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RESEARCH ARTICLE



Obstacles for using assistive technology in centres of special needs in the UAE

Mohammad Fteiha^a, Mohammad Al-Rashaida^b , Deena ElSORI^c, Ashraf Khalil^d and Ghanem Al Bustami^a

^aDepartment of Education, College of Arts and Sciences, Abu Dhabi University, Abu Dhabi, United Arab Emirates; ^bDepartment of Special and Gifted Education, College of Education, United Arab Emirates University, Abu Dhabi, United Arab Emirates; ^cRabdan Academy, Abu Dhabi, United Arab Emirates; ^dCollege of Technological Innovation, Zayed University, Dubai, United Arab Emirates

ABSTRACT

Assistive technology (AT) represents one way to improve access and participation in the school and home environments of people with disabilities (PWDs). This study analyzed the obstacles to AT acquisition, knowledge, use, recommendation, and training in special needs centers in the United Arab Emirates (UAE) from the perspective of professionals (teachers and therapists). A questionnaire was developed and its validity and reliability were confirmed. The questionnaire was distributed to all special-needs centers in the UAE via Survey Monkey, and 78 responses were received. The results indicate the nature of obstacles to AT use in special education centers in the UAE, with obstacles related to parents having the highest mean. The results also indicated a statistically significant difference in professionals' perception of obstacles to using AT based on experience level, center location, and level of education. Implications for further research and recommendations for policy and practice are provided.

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KEYWORDS

Assistive technology; special needs; obstacles; centers; teachers; therapists

> IMPLICATIONS FOR REHABILITATION

- Use of assistive technology (AT) enhances accessibility for students with disabilities. Therefore, it is imperative for centers and schools to actively seek access to AT tools and services to meet the needs of students with disabilities.
- Educational institutions must establish clear AT policies and legislation to provide AT tools for students with disabilities and address barriers to their implementation.
- Qualitative studies should be conducted to better understand the obstacles perceived by students with disabilities, teachers, principals, other staff, and parents as well as to gather recommendations for improvement.

Introduction

People with disabilities (PWDs) often face obstacles in accessing and participating in self-care, play, leisure, and education [1]. Today, PWDs are breaking obstacles through assistive technology (AT), which has become a necessary tool for engaging in and performing many tasks. The availability of AT devices and services empowers PWDs to have greater control over their lives. This enables them to participate in and contribute more fully to activities in their homes, schools, work environments, and communities. Moreover, AT enhances PWDs' ability to interact with others and benefits from otherwise inaccessible opportunities while promoting independence and improving their quality of life.

According to the IDEA, AT is defined as "any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of a child with a disability" [2]. The law mandates training for students with special needs, their families, and their teachers on how to use such technological tools [2]. Technological tools must adequately match students' needs to achieve desired outcomes or they will not benefit from such access [3,4].

Assistive technology can include mobility devices, such as walkers and wheelchairs, as well as hardware, software, and peripherals that assist people with disabilities in accessing computers or other information technologies [4]. For example, people with limited hand functions may use a keyboard with large keys or a special mouse to operate a computer, whereas people who are blind may use software that reads text on the screen in a computer-generated voice. People with low vision may use software that enlarges screen content, people who are deaf may use a text telephone (TTY), or people with speech impairments may use a device that speaks out loudly as they enter text via a keyboard [5,6]. By embracing AT, the UAE provides greater opportunities for PWDs to access education, employment, and community life, thus improving their quality of life.

Literature review

Despite dramatic advances in AT, one of the most prominent difficulties faced by PWDs is the availability of AT tools. Many remain deprived of access to suitable technology, which will help them increase their independence and participation in society. Globally, only 5–15% (~1 in 10 persons) of the population in need has

access to AT products, and the problem is more acute in low- and middle-income countries [7]. In addition, lack of awareness, professional education, and integration of assistive technology in schools have also been cited as obstacles [8,9]. Most teachers of PWDs consider their knowledge of AT inadequate [10,11].

Moreover, Copley and Ziviani [12] reviewed the literature on children with AT to identify the current obstacles to effective school integration. The obstacles included a lack of appropriate staff training and support, negative staff attitudes, inadequate assessment and planning processes, insufficient funding, difficulties in procuring and managing equipment, and time constraints. In this regard, Senjam et al. [13] studied the obstacles to using AT among students with visual disabilities in schools for the blind in India and found that the non-availability or limited possession of AT and financial constraints were significant obstacles to AT use among students.

Dwivedi [14] indicated that one of the prime obstacles financially sound people face is a scarcity of skilled professionals. Many professionals are unaware of newer and higher-quality devices, which restricts them from recommending compatible devices. Moreover, Wong and Cohen [3] described the experiences of AT used by teachers of students with visual impairments in Singapore and indicated significant gaps and disconnections in AT-related knowledge and skills among teachers. The findings also highlight resource limitations and inadequacies in pre-service training and professional development.

