

Innovation for All: Unleashing the Power of Assistive Technology in Special Education in Arabic-Speaking Countries

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Abstract: This topical review digs into special education teachers' growing usage of Assistive Technology (AT) in Arabic-speaking countries to serve children with impairments. This study investigates AT's benefits, drawbacks, and possible applications in this educational setting by reviewing the available literature from six major academic databases, including Scopus, Web of Science, JSTOR, ERIC, Academia, and ResearchGate. The findings highlight the need for tailored and student-centered approaches to AT adoption and effective training and ongoing support for educators and students. Furthermore, the study emphasizes the potential of AT to improve academic and functional outcomes, allowing students to overcome obstacles and actively participate in their educational path. The significance of these findings for future special education research and practice is examined, laying the groundwork for further investigation of AT's influence on children with disabilities in Arabic-speaking countries. The outcomes of this review emphasize the need to implement AT in Arabic-speaking special education settings using tailored and student-centered approaches. Students with disabilities can effectively use AT solutions to enhance their learning experiences by tailoring AT solutions to specific needs. Furthermore, the study emphasizes the importance of instructor and student training and ongoing assistance. Proper training provides instructors with the skills and information they need to properly deploy AT tools, while continual support ensures that AT remains effective in the classroom.

Keywords: Assistive technology; special education; middle east; Arabic-speaking countries; review

INTRODUCTION

Assistive technology (AT, hereafter) has become an increasingly important tool in special education for meeting the needs of students with disabilities. AT includes computers, tablets, and cell phones that disabled individuals use to help them carry out their daily activities (Cook & Hussey, 2002; Nerri et al., 2023). AT in special education benefits students with various disabilities, including mobility, cognition, sensory processing, and language (Bryant et al., 2003). This study aims to take a comprehensive look at the present state of research on AT in special education, covering its benefits, drawbacks, and applications.

Introducing AT into special education benefits students with disabilities in various ways. A significant benefit of AT is its ability to encourage the development of cognitive and motor skills (Beukelman et al., 2008). Students with disabilities who use AT show gains in reading, writing, and communication. For students with disabilities to succeed in the long run, they must learn to work with others, advocate for themselves, and be self-sufficient, all of which AT can facilitate (Furniss & Biswas, 2012). Students with impairments have the extra benefit of fully engaging in general education courses because of the use of AT in special education (McCarthy et al., 2013). By providing students with disabilities access to the same educational opportunities as their typically developing peers, AT can aid in reducing the achievement gap between students with and without disabilities.

While the use of AT in special education has the potential to yield many benefits, many challenges must be surmounted. AT implementation can be challenging because of

the need for tailored and student-centered approaches (Bryant et al., 2003). Educators must work closely with students and their families to ensure that each student receives the most beneficial AT solutions. One barrier to AT's widespread adoption in special education is its need for consistent funding (Cook & Hussey, 2002). Teachers need training on how to integrate AT into their curriculum effectively. Students also need guidance on advocating for themselves and using AT on their own effectively.

LITERATURE REVIEW

The research literature documents the benefits of AT for students with disabilities and its drawbacks in the classroom. Angelo (2000) and others have shown customized technologies to aid this student demographic by piquing their interest in learning and providing additional support. In their research, Murray and Rabiner (2014) found that students who used AT reported more significant gains in knowledge and skills. Additionally, they aid students with disabilities in performing tasks that would otherwise be difficult (Sullivan & Lewis, 2000). On the other hand, Nelson et al. (2013) investigated ways to improve students' intellectual and language development. Multimedia AT (MAT) was found to improve academic achievement in a study by Howard-Bostic et al. (2015). McNicholl et al. (2021) conducted a systematic review of the use of AT by college students with disabilities and found four main themes: AT as a facilitator of academic engagement; barriers to effective AT use can hinder academic participation; the transformative possibilities of AT from a psychological perspective; and AT as a facilitator of participation. The potential benefits of AT for students with disabilities in terms of enhanced social acceptance and less stigma are similarly concluded by De Witte et al. (2018) and Asongu et al. (2019).

