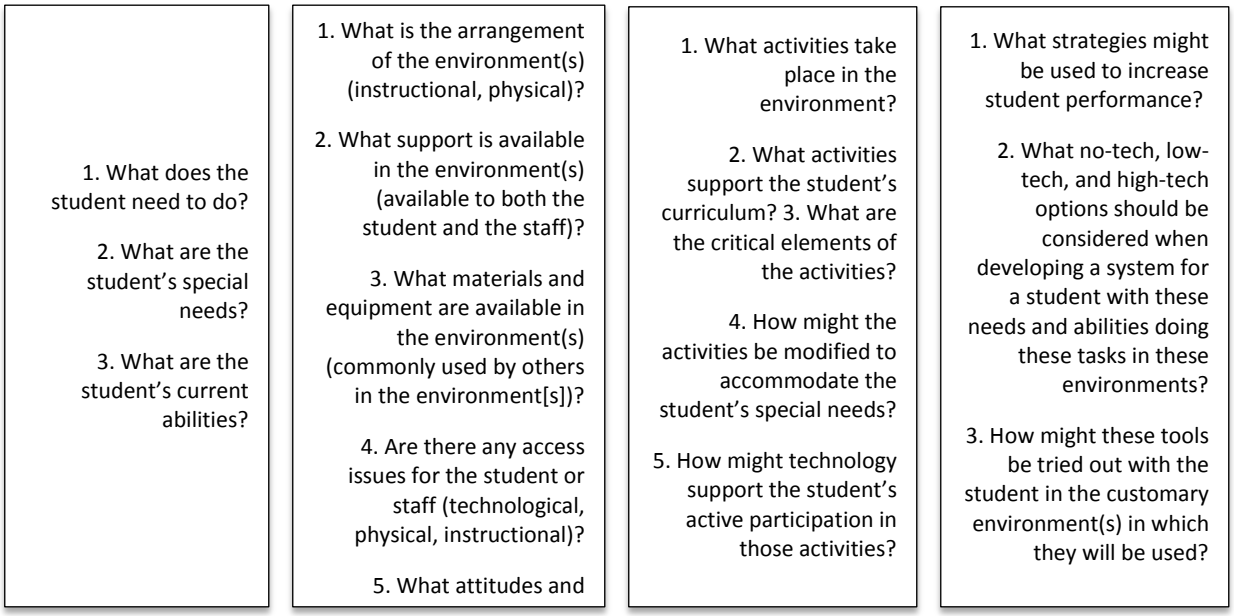


Figure 1
SETT Framework (Zabala, 1995)



The application of the SETT Framework
cannot be successful and effective without the collaboration of the team members regarding the selection and use of AT with students with disabilities (Zabala, 1999). The spirit of collaboration should drive the team to collect data that help make decisions about the students' needs for AT services and devices (Zabala, 2020).

AT in Saudi Context

Recently, the use of AT with students with disabilities in Saudi Arabia has been connected to a number of factors including teachers' knowledge and skills, teachers' consideration of AT for students, the availability of AT tools—particularly high-tech devices—in schools, teachers' professional development in AT, and financial support (Abu-Alghayth, 2020; Alkahtani, 2013; Almalki & Al-Harthi, 2020; Al-Moghyrah, 2017). Concerning Saudi teachers' knowledge and skills, several studies have shown that teachers' lack of knowledge and skills can be a serious challenge when it comes to using AT with students with disabilities in classrooms (Abu-Alghayth, 2020; Alharbi, 2018; Al-Moghyrah, 2017).

For example, Alharbi (2018) explored special education elementary teachers' knowledge in mainstream classrooms and found notable results. He found that teachers had some knowledge regarding how to arrange an environment for AT usage and evaluate the effectiveness of AT usage, and some basic theoretical knowledge regarding the types of AT devices. However, the significant findings of his study showed that male teachers had relatively higher knowledge of AT than female teachers. Teachers with higher qualifications indicated higher knowledge of AT, and teachers of students with intellectual disabilities indicated higher knowledge than

other teachers of other types of disabilities such as autism spectrum disorder (ASD) and multiple disabilities.