Flanagan et al. [15] examined middle school special education teachers' perceptions of AT during literacy instruction with students with high-incidence disabilities. Literacy teachers reported obstacles to using AT, including cost, usability, and a lack of training and experience. However, the consistency of teachers' reports regarding the need for more experience and knowledge of AT to fully utilize it has significant implications for pre-service preparation. This finding implies the necessity of offering supplemental and targeted experiences and information on AT. This may involve increasing the quantity and/or quality of AT training and resources offered in pre-service education programs to adequately prepare teachers to effectively utilize AT in the classroom [9,16–20].

AT in the UAE

In the UAE, AT has been embraced to promote inclusivity and accessibility for PWDs. The UAE is a rapidly developing country with a diverse population, including a significant number of expatriates. The UAE has made significant progress in the development and implementation of AT for PWDs. The country has implemented policies and programs that align with the goals of the United States Individuals with Disabilities Education Act (IDEA) [4,16], such as the National Strategy for Empowering PWDs. This strategy enhances PWD participation in all aspects of society including education, employment, and community life.

The literature on AT in the UAE setting is limited, reflecting its limited use in this particular context. Moreover, Maisikeli [5] examined the level of awareness and use of AT among PWDs in the UAE. Their results showed that only 40% of the participants were currently using assistive technologies, and 61.2% were aware of existing assistive technologies. Maisikeli [5] concluded that there is a need for an effective awareness program to increase the overall use of assistive technologies.

Moreover, Fteiha et al. [6] surveyed 100 special education professionals in the UAE to explore their attitudes toward AT. Their results showed that a positive attitude toward technology can lead to successful integration into the classroom. There were no

significant differences in attitudes based on profession, gender, academic qualifications, or locality. Assistive technology is commonly used in various areas of special education and has a positive impact on the learning process of children with special needs.

Almekhalafi and Tibi [4] examined obstacles to the implementation of AT in students with disabilities. They identified several significant obstacles to AT implementation, including professional development issues, device availability, administration support, and technical support. All participants reported that lack of initial training and sustained professional development, in addition to the high cost of AT devices, were the most common obstacles. These obstacles were largely attributed to a lack of awareness regarding the impact of AT devices on the performance of students with disabilities.

In summary, findings of many studies indicate that most teachers of students with disabilities describe themselves as being insufficiently prepared to use AT [8,10,12,14,15,21–23], and lack of AT knowledge is considered to be a significant barrier in implementing AT services and devices [3,11,15]. Lack of awareness of AT and its potential benefits for students with disabilities have also been cited as obstacles in several studies [8,14]. However, other studies have indicated that the nonavailability or limited possession of ATs and financial constraints were significant obstacles to the use of ATs among students [4,13].

Despite the potential benefits of AT and its increasing prevalence in many countries, including the UAE, research on the effective use of AT in the UAE is limited. Although AT can improve the lives of PWDs, there are many obstacles to the field, including those related to both research and implementation. For example, some obstacles related to implementation include the limited availability of AT devices and services, financial constraints, and insufficient training and support for educators and therapists. Meanwhile, research on AT in the UAE is limited by a lack of funding and resources as well as limited awareness and understanding of the potential benefits of AT for students with disabilities.

This study is grounded in cultural-historical activity theory (CHAT) developed by Vygotsky [24], Leont'ev [25], and Engeström [26], which provides a theoretical framework for exploring the role of assistive technology in special education. Specifically, CHAT was used to investigate how special education centers and their stakeholders in the UAE use AT tools to enhance the learning and development of children with special needs. By examining the availability and obstacles to AT use, this study aims to gain insights into the ways in which AT can be leveraged to build learners' experience and knowledge.

Thus, CHAT serves as a valuable lens for understanding complex interactions among learners, educators, and technology in the context of special education. In other words, CHAT is used to explore how special education centers and their stakeholders in the UAE work with assistive technologies to support children with disabilities and promote their active participation in various activities. Obstacles faced by parents, special educators/teachers, therapists, or professionals involved in the use of AT for students with disabilities and special needs significantly influence the extent to which AT is used in the teaching and learning process.

Considering this emerging literature, the aim of this study is to highlight the challenges to access and use of Assistive Technologies in UAE special education through the opinions and perceptions of professionals working in the field. This study is part of a major project that explores the use and availability of AT in special education centers in the Gulf region, which includes Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE.

Research questions

This study builds on existing literature in the field and answers the following research questions (RQs):

1. What are the obstacles to the use of assistive technology in special education centers in the UAE according to teachers and therapists working in such centers?
2. Does professionals' perception of obstacles regarding their use of assistive technology vary with their educational level, experience level, gender, type of disability center location, center type, and profession?

Methods

Ethical considerations

This study was approved by the ethics committee and conducted in accordance with the Declaration of Helsinki (2013). The patients/participants provided written informed consent to participate in this study.

Participants recruitment

The inclusion criteria for the potential participants were as follows: professionals working as special educators, speech therapists, or occupational therapists in special needs centers in either of the seven Emirates of the UAE, of any gender, age, and with a minimum of one year of professional experience in working with students with disabilities and use of assistive technology tools. The exclusion criteria were other professionals, such as psychologists, administrators, social workers, and nurses.