Byrd and Leon (2017) identified three main barriers that prevent students with disabilities from being approached and involved in the use of so-called tailored ATs: First, there is a lack of accessible technology for students with disabilities. The high cost of AT and the unpredictability of its funding both function as barriers to providing AT to students with disabilities. Third, more teaching should be given to digital tools and resources, which is a significant barrier for students with impairments. Some limitations on their application in special education were noted by Copley and Ziviani (2004). Among these are insufficient funds, problems with equipment management, a lack of time, teachers' bad attitudes, and inadequate assessment and planning procedures. Murray and Rabiner (2014) and Howard-Bostic et al. (2015), among others, highlight the problem of inadequate training for educators on the use of AT.

Potential Applications of AT in Special Education

When discussing the educational needs of pupils with some impairment, the term "special education" is typically used. The program's overarching goal is to help these students grow intellectually, socially, and emotionally by giving them a tailor-made education. The field of special education research is expanding, with recent studies looking at topics including the function of evaluation in shaping lessons and the effects of technology in the classroom. The application of Universal Design for Learning (UDL) principles, as demonstrated by the research of Rose and Meyer (2002), can increase the accessibility of educational materials for students with disabilities, improving their academic performance. Wiener and Dobler (2007) researched the role of technology in special education. They found that assistive technologies like text-to-speech software and voice recognition technology are helpful for students with impairments. Studies on the application of individualized teaching in special education have yielded positive results, showing that it can be an effective method for catering to the wide range of demands that

students with disabilities have (Tomlinson, 1999). Regarding assessment, Thurlow, Ysseldyke, and Moch (2002) discovered that using assessment data influences instructional decision-making and boosts students with disabilities' academic outcomes.

AT has great promise to promote the learning and development of students with disabilities across a wide range of academic and functional domains, despite the limitations connected with its implementation. Literacy, numeracy, and even executive function can all benefit from using AT. Self-advocacy, social skills, and independent living can all benefit from using AT. AT in special education programs to enhance children's academic performance has recently gained popularity. Different types of AT have been studied for their efficacy, along with the factors that help and hinder their use in educational settings. Studying how students with disabilities might benefit from mobile technology and apps is an exciting new topic. For instance, Hermann et al. (2012) discovered that iPads helped autistic youngsters with speech and attention. Another study that demonstrated iPad software to help enhance social communication skills in autistic children was conducted by Hume and colleagues in 2013.

The study of how AT can improve literacy is another active area of inquiry. Reading comprehension and fluency were enhanced when students with reading challenges used text-to-speech software, according to research by Park et al. (2015). Students with dyslexia who used dictation software had more significant gains in writing ability, according to research by Pereira et al. (2019). The benefits and drawbacks of implementing AT in classrooms have also been studied. According to research by Bouck et al. (2012), a lack of knowledge and training among educators is a significant barrier to the widespread use of AT. On the other hand, Choi et al. (2018) discovered that teacher training and support aided in adopting AT in schools. Recent studies have shown that AT can be a valuable tool for helping students with disabilities succeed in school. However, AT in schools may require supplementary teacher assistance and training to guarantee successful implementation.

Virtual and augmented reality, as AT in special education, is another field of study. Students with special needs may benefit from a more interactive and immersive educational experience with the help of virtual and augmented reality technologies. Researchers Mitsea et al. (2022) showed that autistic pupils' spatial skills and problem-solving abilities improved with VR training. It has been shown that students with disabilities who use AT see positive changes in their social and emotional well-being and academic performance. Zhang (2019) reported that social robots helped autistic youngsters with their communication and emotional development. Ramdoss et al. (2011) discovered that video self-modeling intervention helped students with disabilities become more socially and communicatively adept. Nonetheless, despite AT's promise, there remain obstacles to its widespread implementation in classrooms. According to research by Zainuddin and Perera (2018), more money is needed to ensure the widespread implementation of AT in educational settings. Keefer et al. (2018) also discovered that further research is needed to determine which AT solutions are most helpful for people with different types of disability.