Another study was carried out by Alkahtani (2013), who surveyed 127 general and special education teachers and interviewed three to collect data on their knowledge of AT. Her study revealed that the majority of the teachers (72.4%) either did not have an adequate level of knowledge or had no knowledge at all of AT usage. Alkahtani pointed out that the lack of knowledge among most of the participants was a critical issue, with close to 93% participants reporting poor preparation or no preparation for AT use with students with disabilities in classrooms. The challenge of teachers' deficiency in knowledge has consistently been raised in international studies over the last decade (Ajuwon & Chitiyo, 2016; Flanagan et al., 2013), and has been found to be a serious limitation to the use of AT in classrooms of students with disabilities.

The evidence found in the above studies suggests, first, that there is a lack of research concerning teachers' knowledge of AT; second, that teachers seem to lack sufficient knowledge of AT; and third, that the strategies teachers follow to select and use AT with students with disabilities in light of this limited knowledge are vague. Therefore, the present study aimed to explore teachers' standards of selecting and using AT with students with intellectual disabilities and ASD, and their skills in and knowledge of AT.

Given the significance of teachers' knowledge and how they select AT for students with intellectual disabilities and ASD, this study provides an opportunity to explore in further depth what special education teachers know and how they select AT for students in mainstream classrooms. Such outcomes are important for planning an appropriate intervention to increase teachers' knowledge of AT usage and improve their strategy for selecting the most appropriate AT devices and services for their students.

Through this study, the researcher sought to address the following questions:

1. What standards do teachers follow to guide their decisions in the selection and use of AT for students with intellectual disabilities and ASD in mainstream schools?
2. What AT skills and knowledge do teachers of students with intellectual disabilities and ASD have?
3. Are there significant differences in teachers' standards for selection and use of AT based on (a) their previous professional development, (b) their gender, (c) the type of student disability that they work with, and (d) their teaching experience?
4. Are there significant differences in teachers' skills and knowledge of AT based on (a) their previous professional development, (b) their gender, (c) the type of student disability that they work with, and (d) their teaching experience?

Methods

The research design adopted for this study was descriptive in nature. The quantitative, descriptive survey design allowed the researcher to gain a broad look at the issue being examined through recruiting a large number of participants to provide valuable conclusions with respect to teachers' standards for the selection and use of AT, and their skills and knowledge of AT.

Population and Participants

The participants of the current study were elementary and middle school (i.e., 1st–9th grade) teachers of students with intellectual disabilities and ASD in one southern region of the Kingdom of Saudi Arabia. Non-probability convenience sampling was employed to recruit participants for the study. The study population consisted of 283 teachers who taught in schools that provided inclusion programs for students with intellectual disabilities and ASD. The researcher distributed a link to the online survey to all schools that offered mainstream programs for students with intellectual disabilities and ASD. A total of 116 surveys were returned, with a response rate of 41%. A number of surveys were not fully completed, only the questions on demographic information and a few other items were answered. They were therefore excluded. A total of 79 surveys were fully completed (N = 79).

Instrumentation

The online survey (through Qualtrics) consisted of three sections: (1) demographics (i.e., gender, type of student disability that teacher works with, previous professional development, and teaching experience), (2) standards of selection and use of AT (SETT), and (3) skills and knowledge of AT. The second section was developed based on Zabala's (1995) SETT Framework of selection and use of AT for students with disabilities. This section was divided into four dimensions: (a) student, (b) environment, (c) tasks, and (d) tools. Each dimension consisted of a number of items, with a total of 16 items across all dimensions. For each listed item in this second section, participants responded using a 5-point Likert scale (1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Very often, and 5 = Always).

In regard to the section on skills and knowledge—the third section—, permission was granted to derive, modify, and adapt the survey of the CEC Knowledge and Skill Base for All Entry-Level Special Education Teachers of Students with Intellectual/Developmental Disabilities (Council for Exceptional Children, 2003). This section comprised of 20 items on teachers' skills and knowledge of AT usage. Participants answered all items using a 5-point Likert scale (1 = Very poor, 2 = Below average, 3 = Average, 4 = Above average, and 5 = Excellent).