Procedure

The researchers contacted 80 managers of special needs centers across the seven UAE Emirates by email or phone. Of these, 76 managers from five Emirates (Abu Dhabi, Dubai, Sharjah, Umm Al Quwain, and Ras Al Khaimah) agreed to participate in the study and were recruited to help identify potential participants. The centers located in Ajman and Fujairah did not respond. Potential participants were then recruited through the participating centers, and the questionnaires were distributed *via* a hyperlink to an online survey administered through SurveyMonkey. Professionals who met the inclusion criteria were asked to complete the survey anonymously.

Instrument

The instrument used in this study was developed after an extensive review of the worldwide literature, with a particular focus on research related to assistive technology (AT) obstacles [10,12,14,27–29]. The procedure used to develop the first version of the instrument is as follows:

Content validity

To validate the questionnaire, a panel of five experts in the field of special education and AT was selected based on their qualifications and experience, including involvement in research related to AT and special education. All experts held doctoral degrees

and academic positions at universities in the UAE. Each expert was asked independently *via* email to rate the relevance of the 42 draft items of the conceptual framework on a four-point Likert scale, with one meaning “not relevant” and four meaning “highly relevant”, and to provide feedback on the items.

Based on feedback from the experts, the questionnaire was modified, including the removal of two items (“acceptance of the assistive technology tools by parents” and “coordination between students/parents to get the best results by choosing the appropriate tool”) and the grouping of others into sub-dimensions. The instrument was refined through the incorporation of expert observations and recommendations before undergoing a pilot study.

Pilot test

Before administering the questionnaire to the participants, a pilot study was conducted to assess its clarity and understandability. The pilot study involved 15 randomly selected master's students from a university special education program. The pilot sample confirmed that the questionnaire items were clear and easily understood. However, feedback from the pilot study participants highlights the need for additional guidelines to clarify the purpose of the survey. This valuable feedback played a crucial role in refining the questionnaire for the main study.

Final version of the questionnaire

The final version of the questionnaire (detailed in [Appendix A](#)) consisted of two parts. The first part comprised the seven demographic questions listed in [Table 1](#). The second part consisted of 40 items divided into five components: obstacles related to students with disabilities (items 1–5), professionals (items 6–23), parents (items 24–26), AT tools (items 27–38), and policies (items 39–40). Participants were asked to rate their center's obstacles on a five-point Likert-type scale, ranging from (5) strongly agree to (1) strongly disagree, and they had the option of providing additional obstacles not listed in the prepared survey *via* an open-ended question at the end of the questionnaire. The higher the mean, the greater the degree to which the participants perceived obstacles.

Reliability

The questionnaire showed high reliability, with a Cronbach's alpha value of 0.940, after conducting the study with 78 participants and analyzing the data [30].

Statistical analysis

Descriptive statistics were used to describe the participants. To answer Research Question 1, the mean and standard deviation (SD) were calculated for each item, and the average of all items for each subscale was determined. To answer research question 2, a *t*-test and one-way analysis of variance (ANOVA) for an independent sample were used to compare the differences in professionals' perceptions of obstacles in using AT based on the study variables. The alpha level was set at 0.05 *a priori*. The internal consistency of the questionnaire was estimated using Cronbach's alpha coefficient. IBM SPSS Statistics 23.0 was used for all analyses.

Table 1. Number and percentages of participants, mean and standard deviation, t-test, and one-way ANOVA results.

No.	Variable	N (%)	Mean $\pm$ SD	F (T)	p-Value
1	Center type			1.16	0.320
	Private	19 (24.3)	3.62 $\pm$ 0.35		
	Government	26 (33.3)	3.69 $\pm$ 0.32		
	Semi-government	33 (42.4)	3.71 $\pm$ 0.40		
2	Center location			4.26	0.00*
	Abu Dhabi	40 (51.2)	3.80 $\pm$ 0.36		
	Dubai	23 (29.4)	3.68 $\pm$ 0.13		
	Sharjah	9 (11.5)	3.79 $\pm$ 0.32		
	Ras al Khaimah	4 (5.2)	3.83 $\pm$ 0.12		
	Umm al Quwain	2 (2.5)	3.26 $\pm$ 0.65		
3	Profession			1.28	0.284
	Speech language therapist	24 (31)	3.82 $\pm$ 0.52		
	Occupational therapist	18 (23)	3.68 $\pm$ 0.26		
	Special educator	36 (46)	3.89 $\pm$ 0.65		
4	Educational level			(4.56)	0.01*
	MA and above	36 (46.1)	3.81 $\pm$ 0.33		
	BA	42 (53.9)	3.56 $\pm$ 0.42		
5	Gender			(1.61)	0.207
	Female	59 (75.6)	3.79 $\pm$ 0.44		
	Male	19 (24.4)	3.71 $\pm$ 0.40		
6	Experience levels			3.20	0.02*
	<4 years	14 (18)	3.74 $\pm$ 0.23		
	4–10 years	34 (43.6)	3.87 $\pm$ 0.24		
	10–15 years	4 (5.1)	3.05 $\pm$ 1.03		
	More than 15 years	26 (33.3)	3.98 $\pm$ 0.34		
7	Disability type			1.77	0.131
	Intellectual disability	9 (11.5)	3.85 $\pm$ 0.52		
	Autism spectrum disorder	50 (64)	3.71 $\pm$ 0.42		
	Learning difficulties	4 (5.2)	3.59 $\pm$ 0.26		
	Physical and health impairments	10 (13)	3.87 $\pm$ 0.30		
	Speech and language disorders	5 (6.3)	3.87 $\pm$ 0.30		