Involving students with disabilities in the process of choosing and implementing AT has also been highlighted by recent studies. Students' happiness and use of AT improved when they were included in the decision-making process, according to research by Baragash et al. (2020). In conclusion, current studies on AT in special education have shown its promise to enhance kids' academic performance, social and emotional well-being, and quality of life. However, more study is required to determine the most efficient AT interventions and remove obstacles to adoption in educational settings. Students with

disabilities can benefit the most from AT if they are actively involved in choosing and implementing this tool.

METHOD

The methodology used to systematically examine a topic's previous research output in the form of a thematic review. Scopus, Web of Science, JSTOR, ERIC, Academia, and ResearchGate were used, along with a few others, to verify completeness. The methodology's stated goal was to compile pertinent scholarly works and comprehensively examine the topic of interest. Articles that provide a thematic assessment of the relevant literature and provide new light on a topic are valuable resources. A stringent process is required to guarantee the review's reliability and applicability. Focusing on the vast literature search across six academic databases, this article details the process used for a thematic review.

The literature search was broken down into multiple phases to collect as many relevant articles as possible.

1. First, we had to zero in on the article review's central focus. Defining the scope of the review and honing in on a specific research issue benefited greatly from this preliminary work.
2. Six of the most widely used academic databases were chosen for this search.
 - a. Scopus, well-known for its breadth of coverage, is a database that houses many scholarly works, such as journal articles, conference proceedings, and patents.
 - b. Web of Science: Web of Science is an extensive database of intellectual and scientific articles most known for its citation indexing.
 - c. JSTOR: JSTOR is an online library that houses scholarly journals, books, and sources in the humanities, social sciences, and allied fields.
 - d. ERIC (Education Resources Information Center): ERIC is a centralized database of scholarly articles, reports, and other materials connected to education. Academia.edu is a website where academics can upload and share their work, including preprints, conference papers, and published articles.
 - f. ResearchGate: ResearchGate is an academic, social network that connects scholars and the papers, projects, and chances for collaboration they need to do their work.
3. I ensured our search queries were as thorough as possible by tailoring them to each database. Articles most relevant to the search were retrieved using keywords, Boolean operators, and controlled language terms.
4. The many retrieved articles required establishing inclusion and exclusion criteria. Peer-reviewed articles published within a specific time limit and directly connected to the theme were prioritized for inclusion. Articles that were not written in English were not considered for this study.
5. Screening and data extraction: Articles were screened using titles, abstracts, and full texts to assess eligibility for the review. Data extraction from the selected journals collected key findings, techniques, and conclusions.

This theme review article ensures a thorough examination of the relevant literature by employing a systematic methodology.

RESULT AND DISCUSSION

AT in Middle Eastern Countries

Few studies have been conducted on AT in special education in the Arab world, but this is beginning to change. Alshehri and Alzahrani (2019) researched how educators in Saudi Arabia feel about using AT. The study indicated that while educators viewed AT

favorably, barriers to its widespread implementation existed, notably a need for more appropriate training and funding. Al-Saggaf et al. (2016) researched how students with visual impairments use assistive technologies in Saudi Arabia. According to the study, students with visual impairments who used assistive technologies like screen reading software showed significant gains in reading and writing ability.

Alghamdi et al. (2018) examined how students with learning difficulties in the United Arab Emirates use assistive technologies. The study concluded that students with learning difficulties who used AT, such as text-to-speech software, saw significant gains in reading comprehension and academic accomplishment. Despite the apparent advantages, the Arab world faces challenges when embracing AT. Some of these are things like needing more money or knowledge about AT. Evidence suggests that using AT in special education can enhance learning outcomes for children with disabilities. However, research on its usage in the Arab world is currently scarce. However, more study is required to discover efficient interventions and conquer obstacles to adoption in the area.

There have been many recent reports on the effectiveness of incorporating AAC into special education in Saudi Arabia. Students in Saudi Arabia with learning problems are the focus of a study by Al-Dababneh & Al-Zboon (2022). Reading comprehension and academic performance improved significantly for children with learning difficulties who used assistive technologies such as electronic dictionaries and text-to-speech software. Al-Qahtani et al. (2016) researched the use of mobile apps for students with autism in Saudi Arabia. Researchers found that teaching autistic pupils mobile apps like "social stories" and "communication apps" improved their ability to interact with others.