Validity and Reliability

Professors' reviews were utilized to measure and enhance face validity (Lamb et al., 2014). Five professors of special education who were familiar with the use of AT with students with disabilities were hired to check the validity of the instrument (Lamb et al., 2012). The professors checked the face validity of the instrument, including its appearance, clarity, and accuracy. Moreover, three of the reviewers were fluent in both Arabic and English, which enabled them to review both versions. Suggestions made by the professors included adding, correcting, and removing items in the instrument, and had an agreement rate of 85%. The suggestions and recommendations were taken into consideration for the final version of the instrument.

To test the instrument and determine whether there was an issue with clarity, and to identify its strengths and weaknesses, a pilot study with a small sample was carried out. Johnson and Brooks (2010) suggested recruiting approximately 30 participants. However, due to time constraints, it was not possible to reach this number. For the pilot study, the survey was disseminated to 35 teachers of students with intellectual disabilities and ASD who did not participate in the study. Only 19 surveys were returned, 16 of which had been completed. Additionally, the Pearson correlation coefficient was calculated. The results indicated that correlations between the four dimensions of the first section and their relation to the first section ranged from 0.88 to 0.81. In the second section, they ranged from 0.93 to 0.85. The correlations between the two sections and the total score indicated the reliability of the instrument.

The reliability of the instrument was measured using a Cronbach's alpha test (Cronbach, 1951) utilizing the Statistical Package for the Social Sciences (SPSS) software version 22. All 16 items in the second section—standards of selection and use of AT—were checked. The results of the analysis indicated a Cronbach's alpha coefficient of .88. The Cronbach's alpha coefficient for the 20 items in the third section—skills and knowledge of AT—was .96. The Cronbach's alpha coefficient of both sections yielded a high reliability coefficient, which indicates that the survey was highly reliable for all items.

Procedures

An invitation letter explaining the study and the participants' rights was provided on the first page of the online survey using Qualtrics. The link of the survey was sent to school principals and teachers in all schools that provided programs for students with intellectual disabilities and ASD in the region. Of the surveys returned, 47 were completed after initial contact. Ten days later, some principals and teachers were called via phone to be reminded. In the two days that followed, 23 additional surveys were completed. A week after the first reminder, another reminder was sent as a text message to some principals and teachers. The participants were then given several additional days, after which the survey was closed. Before this final date, 9

additional surveys were completed. A total of 79 surveys were therefore included in this study.

Data Analysis

To analyze the obtained data and answer the research questions of this study, several statistical procedures were carried out, including descriptive and inferential statistics. Descriptive statistics (standard deviation, percentage means, and frequencies) were provided and explained in tables. Moreover, a two-sample t-test was conducted to measure the significant differences in teachers' skills, knowledge, and standards of selection and use of AT based on their previous professional development, gender, and the type of student disability that they worked with. One-way analysis of variance (ANOVA) was conducted to measure the significant differences in teachers' skills, knowledge, and standards of selection and use of AT based on their teaching experience.

Results

Demographic Information

The following table demonstrates information about the teachers' gender, the type of student disability that they work with, their previous professional development, and their teaching experience.

Table 1
Participants' Demographics

Gender	Population	Sample	Percent of total population	Percent of total sample
Male	173	44	25.4	55.7
Female	110	35	31.8	44.3
Type of students' disabilities teachers work with	Population	Sample	Percent of total population	Percent of total sample
Intellectual disabilities	248	55	22.2	69.6
Autism spectrum disorder	35	24	68.5	30.4
Previous professional development in AT	Frequency	Percent		
Yes	34	43.0		

No	45	57.0
Total	79	100.0
Years of teaching experience	Frequency	Percent
Less than 5 years	28	35.4
5–10 years	22	27.8
11–15 years	16	20.3
More than 15 years	13	16.5

The first research question was: What standards do teachers follow to guide their decisions in the selection and use of AT for students with intellectual disabilities and ASD in mainstream schools? As illustrated in Table 2, teachers' responses to the first dimension, *student*, showed that the total mean score for all items was M = 3.97, SD = 0.96. The highest total mean score in this dimension was for taking into consideration students' special needs. The majority of the participants (75.9%) reported either always or very often taking this point into consideration.