* $p < 0.05$.

Results

Sociodemographic data of the participants

The participants in the study comprised 78 relevant professionals of different types [36 special educators (46%), 24 speech therapists (31%), and 18 occupational therapists (23%)]. Of these, 60 were female (77%), 18 were male (23%), and 34 professionals had work experience from 4 to 10 years (41%). Forty participants worked in the Emirate of Abu Dhabi (53.3%) as opposed to other emirates, and 33 worked in semi-governmental organizations (43.4%). Table 1 presents the participants' general characteristics.

Research Question 1 investigated the obstacles faced by teachers and therapists in implementing AT in special education centers in the UAE. This study identifies several obstacles that limit the successful integration of AT tools in special-needs centers.

Existing obstacles related to students with disabilities

The results presented in Table 2 show important obstacles in centers related to students with disabilities ($M=3.03$, $SD=1.409$) from the viewpoint of professionals. It is sufficient to take note of the high scores (i.e., the mean above 3) of Items 1 and 3, which show the existence of significant obstacles in the centers from the participants' perception in this study. In this way, the obstacles in the centers related to students with disabilities were as follows:

- Students' awareness and acceptance of assistive technology tools ($M=3.79$, $SD=.770$).
- The ability of students to choose appropriate assistive technology tools ($M=3.03$, $SD=1.516$).

Existing obstacles related to professionals

The results presented in Table 2 show important obstacles related to professionals in the centers ($M=3.22$, $SD=0.965$). The obstacles present in this dimension can be observed (Items 8, 9, 12, 13, 17, 18, 20, 21, 22, and 23), such as:

- Ongoing training of therapists/teachers on the use of assistive technology tools ($M=3.01$, $SD=0.965$).
- Attitudes of therapists/teachers toward the use of assistive technology ($M=3.22$, $SD=1.015$).
- Time needed to train parents of people with disabilities to use assistive technology tools ($M=3.97$, $SD=0.847$).
- Time required for maintenance of assistive technology tools ($M=3.78$, $SD=0.870$).
- -Availability of a team to assess the needs of individuals with special needs ($M=3.79$, $SD=0.940$).
- Community attitudes toward disability ($M=3.74$, $SD=1.053$).
- Time available for learning about new assistive technology and how to use it ($M=3.06$, $SD=0.830$).
- Technical support for integrating instructional technology into the classroom ($M=3.05$, $SD=0.786$).
- Time available to prepare and develop new teaching strategies using assistive technology ($M=3.71$, $SD=1.056$).
- Spending a lot of time in the learning process when using assistive technology tools ($M=3.11$, $SD=0.946$).

Existing obstacles related to parents

The participants identified obstacles linked to their parents in special education centers. This is shown in Table 2, where we find values of the mean above 3 for this dimension ($M=4.03$, $SD=0.975$), indicating a high level of perceived obstacles, as well as for all its items (24, 25, and 26), such as:

- Knowledge of parents about different types of assistive technology ($M=4.07$, $SD=0.785$).
- Preparation and training of parents to use assistive technology tools ($M=4.03$, $SD=0.875$).
- Parents' knowledge about maintenance procedures of assistive technology tools ($M=4.03$, $SD=0.795$).

Existing obstacles related to the AT tools

The results presented in Table 2 show important obstacles in the centers related to AT tools ($M=3.17$, $SD=1.106$) from a professional viewpoint. These obstacles (Items 27, 30, 31, 32, 35, 37, and 38) include:

- Funding for assistive technology tools ($M=3.03$, $SD=0.823$).
- Long-term effectiveness of assistive technology ($M=3.47$, $SD=1.106$).
- should change the tool for each period ($M=3.28$, $SD=0.922$).
- Access to assistive technology tools ($M=4.10$, $SD=0.817$).
- Importance of assistive technology tools in promoting student learning and development ($M=3.10$, $SD=1.772$).

Table 2. Mean and standard deviation of all items in the obstacle survey.