Despite the apparent advantages, there are still barriers to the widespread use of AT in Saudi Arabia. According to research conducted by Alshehri and Alzahrani (2019), educators in Saudi Arabia confront numerous challenges when implementing AT. In response to these difficulties, projects have been launched to expand the use of AT in Saudi Arabia's special education system. For instance, the Saudi Ministry of Education has initiated many programs to equip educators with knowledge and tools to implement AT in the classroom. Much more work needs to be done to remove obstacles to using AT, but there is evidence that it can help students with disabilities in Saudi Arabia learn more effectively. The success of students with disabilities in school depends on efforts to raise understanding, supply instruction, and distribute adequate resources.

Mohamed Emam & Al-Mahdy (2020) study, where many pupils with visual impairments attend school. According to the study, students with visual impairments benefitted from using AT, like screen readers and magnifiers. The use of AT in Omani special education for students with intellectual disabilities was also studied by Al-Abri et al. (2018). Students with intellectual disabilities benefitted from using AT, such as augmentative and alternative communication devices, regarding their ability to communicate and interact with others. Efforts have been made to increase the availability of AT for students with special needs in the classrooms of the United Arab Emirates (UAE). The relevance of AT in facilitating the integration of students with disabilities into regular classrooms is highlighted, for instance, in the Dubai Inclusive Education Policy Framework, which was introduced in 2017. Alghazo et al. (2018) researched integrating AT into UAE special education for impaired children. Researchers found that students with impairments who used assistive technologies like screen readers and voice recognition software significantly improved academic performance and autonomy. In the United Arab Emirates (UAE), Saudi Arabia, and Oman, there is a growing body of literature on the application of AT in special education. Although there are barriers to the widespread use of

AT in education, students with disabilities must have access to the devices they need to be successful.

a. AT in Egypt

Several recent Egyptian studies have examined the utility and efficacy of AT tools and services in inclusive and specialized classrooms. One major takeaway from this research is that the implementation of AT in Egypt's special education sector is still in its infancy and faces numerous obstacles. Educators' and parents' need for more familiarity with the benefits of AT, the scarcity of appropriate devices and services, and the inability to secure adequate money all work against its widespread implementation in Egypt's special education system (Abd El-Ghaffar et al., 2019). Elgendy (2018) came to a similar conclusion: inadequate teacher preparation is a significant barrier to the successful integration of AT into Egypt's special education system.

Despite these obstacles, some work has been done to increase the incorporation of AT into Egypt's special education curriculum. For instance, special education students in Egypt can now access AT equipment and services thanks to a new initiative by the country's Ministry of Education and Technical Education (Ministry of Education and Technical Education, 2021). Educators and officials in Egypt are also becoming increasingly interested in AT's potential to expand opportunities for students with impairments (Elgendy, 2018). There have been multiple investigations into how well AT works in special education settings in Egypt. For instance, research by Elhussein et al. (2019) demonstrated that AT interventions can improve students' academic performance and engagement with visual impairments in Egypt's mathematics classrooms. Students with autism spectrum disorder (ASD) in Egypt's special education settings can benefit from the usage of AT devices and services, according to research by Elwahsh et al. (2018).

Despite the studies' encouraging results, more investigation into AT's utility and efficacy in Egypt's special education context is warranted. It is challenging to evaluate the effect of AT on students with disabilities due to the paucity of empirical data on the use and effectiveness of AT in the country. More research on the efficacy of AT and the identification of best practices for using AT in different settings was called for by Elgendy (2018). Egypt's special education system has struggled to incorporate AT due to a lack of funding and knowledge about the benefits of AT for students with disabilities. While there have been negative findings on the efficacy of AT interventions for students with disabilities, there have also been efforts to promote the use of AT. More study is required to assess the effectiveness of AT on students with disabilities and determine the most effective ways to implement AT in various Egyptian educational contexts. To improve the usage and efficacy of AT in special education in Egypt, instructors must obtain training and support on how to use the technology effectively.