With respect to the second dimension, *environment*, the total mean score for all items was M = 3.19, SD = 0.92. There was an obvious lack of consideration for the attitudes of staff, family, or peers and the expectations placed on the student in environments where AT would be used. The lowest total mean score in this dimension was M = 2.74. Approximately 40.5% of the participants reported that they never or rarely take this aspect into consideration when selecting or using AT with students. The total mean score for the third dimension, *tasks*, was M = 3.57, SD = 0.84. Most of the participants (72.1%) reported either always or very often taking into consideration the activities that would take place in the environment by using AT with students.

For the last dimension, *tools*, the total mean score was M = 3.22, SD = 0.77. Almost half of the participants (48.1%) indicated that they never or rarely take into consideration the tools that might be tried out with the student in the customary environments in which they will be used. The overall mean score of all items in this section was M = 3.46, demonstrating that teachers fall between "sometimes" and "very often" in their responses to which standards they take into consideration when selecting and using AT with students.

Table 2
Standards of Selection and Use of AT

Number	Statement	M	SD	Rank
Student				
1	I take into consideration what my students need to do.	3.86	1.02	5
2	I take into consideration my students' special needs.	4.13	.93	1
3	I take into consideration my students' current abilities.	3.93	.95	4
Environment				
4	I take into consideration the materials and equipment that are currently available in the environment.	3.79	.83	6
5	I take into consideration the access to AT and its related issues for the student or staff.	3.54	.82	8
6	I take into consideration the instructional and physical arrangements in the environment in which the AT would be used.	2.87	.75	14
7	I take into consideration the support available for students and staff in the environment in which the AT would be used.	3.02	1.03	12
8	I take into consideration the attitudes and expectations of staff, family, or peers that are placed on the student in the environment in which the AT would be used.	2.74	1.18	15
Tasks				
9	I take into consideration the activities that would take place in the environment by using AT.	4.12	.72	2
10	I take into consideration the activities that support the student's curriculum.	3.51	.86	9
11	I take into consideration the critical elements of the activities.	4.00	.84	3
12	I take into consideration the activities that might be modified to accommodate the student's special needs.	3.01	.85	13
13	I take into consideration how technology might support the student's active participation in the activities.	3.22	.94	10
Tools				

14	I take into consideration the no-tech, low-tech, and high-tech options that should be considered when developing a system for a student with these needs and abilities doing these tasks in these environments.	3.79	.82	7
15	I take into consideration the strategies that might be used to increase student performance.	3.21	.99	11
16	I take into consideration the tools that might be tried out with the student in the customary environments in which they will be used.	2.67	1.05	16
	Overall score	3.46	.87	

The second research question was: What AT skills and knowledge do teachers of students with intellectual disabilities and ASD have? Table 3 demonstrates the frequency, means, and standard deviation of each item in the survey. The highest total mean score of all items in this section was *"I know concepts and terms related to the use of technology in education and other aspects of our society"* (M = 4.31; SD = .84). However, 60.8% of the participants reported either very poor or below average knowledge of how to monitor outcomes of technology-based interventions and re-evaluate and adjust the system as needed (M = 2.24; SD = .89). Moreover, another low total mean score in this section was "*I use technology in the assessment, diagnosis, and evaluation of individuals with exceptional learning needs"* (M = 2.62; SD = .93). The overall mean score of the participants' responses about AT knowledge and skills was M = 3.48, SD = 1.00, indicating that teachers were between average and above average in their skills and knowledge of AT.

Table 3
Teachers' Skills and Knowledge of AT

Number	Statement	M	SD	Rank
17	I know concepts and terms related to the use of technology in education and other aspects of our society.	4.31	.84	1
18	I know legislative mandates and governmental regulations and their implications for technology in special education.	3.32	.99	13
19	I understand issues in diversity and in the use of technology with students with disabilities.	3.93	1.11	6
20	I provide technical support to individuals with exceptional learning needs who are receiving	3.82	.93	8

	instruction in general education settings.			
21	I evaluate features of technology systems.	3.96	.80	5
22	I identify the demands of technology on individuals with exceptional learning needs.	4.05	.76	3
23	I understand the procedures for evaluation of computer software and other technology materials for their potential application in special education.	3.06	1.15	15
24	I identify elements of the curriculum for which technology applications are appropriate and ways they can be implemented.	3.82	1.00	7
25	I identify and operate software that meets educational objectives for individuals with exceptional learning needs in a variety of educational environments.	3.60	1.27	11
26	I design, fabricate, and install assistive technology materials and devices to meet the needs of individuals with exceptional learning needs.	4.05	1.01	2
27	I provide consistent, structured training to individuals with exceptional learning needs on how to operate instructional and adaptive equipment and software until they have achieved mastery.	2.98	1.13	16
28	I develop and implement contingency plans in the event that assistive or instructional technology devices fail.	3.81	1.00	10
29	I use technology in the assessment, diagnosis, and evaluation of individuals with exceptional learning needs.	2.62	.93	19
30	I match characteristics of individuals with exceptional learning needs with technological products or software features.	3.81	1.03	9