No.	Statements	Mean	Std. deviation
Obstacles related to students with disabilities			
1.	Students' awareness and acceptance of assistive technology tools	3.79	0.770
2.	Students' experience and skills in using assistive technology tools	2.71	0.799
3.	The ability of students to choose appropriate assistive technology tools	3.03	1.516
4.	The impact of students' physical and health conditions on the use of assistive technology tools	2.97	1.516
5.	The effect of assistive technology tools on the timely completion of individual	2.67	1.491
Obstacles related to professionals			
6.	Availability of adequate time for students to use assistive technology tools	2.85	0.784
7.	Training and preparation of therapists/teachers on the use of assistive technology tools before hiring	2.88	0.960
8.	Ongoing training of therapists/teachers on the use of assistive technology tools	3.01	0.965
9.	Attitudes of therapists/teachers towards the use of assistive technology	3.22	1.015
10.	Coordination among therapists/teachers to choose appropriate tools	2.90	0.817
11.	Time required to teach individuals with special needs to use assistive technology tools	2.88	.857
12.	Time needed to train parents of people with disabilities to use assistive technology tools	3.97	0.847
13.	Time needed for maintenance of assistive technology tools	3.78	0.870
14.	Understanding of administrators about the needs of teachers and students	2.93	0.868
15.	Provision of reference for choosing appropriate assistive technology tools	2.87	0.846
16.	Knowledge of administrators about the importance of assistive technology	2.93	0.980
17.	Availability of a team to assess the needs of individuals with special needs	3.79	0.940
18.	Community attitudes towards disability	3.74	1.053
19.	University courses that provide comprehensive knowledge about assistive technology	2.86	0.789
20.	Time available for learning about new assistive technology and how to use it	3.06	0.830
21.	Technical support for the integration of instructional technology in the classroom	3.05	0.786
22.	Time available to prepare and develop new teaching strategies using assistive technology	3.71	1.056
23.	Spending a lot of time in the learning process when using assistive technology tools	3.11	0.946
Obstacles related parents			
24.	Knowledge of parents about different types of assistive technology	4.03	0.975
25.	Preparation and training of parents to use assistive technology tools	4.07	0.785
26.	Parents' knowledge about maintenance procedures of assistive technology tools	4.03	0.875
Obstacles related AT tools			
27.	Funding for assistive technology tools	4.03	0.795
28.	Technical assistance in adapting and modifying tools	3.17	1.106
29.	Technical assistance in the maintenance of assistive technology tools	3.03	0.823
30.	Long-term effectiveness of assistive technology	2.89	0.786
31.	Need to change the tool each period	2.93	0.884
32.	Access to assistive technology tools	3.47	1.106
33.	Availability of assistive technology tools in Arabic markets	3.28	0.922
34.	Most of the tools available are in English	4.10	0.817
35.	Importance of assistive technology tools to promote student learning and development	2.89	0.875
36.	Appropriate assessment tools to determine student needs	2.93	0.868
37.	Reliability of assistive technology tools	3.10	1.772
38.	Cost of assistive technology tools	2.87	0.681
Obstacles related to policies			
39.	Availability of policies and legislation to ensure the use of assistive technology tools	3.45	0.948
40.	Implementation of policies and legislation to ensure the use of assistive technology tools in special education centers	3.02	0.983
		3.96	0.89
		3.94	0.929
		3.97	0.850

- Reliability of assistive technology tools ($M=3.45$, $SD=0.948$).
- Cost of assistive technology tools ($M=3.02$, $SD=0.983$).

Obstacles related to policies

The participants identified obstacles in special education centers linked to policies. This is shown in Table 2, where we find values of the mean above 3 for this dimension ($M=3.96$, $SD=0.89$), indicating a high level of perceived obstacles, as well as for all its items (39 and 40), such as:

- Implementation of policies and legislation to ensure the use of assistive technology tools in special education centers ($M=3.97$, $SD=0.850$).
- Availability of policies and legislation to ensure the use of assistive technology tools ($M=3.94$, $SD=0.929$).

Research question 2 investigated whether there were statistically significant differences between the five obstacles and the

professionals' (a) experience levels, (b) educational level, (c) gender, (d) type of disability they work with, (e) center location, (f) center type, and (g) profession.

As shown in Table 1, the results of the one-way ANOVA showed a statistically significant difference in professionals' perceptions of obstacles hindering the use of AT based on experience level, favoring those with more than 15 years of experience. Similarly, there was a statistically significant difference in their perception of obstacles based on the center location, favoring those working in Abu Dhabi. However, no statistically significant difference was found among professionals in their perception of obstacles regarding their use of AT based on the type of disability they work with, profession, and center type, with $p < .05$.

Additionally, the *t*-test revealed a statistically significant difference in the perception of obstacles based on educational level, favoring those with a Master's degree or higher. However, there was no statistically significant difference among professionals in their perception of obstacles related to their use of AT based on gender ($p < .05$).