b. AT in Jordan

Over the past decade, there has been a growing demand for AT in Jordan, prompting researchers to examine the effectiveness of AT interventions in the country's special education institutions. These studies have found, among other things, that the implementation of AT in special education in Jordan is still in its early stages and confronts many obstacles. The lack of money for AT programs, the restricted availability of AT devices and services, and the lack of awareness and knowledge among educators and parents are just some of the obstacles to using AT in special education in Jordan (Abu-Hamour & Abu-Saad, 2016). Al-Sa'di (2018) came to a similar conclusion, stating that inadequate training and support for teachers using AT is a significant barrier to the

successful implementation of AT treatments in special education in Jordan. Despite these obstacles, some work has been done to expand the use of AT in Jordan's special education system. For instance, in Jordan, the Ministry of Education has initiated a program to supply special education students with AT devices and services (Ministry of Education, 2021). Educators and politicians in Jordan have also shown a growing interest in AT to expand opportunities for children with impairments to participate fully in the classroom setting (Al-Sa'di, 2018).

Research into the usefulness of AT in Jordanian special education settings has also been conducted. Studying the role of AT in the literacy development of students with dyslexia in Jordan, Albashtawi & Al Bataineh (2020) discovered that AT interventions can improve students' reading and writing skills. Similarly, Abu-Rmaileh and Abu-Zhaya (2019) discovered that students with autism spectrum disorder (ASD) in special education settings in Jordan benefited from incorporating AT devices and services into their daily routines. Despite these encouraging results, the studies also show that more investigation is needed into AT and its effectiveness in Jordanian special education settings. It is challenging to evaluate the effect of AT on students with disabilities due to the paucity of empirical data on the use and effectiveness of AT in the country. More studies on the efficacy of AT and the identification of best practices for using AT in different settings were called for by Al-Sa'di (2018). Several obstacles have impeded the implementation of AT in special education in Jordan, including a need for more funding and a general lack of understanding by teachers and parents. While there have been negative findings on the efficacy of AT interventions for students with disabilities, there have also been efforts to promote the use of AT. The effectiveness of AT for disabled students and the identification of best practices for its use in various settings in Jordan need more study. To improve the usage and efficacy of AT in special education in Jordan, instructors must receive training and support on how to use the technology effectively.

c. AT in Yemen

As one of the region's poorest countries, special education in Yemen has had limited access to AT. In Yemen, special education settings have struggled to effectively implement AT treatments due to a lack of resources, infrastructure, and experience, despite rising acknowledgment of the relevance of AT in boosting the learning and development of students with disabilities. Only a few studies have examined where AT stands in special education in Yemen. Al-Sakkaf (2017) surveyed special education teachers in Yemen to gauge their familiarity with and understanding of AT. The survey indicated that while most educators were familiar with AT, their understanding of its many forms and uses could have been improved. The study also emphasized the difficulties special education instructors in Yemen face in implementing AT interventions due to a need for more resources and training opportunities.

There have been various initiatives to increase the availability of AT for students with special needs in Yemen's public schools. One such partnership is between the World Health Organization (WHO) and the Ministry of Education in Yemen to promote the use of AT in special education and to offer related training and resources. While the ongoing conflict in Yemen has limited the reach of these programs, some non-governmental organizations (NGOs) have provided AT devices and services to children with disabilities. More funding, facilities, and trained professionals are needed to ensure the implementation of AT in special education in Yemen. The continuous violence in the country has also made it more challenging to give the required assistance and services to children with disabilities. However, efforts are being made to spread the word about AT and raise awareness among teachers, parents, and other caretakers. There needs to be more

investigation on the efficacy of these interventions and the best ways to implement AT in the specific setting of Yemen.

d. AT in Qatar, Kuwait, and Iraq

More studies must examine AT's role in special education in Qatar, Kuwait, and Iraq. However, many studies have highlighted the obstacles and possibilities associated with AT's widespread adoption in these nations. The attitudes of Qatari educators and parents on the implementation of AT in special education were investigated in a study by Al-Hamed and Al-Jaber (2019). The research showed that educators and parents understood the value of AT in helping students with disabilities learn. However, they also noted several obstacles to the efficient application of AT, such as a dearth of resources and technical support, inadequate teacher training and awareness, and pervasive cultural attitudes and beliefs about disability.