31	I use technology to collect, analyze, summarize, and report student performance data to aid instructional decision-making.	3.11	1.20	14
32	I monitor outcomes of technology-based interventions and reevaluate and adjust the system as needed.	2.24	.89	20
33	I make technology-related decisions based on a continuum of options ranging from no technology to high technology.	3.96	.88	4
34	I work with team members to identify assistive and instructional technologies that can help individuals meet the demands placed upon them in their environments.	2.94	1.09	17
35	I refer team members and families to assistive and instructional technology resources.	3.46	1.02	12
36	I collaborate with other team members in planning and implementing the use of assistive and adaptive devices.	2.82	1.05	18
	Overall score	3.48	1.00	

Research questions 3a, 3b, and 3c were: Are there significant differences in teachers' standards for selection and use of AT based on (a) their previous professional development, (b) their gender, and (c) the type of student disability that they work with? A two-sample t-test was conducted to test the significant differences. As Table 4 illustrates, 34 of the participants (43.0%) indicated that they had prior professional development in the use of AT; conversely, 45 (57.0%) reported that they had not. The outcomes of the two-sample t-test demonstrated that the difference in teachers' consideration of SETT in the selection and use of AT with their students according to whether or not they had previous professional development was statistically significant—$t = 4.988$, $p = .001$ with a significance level of 0.05—which indicated that $p < .05$ (Table 4). These findings suggested that teachers having previous professional development in AT had a statistically significant influence on their consideration of SETT in the selection and use of AT with students. However, no significant differences were found in the responses between teachers who work with students with intellectual disabilities and teachers who work with students with ASD, nor were significant differences found concerning the gender of the participants (Table 4).

Table 4
Two-Sample T-Test of Teachers' Standards of Selection and Use of AT Based on Previous Professional Development, Type of Student Disability, and Gender

Previous PD on AT use	N	M	SD	df	t	p
Yes	34	58.38	4.09	77	4.988	.001
No	45	53.31	4.73			
Type of student disability that teacher works with						
Intellectual disabilities	55	55.41	5.49	77	−.197	.844
Autism spectrum disorder	24	55.66	4.21			
Gender						
Male	44	54.59	.80	77	−1.784	.078
Female	35	56.62	.78			

Research question 3d was: Are there significant differences in teachers' standards for selection and use of AT based on their teaching experience? A one-way ANOVA was conducted to determine whether there were statistically significant differences between teachers' teaching experience and their standards for the selection and use of AT with students. As Table 5 demonstrates, the outcomes indicated that there were no significant differences in teachers' responses to the SETT standards based on their teaching experience.

Table 5
One-Way ANOVA of Teachers' Standards of Selection and Use of AT Based on Teachers' Experience

Source	SS	df	MS	F	p
Between groups	55.611	3	18.537	.701	.555
Within groups	1984.136	75	26.455		
Total	2039.747	78			

With respect to questions 3a, 3b, and 3c—concerning previous professional development, type of disability, and gender—, a two-sample t-test was conducted to test the significant differences. Presented in Table 6, the findings indicated that the differences in teachers' AT knowledge and skills based on whether they had previous professional development in the use of AT or not was statistically significant—t = 3.677, p = .001 with a significance level of 0.05—which indicated that p < .05 (Table 6). The results did not indicate statistically significant differences in teachers' knowledge and skills between those who work with students with intellectual disabilities and those who work with students with ASD, nor were there statistically significant differences based on gender (Table 6).