Discussion

Our study aimed to identify the obstacles to the use of AT in special education centers in the UAE according to teachers and therapists working in such centers. In addition, it examines whether professionals' perception of obstacles regarding their use of AT varies with their educational level, experience level, gender, type of disability they work with, center location, center type, and profession. The results of this study shed light on the significant obstacles that hinder the successful integration of AT tools into special education centers in the UAE. These obstacles were categorized into several categories: obstacles related to students with disabilities, existing obstacles related to professionals (teachers and therapists), existing obstacles related to parents, existing obstacles related to AT tools, and obstacles related to policies.

One of the significant obstacles identified in centers related to students with disabilities is their awareness and acceptance of AT tools. Many students with disabilities may be unaware of the benefits of AT and may have negative perceptions of their ability to use such tools [31]. This lack of awareness and negative perceptions can limit their willingness to explore and use AT in their learning and daily lives. Furthermore, the students' ability to choose appropriate AT tools was identified as an obstacle. Lee and Templeton [32] found that students with disabilities face obstacles in accessing technological tools due to financial issues, lack of familial involvement, absence of qualified professionals, and unavailability of appropriate tools [33]. This finding highlights a clear lack of support and guidance for students in selecting the most suitable AT tools for their specific needs. This finding is consistent with the research conducted by Al-Zboon [34] in Jordan, which found that teachers faced obstacles related to the inappropriate use of AT tools for students with disabilities.

Furthermore, the results indicate that professionals working in special education centers face various obstacles to implementing AT. One prominent obstacle was the ongoing training of therapists and teachers on the use of AT tools. This finding agrees with the existing literature that highlights the need for professional development and continuous training for educators to effectively integrate assistive technology into their instructional practices [35,36]. According to Al-Zboon [34], teachers reported a lack of technical support and knowledge regarding the use of technological tools.

Another obstacle identified was the attitudes of therapists and teachers toward the use of AT tools. This aligns with previous literature that has emphasized the importance of positive attitudes and beliefs about assistive technology among professionals [37,38]. These attitudes can significantly influence the implementation and success of assistive technology in special education centers. Additionally, the study found that the time required to train the parents of individuals with disabilities to use assistive technology tools was perceived as a significant obstacle. This aligns with Alharbi's [39] study, which highlighted the lack of support and training for parents in using AT tools and the resultant barriers to their effective use. Furthermore, the study found that professionals perceived community attitudes toward disabilities as an obstacle to the implementation of assistive technology. This finding indicates that negative societal attitudes and stigma toward individuals with disabilities may hinder the acceptance and use of assistive technology in special education centers.

However, the lack of suitable training for center personnel poses a significant obstacle to effective AT implementation [23,27,40–42]. These obstacles are consistent with the findings of other studies [3,4,11,15] that have identified a lack of AT

knowledge as a significant barrier to implementing AT services and devices. Furthermore, studies [8,14] have found that lack of awareness is also a barrier to implementation.

Additionally, the study revealed that professionals perceived the lack of a team to assess the needs of students with disabilities as an obstacle. This finding is consistent with the literature that emphasizes the importance of a multidisciplinary approach in assessing and planning the AT needs of individuals with disabilities [43]. Another obstacle identified in the study was the time available for learning new AT tools and how to use them. This finding agrees with Antón-Sancho et al.'s study [44], which highlighted the time constraints faced by professionals in special education centers. These time constraints can limit the ability of professionals to stay updated and knowledgeable about new assistive technology tools and their implementation strategies [31].

This highlights the importance of providing support and training for both professionals and parents. It is essential that professionals receive adequate training to enable them to effectively train parents on the use of AT tools, as this can significantly impact the successful integration of AT tools into the lives of PWDs [16]. This finding is consistent with previous studies [8,10,14–16,21] that indicated that most teachers of students with disabilities described themselves as insufficiently prepared to use AT.

The results showed that parents were the most significant obstacle to the successful integration of AT tools, with their lack of knowledge about the different types of AT being a notable concern. Furthermore, the participants noted that the preparation and training of parents to use AT tools and their knowledge of maintenance procedures were also considered obstacles to the successful implementation of AT in the centers. These findings are not surprising, as parents play a critical role in their children's education, especially those with disabilities, and their level of involvement can significantly impact the effectiveness of interventions [6,16]. The finding of obstacles related to parents aligns with Mapepa and Magano's study [45], which emphasizes the importance of training and support for parents in using AT. This was also confirmed by Koch's [46] findings, which highlighted the importance of parent involvement and support in the successful implementation of assistive technology in special education settings.

Furthermore, the study found that professionals perceived a lack of funding for AT tools as a significant obstacle. This is because the high cost of AT devices is a barrier to their effective use [47]. In addition, the participants in our study perceived the long-term effectiveness of AT tools as an obstacle. This finding indicates that professionals may be concerned about the sustainability and durability of AT tools. However, issues related to funding and the effectiveness of AT tools were considered common barriers to the implementation of AT in educational settings [36,48].

The study also found that access to AT tools is a significant obstacle, with students with disabilities facing difficulties in accessing necessary tools and services. The finding that access to AT tools is a significant obstacle is concerning because it directly affects the ability of students with disabilities to benefit from the use of AT. The lack of access to these tools and services may be due to several factors, such as limited funding, insufficient resources, or inadequate policies [6].