Aljassar et al. (2021) researched Kuwait to find out how students with visual impairments use AT to help them succeed in school. Researchers showed that students who used AT, like screen readers and braille displays, dramatically improved their academic performance. However, the study also highlighted the difficulties students and teachers face in accessing and using AT devices, such as the high cost and the need for more readily available technical support. Al-Bayati et al. (2019) researched Iraq to explore the barriers and benefits of incorporating AT into special education. The research uncovered many barriers, such as inadequate money and resources, a lack of proper regulations and guidelines for using AT in special education, and a lack of awareness and expertise among teachers and parents. The survey did find some bright spots, though, including rising policymaker interest and support as well as access to foreign resources and experience. Overall, the scant study into AT's usage in special education in Qatar, Kuwait, and Iraq reveals that, while there are chances for the effective implementation of AT, substantial problems must be addressed. The efficient use of AT in special education settings is hindered by a lack of resources, including money, technical assistance, and training for educators and parents.

e. AT in Saudi Arabia

A summary of AT's application in Saudi Arabia is provided by Al-Ateeq and Al-Beeshi (2019). More research and resources are needed to support the use of AT in the country, which is something the authors emphasize. Although informative, the article does not delve deeply into the benefits and drawbacks of implementing AT in Saudi Arabia. Children in Saudi Arabia with autism spectrum disorder (ASD) were the focus of a scoping review by Alahmadi et al. (2021). Based on their findings, the authors argue that more research and resources are needed to employ AT with children with ASD effectively. The essay sheds light on the difficulties children with ASD have in gaining access to AT in Saudi Arabia. However, it solely addresses this particular impairment.

Students with impairments in Saudi Arabia can access a comprehensive overview from Al Sobhi and Ahmad (2020). The authors emphasize the positive effects of AT on pupils' academic performance and social integration. However, more resources and training for teachers to effectively use AT in the classroom are also highlighted in the article. Insights into the current level of AT use in special education in Saudi Arabia are provided in this article; however, the article needs to analyze the obstacles and potential benefits of adopting AT in the country. Al-Zahrani and Al-Mansour (2018) examine the barriers to and potential benefits of AT for students with special needs in Saudi Arabian classrooms. While there is a growing recognition of the importance of AT in the United States, the

authors argue that significant challenges must be addressed. These include a lack of resources, a need for more awareness among educators and families, and a lack of training and support for using AT. In this essay, we closely examine the current condition of AT in Saudi Arabia's special education system and highlight crucial areas for development. One can learn more about the government's initiatives to promote the use of AT in special education on the website of the Ministry of Education Saudi Arabia (Ministry of Education Saudi Arabia, 2021). The website emphasizes the government's dedication to supplying kids with disabilities with AT devices and services and providing teachers and families with training and assistance. The webpage is helpful, but it needs to detail the benefits and drawbacks of adopting AT in Saudi Arabia's special education system. This research shed new light on the accessibility technology landscape in Saudi Arabia. Access to appropriate technologies and the requisite support for those with disabilities to utilize them effectively is an issue that has to be addressed despite the growing use of AT in the country. Improving access to AT devices and services, boosting knowledge of the benefits of AT, and increasing resources and training for educators and families are all crucial areas for development.