Table 6
Two-Sample T-Test of Teachers' Skills and Knowledge Based on Previous Professional Development, Type of Disability, and Gender

Previous PD on AT use	N	M	SD	df	t	p
Yes	34	73.26	7.89	77	3.677	.001
No	45	67.08	6.98			
Type of student disability that teacher works with						
Intellectual disabilities	55	69.89	7.23	77	.242	.809
Autism spectrum disorder	24	69.41	9.58			
Gender						
Male	44	68.77	7.70	77	−1.223	.225
Female	35	70.97	8.22			

Research question 4d was: Are there significant differences in teachers' skills and knowledge of AT based on their teaching experience? A one-way ANOVA was conducted to determine whether there were significant differences between teachers' teaching experience and their considerations of SETT standards in the selection and use of AT with students. The results of the one-way ANOVA suggested that the differences in teachers' skills and knowledge based on their teaching experience were statistically significant p < .05 (Table 7). To obtain further details about the

differences in teachers' skills and knowledge, a Tukey post-hoc test was conducted. The findings indicate that teachers with more years of teaching experience tended to have more skills and knowledge of AT.

Table 7
One-Way ANOVA of Teachers' Skills In and Knowledge Of AT Based on Teachers' Experience

Source	SS	df	MS	F	p
Between Groups	639.739	3	213.246	3.715	.015
Within Groups	4305.198	75	57.403		
Total	4944.937	78			

Discussion and Implications

The SETT Framework

This framework was designed with the aim of assisting team members to work together, obtain, and organize data on students to achieve collaborative decision-making regarding the selection and use of AT to help increase the educational success of students with disabilities (Zabala, 2020). To ensure that students with disabilities are provided with the AT devices and services that best suit their abilities, needs, and wants, it is highly recommended that the SETT Framework be taken into consideration when selecting and using AT (Zabala, 1995). Each of the four elements of SETT—student, environment, tasks, and tools— contains several standards that guide collaborative teams when selecting and using AT with students with disabilities.

The findings of the current study revealed that teachers' consideration of the SETT Framework was somehow lacking in many areas. However, the total mean score of all items was 3.46, indicating a relatively average level of consideration of the SETT standards in the selection and use of AT with students with intellectual disabilities and ASD. These results match those observed in an earlier study conducted by Abu-Alghayth (2020). The researcher examined the extent to which teachers took into consideration several standards related to the SETT Framework when using AT with students with severe intellectual disabilities and ASD. Abu-Alghayth (2020) found that teachers lacked consideration for the standards due to the absence of planning and collaboration concerning AT use in the students' IEP. However, the study examined only four standards under the student element of the SETT. The current study went further and examined all standards under all four elements.

Statistically significant differences were found based on teachers' previous professional development. Results indicated that 57% of the participants did not have previous professional development in the use of AT. Other studies conducted in Saudi Arabia showed a serious lack of professional development in AT use among special education teachers (Abu-Alghayth, 2020; Alkahtani, 2013; Almalki & Al-Harthi, 2020). This is a negative indicator when it comes to the importance of AT use in teaching students with intellectual disabilities and ASD. Professional development in the use of AT has been proved to play a significant role in teachers' AT use with students with disabilities. Several studies have shown a connection between insufficient professional development in AT and the use of AT among teachers (Abu-Alghayth, 2020; Alfaraj & Kuyini, 2014; Alkahtani, 2013; Flanagan et al., 2013). For instance, Alkahtani (2013) found that 92.9% of participants did not attend any workshops or training on the use of AT, and approximately 93.7% (N = 119) neither used nor requested AT evaluation for students.

In this study, participants with no previous professional development in AT reported that they selected and used AT with less consideration of the standards of the SETT Framework than teachers with previous professional development in AT. This indicates that increasing teacher professional development is significant, particularly when it comes to teaching students with intellectual disabilities and ASD using AT. Several researchers have found that training teachers on the use of AT has become a major need (Ajuwon & Chitiyo, 2016; Constantinescu, 2015; Flanagan et al., 2013; Jacobsen, 2012). Thus, it is highly recommended that Saudi teachers working with students with disabilities receive adequate professional development sessions on the use of AT.