The results of this study highlight the critical role of policies and legislation in the successful integration of AT tools in special education centers. The finding that the activation of policies and legislation is a significant obstacle indicates a clear gap between the development and implementation of policies and their practical applications in the field. This gap is likely attributable to a lack of resources or training to effectively implement policies

related to AT in special education centers [4–6,16]. Moreover, supportive policies and legislation to ensure the use of assistive technology tools in special education centers are significant [31]. For example, Baglama [35] emphasized the need for clear policies and legislation that promote the integration of assistive technology in special education centers.

The second research question aimed to investigate whether there were any statistically significant differences between the five obstacles and various factors, such as professionals' experience levels, educational level, gender, type of disability they work with, center location, center type, and profession. The findings of the current study revealed a statistically significant difference in professionals' perceptions of obstacles to using AT regarding their experience level, educational level, and center location.

Specifically, the results of this study indicated that professional experience levels had a significant impact on their perception of obstacles to using AT, which contradicts the findings of previous studies [49,50]. These studies found that years of teaching experience did not affect teachers' beliefs about AT use. However, professionals with more experience in special needs centers may have advanced knowledge and greater awareness of the importance of AT in the learning process and in supporting the abilities of students with disabilities [6,16,20].

Based on the findings of the current study, there were significant statistical differences in professionals' perceptions of obstacles to using AT based on their level of education. Post- and undergraduate special education programs include courses that focus on the benefits of AT implementation when teaching students with disabilities. This may explain why professionals with master's degrees and above had a more positive attitude toward using AT. Interestingly, professionals with master's degrees were also the most critical in identifying a greater number of obstacles to using AT, indicating a higher level of awareness of and attention to potential obstacles [51].

The study found a significant difference in the perception of obstacles to the use of AT among professionals in the UAE, with those working in Sharjah having a more favorable perception than professionals in other emirates. Specifically, professionals in Abu Dhabi and Dubai reported encountering more obstacles to using AT than those in Sharjah did. However, there was no significant difference in the perception between professionals in Ras Al Khaimah and Umm Al Quwain. One possible explanation for this difference may be related to the availability of resources at each location. Perhaps Sharjah has more resources allocated toward AT and professionals in this location are better equipped and supported in using AT with their students. Additionally, there may be differences in the training and professional development opportunities available for teachers and therapists in different locations, which could also impact their perception of AT use [6,16,51].

The results of this study did not show any statistically significant differences in professionals' perceptions of obstacles to using AT based on gender. The study participants of both genders showed awareness of the significance of AT in special education centers, which could explain this result. This finding is consistent with several studies [22,28,29] that found no significant differences in teachers' perceptions of AT use based on gender.

Limitations

The generalizability of this study's findings may be limited because of the small, randomly selected sample size of the study participants. In addition, the study relied solely on self-reported data

from professionals, and no effort was made to verify the accuracy of their responses. Data were collected through a survey that focused primarily on identifying obstacles to implementing AT without incorporating other research methods, such as interviews. Therefore, further validation of the survey instrument, with additional items addressing strategies for overcoming the identified obstacles, may be beneficial based on a larger sample size. Additionally, the study was conducted exclusively within special needs centers, and the conditions for successful AT implementation may differ significantly in public schools.

Implications and potential solutions

Based on the findings of this study, addressing these obstacles is crucial for the successful integration of AT tools and services in special education centers in the UAE. Furthermore, it is essential to prioritize the training and professional development of teachers, therapists, service providers, and families. This will enable them to effectively utilize assistive technology tools and provide necessary support and guidance to students with disabilities. These individuals require a multifaceted approach to training and support, covering a range of knowledge and skills related to disability, hardware and software, adaptive devices, systems for procuring equipment, design and construction of individualized equipment adaptations, and the settings in which AT will be used [50]. This is important because it ensures that those working with individuals with disabilities have the necessary knowledge and skills to implement AT solutions effectively.

Special education centers should establish one-to-one consultations with technology experts to provide ongoing support for educators and other professionals. This consultation can be conducted either on-site or through regular visits and serves as a valuable resource for troubleshooting and addressing any issues that may arise with the use of AT. In addition to training and support, careful planning is critical to ensure that students with special needs can effectively use AT to address their goals [49]. This includes a structured program that regularly incorporates AT devices and services into the classroom.

Centers and schools should allocate resources to meet the technological needs of their students because AT devices can be costly. Furthermore, it is recommended that there are clear AT policies and legislation in place. These policies and legislation should outline the entire AT process, including consideration, assessment, implementation, and progress monitoring. Having clear guidelines and a standardized process for AT will help overcome current obstacles and provide educators, therapists, parents, and other team members with a clear framework for effectively managing and implementing AT.

Despite the obstacles identified in our study, several potential solutions could be implemented in the UAE and other countries and societies. These potential solutions include raising awareness of assistive technology and its benefits among people with disabilities and their families. In addition, advocating the rights of people with disabilities to access and use AT is crucial [38]. Furthermore, supporting the research and development of AT is essential to ensure that people with disabilities benefit from the latest technological advances [52–54].