Knowledge and Skills

It has long been known that the success of AT usage with students with disabilities is connected to the skills and knowledge of their teachers (Michaels & McDermott, 2003). The current study found that teachers reported a high level of knowledge and skills in some areas and a lack in others. For example, reported knowledge of concepts and terms related to the use of technology was the highest mean score among all items (M = 4.31). Meanwhile, teachers reported a significant lack of knowledge and skills in areas such as monitoring the outcomes of technology-based interventions and re-evaluating and adjusting the system as needed (M = 2.24); using technology in the assessment, diagnosis, and evaluation of students (M = 2.62); and collaborating with other team members in planning and implementing the use of assistive and adaptive devices (M = 2.82). Such insufficient knowledge in certain areas of AT knowledge and skills further supports the outcomes of other recent studies (Alharbi, 2018; Chukwuemeka & Samaila, 2020). For instance, Alharbi (2018) found that teachers reported high levels of knowledge of AT in areas such as arranging the classroom for AT, but a lack of knowledge in following a plan to evaluate students' improvement after AT usage.

Furthermore, the present study's findings indicated a statistically significant difference in teachers' knowledge and skills based on their previous professional development. Teachers with previous professional development reported a relatively higher level of knowledge and skills than other teachers. These results agree with the findings of other studies that found professional development to be associated with teachers' knowledge of AT (Ajuwon & Chitiyo, 2016; Schaaf, 2018). This is an indicator that teachers of students with disabilities are in a great need of professional development sessions on the use of AT to gain further knowledge in AT so they can use it to teach students effectively. This study also demonstrated statistically significant differences in teachers' knowledge and skills in AT use based on their teaching experience. Teachers with more years of teaching experience reported higher mean scores in AT knowledge and skills than other teachers. These results differ from those of Alharbi (2018) and Alasmari (2019), who found no statistically significant differences in teachers' AT knowledge and skills based on years of teaching experience. However, those studies were conducted in different areas of the country on different populations and with different samples. Moreover, the survey items on AT knowledge and skills—derived from the CEC Knowledge and Skill Base for All Entry-Level Special Education Teachers of Students with Intellectual/Developmental Disabilities—consisted of several areas of knowledge and skills that teachers with more years of teaching experience usually have. However, further investigation is still needed regarding the relationship between teachers' experience and their AT knowledge and skills.

In summary, these findings have important implications in terms of understanding what teachers know about using AT with students with intellectual disabilities and ASD, and how they select and use AT with students. The evidence from this study suggested that it is critical to develop teachers' skills and improve their selection and use of AT through a series of professional development sessions on the use of AT.

Limitations of the Study

There are several limitations in this investigation that must be acknowledged. The first limitation is the study sample. There was a relatively low response rate and the participants were recruited from only one city with a small population of teachers of students with intellectual disabilities and ASD. This limits the generalizability of the study's outcomes to other places across the country. Another limitation is that the participants' level of education was not examined to determine whether it affects teachers' skills and knowledge of AT or the SETT Framework. Level of education has been associated with teachers' knowledge of AT in previous studies (e.g., Alasmari, 2020; Alharbi, 2018). Moreover, this study examined the extent to which teachers follow the SETT Framework guidelines in their selection and use of AT, so exploring other strategies and standards was beyond the scope of the current study.

Recommendations for Future Directions

This study has presented questions in need of further investigation concerning teachers' selection and use of AT and their knowledge and skills in its use with students with disabilities. Further work should be carried out to explore which other standards teachers take into consideration when selecting and using AT with students with disabilities. More broadly, based on the outcomes of this study, it is highly recommended to conduct a study examining how teachers decide which AT to use with students, when and how they decide to use it, and how that influences student achievement.

Further research into teachers' professional development in the use of AT with students with disabilities is strongly recommended. It is critical to understand the challenges of professional development sessions on the use of AT among many special education teachers. More information on the areas of AT usage and the skills that teachers still need in terms of how to use AT with students with disabilities is highly important and could be usefully explored in future research.

Conclusion

This study set out to determine the standards that teachers take into consideration when selecting and using AT with students with intellectual disabilities and ASD, in addition to exploring their AT knowledge and skills. The findings indicated that teachers did not consider most areas of the SETT Framework regarding the selection and use of AT with students. Also, teachers with less teaching experience reported relatively less knowledge than their peers. With respect to these findings, it was evident that professional development in the use of AT is a significant factor associated with teachers' selection and use thereof.

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