Conclusions

Our study identified various obstacles to the use of assistive technology in special education centers in the UAE. These obstacles

encompassed multiple dimensions, including existing ones related to students with disabilities, professionals (teachers and therapists), parents, AT tools, and policies. The greatest obstacle identified was the lack of knowledge among parents regarding different types of AT. In addition, the activation of AT policies and legislation was found to be a significant barrier. These findings emphasize the need for change and innovation at all levels of the current AT system.

Further qualitative studies are recommended to obtain a comprehensive understanding of the obstacles and recommendations related to assistive technologies for students with disabilities. These could involve conducting interviews with participants to validate the results of the questionnaires and gain additional insights into the obstacles faced in AT training programs in the UAE. Additionally, delving into the experiences of people with disabilities regarding their use of AT tools and services through individual interviews or focus groups can confirm and deepen our understanding of the specific obstacles they face when using AT, going beyond questionnaire data. Capturing their personal reflections and insights would be invaluable for therapists, guiding them to recommend more relevant and tailored AT solutions that effectively address PWDs' individual needs and preferences. In addition, it is important to address the obstacles to integrating AT into education systems. Further studies are also recommended to investigate the reason behind the existing obstacles to AT in the UAE and consider toing these obstacles.

Based on these results, it is evident that addressing the obstacles related to AT implementation in special education centers requires a comprehensive approach involving multiple stakeholders. These stakeholders must work together to improve awareness, provide adequate training and support, address funding and accessibility issues, and advocate for supportive policies and legislation.

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ORCID

Mohammad Al-Rashaida  <http://orcid.org/0000-0001-6354-1187>

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Appendix

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Dimension one: Obstacles related to students with disabilities					
1. Students' awareness and acceptance of assistive technology tools					
2. Students' experience and skills in using assistive technology tools					
3. The ability of students to choose appropriate assistive technology tools					
4. The impact of students' physical and health conditions on the use of assistive technology tools					
5. The effect of assistive technology tools on the timely completion of individual					
Dimension two: Obstacles related to professionals					
6. Availability of adequate time for students to use assistive technology tools					
7. Training and preparation of therapists/teachers on the use of assistive technology tools before hiring					
8. Ongoing training of therapists/teachers on the use of assistive technology tools					
9. Attitudes of therapists/teachers towards the use of assistive technology					
10. Coordination among therapists/teachers to choose appropriate tools					
11. Time required to teach individuals with special needs to use assistive technology tools					
12. Time needed to train parents of people with disabilities to use assistive technology tools					
13. Time needed for maintenance of assistive technology tools					
14. Understanding of administrators about the needs of teachers and students					
15. Provision of reference for choosing appropriate assistive technology tools					
16. Knowledge of administrators about the importance of assistive technology					
17. Availability of a team to assess the needs of individuals with special needs					
18. Community attitudes towards disability					
19. University courses that provide comprehensive knowledge about assistive technology					
20. Time available for learning about new assistive technology and how to use it					
21. Technical support for the integration of instructional technology in the classroom					
22. Time available to prepare and develop new teaching strategies using assistive technology					
23. Spending a lot of time in the learning process when using assistive technology tools					
Dimension three: Obstacles related parents					
24. Knowledge of parents about different types of assistive technology					
25. Preparation and training of parents to use assistive technology tools					
26. Parents' knowledge about maintenance procedures of assistive technology tools					
Dimension four: Obstacles related AT tools					
27. Funding for assistive technology tools					
28. Technical assistance in adapting and modifying tools					
29. Technical assistance in the maintenance of assistive technology tools					
30. Long-term effectiveness of assistive technology					
31. Need to change the tool each period					
32. Access to assistive technology tools					
33. Availability of assistive technology tools in Arabic markets					
34. Most of the tools available are in English					
35. Importance of assistive technology tools to promote student learning and development					
36. Appropriate assessment tools to determine student needs					
37. Reliability of assistive technology tools					
38. Cost of assistive technology tools					
Dimension five: Obstacles related to policies					
39. Availability of policies and legislation to ensure the use of assistive technology tools					
40. Implementation of policies and legislation to ensure the use of assistive technology tools in special education centers					

Appendix A

The instrument items

Section one: Demographic information

Gender: ☐ Female ☐ Male

What is the highest education level you have achieved?

What type of center do you work in?

☐ Private ☐ Government ☐ Semi-government:

In which city/emirate is your center located?

What is your primary profession within the center?

How many years of experience do you have working with students with disabilities?

☐ <4years ☐ 4–10years ☐ 10–15years ☐ More than 15years

What type of disabilities do the students you work with primarily have?

Section two: Professional perspectives on using assistive technology in centers of special needs in the UAE

Please rate the following statements based on your perceptions and challenges regarding the use of assistive technology tools in special education settings for students with disabilities