Over the past two decades, AT has gained widespread acceptance in Saudi Arabia as a vital resource for facilitating students with disabilities access to and participation in general education classrooms. Researchers have looked into the usefulness of AT tools and services in various special education settings nationwide. These studies have found, among other things, that the availability and implementation of AT in special education settings in Saudi Arabia still need to improve. A lack of awareness and expertise among educators and parents, limited availability of AT devices and services, and a lack of money for AT programs were all cited as obstacles to the use of AT in special education by Al-Zahrani and Al-Mansour (2018). These findings were repeated by Al-Ateeq and Al-Beeshi (2019), who pointed out that a lack of skilled personnel and scarce resources pose severe obstacles to the efficient implementation of AT in special education in the country. Despite these obstacles, there have been some initiatives to increase the incorporation of AT into special education in Saudi Arabia. A program to provide AT equipment and services to students with impairments in special education has been launched by the Saudi Arabian Ministry of Education (Ministry of Education Saudi Arabia, 2021). According to AlSobhi and Ahmad (2020), educators and policymakers in Saudi Arabia have shown a growing interest in AT, which may indicate a growing acknowledgment of the potential benefits of AT for children with disabilities.

Multiple investigations have been into AT's usefulness in Saudi Arabia's special education programs. A scoping review of the literature on AT for children with autism spectrum disorder (ASD) in Saudi Arabia by Alahmadi et al. (2021) indicated that AT therapies can improve children with ASD's communication and social abilities. Based on their comprehensive assessment of research on AT for students with disabilities in Saudi Arabia, AlSobhi and Ahmad (2020) concluded that AT can potentially boost students' academic and social performance. Despite the studies' encouraging results, more investigation into AT's usefulness in Saudi Arabia's special education context is warranted. It is challenging to evaluate the effect of AT on students with disabilities due to the paucity of empirical data on the use and effectiveness of AT in the country. According to Al-Ateeq and Al-Beeshi (2019), more studies are needed to determine the efficacy of various forms of AT and best practices for their application in various contexts.

In addition, the studies analyzed indicate that teachers and other special education professionals could benefit from additional training and professional development to make the best possible use of AT in the classroom. According to Al-Zahrani and Al-Mansour

(2018), many Saudi Arabian teachers need to be adequately trained in using AT devices and services, hindering their ability to integrate AT into their classrooms effectively. AlSobhi and Ahmad (2020) came to a similar conclusion, observing that many Saudi Arabian educators need help with AT owing to a deficiency of training and assistance. Therefore, special education teachers must be given the necessary resources to incorporate AT into their lessons. These resources include instruction in using AT devices and services and guidance on effectively incorporating AT into classroom instruction. Teachers' familiarity and comfort with using AT for students with special needs can be improved by participation in workshops and other professional development opportunities.

Educators, policymakers, and researchers are all critical players in special education, and the evaluated papers highlight the importance of working together. When discussing the barriers to AT use in special education in Saudi Arabia, Al-Ateeq and Al-Beeshi (2019) stressed the importance of collaboration between various stakeholders. Al-Zahrani and Al-Mansour (2018) echoed this sentiment, noting that successful AT intervention requires collaboration between teachers and other specialists, including speech and occupational therapists. To sum up, insufficient resources and a lack of understanding among educators and parents have been two of the biggest obstacles to implementing AT in special education in Saudi Arabia over the past two decades. While there have been negative findings on the efficacy of AT interventions for students with disabilities, there have also been efforts to promote the use of AT. More research, training, and collaboration among different stakeholders in the field are needed to increase the use and effectiveness of AT in special education in Saudi Arabia. These initiatives can potentially boost the educational and social outcomes for students with disabilities by increasing their access to and participation in mainstream classrooms.

f. AT in Oman

The role of AT in facilitating the education of students with disabilities in Oman has grown significantly in recent years. The government of Oman has taken action to increase access to and understanding of AT. However, more study and funding are required to implement AT in Oman's special education system fully. The need for more study and awareness of the problem was observed in a review of the literature on AT use in special education in Oman by Al-Mahrooqi et al. (2022). They suggested conducting additional research to understand the current state of AT use better and identify the gaps and difficulties that need to be addressed.

Despite the obstacles, Oman has seen some positive results with using AT in special education. For instance, Al-Mahrooqi et al. (2021) discovered that students with learning difficulties in Oman benefited greatly from implementing AT. They advocated for training and assistance for instructors and students and for using assistive software and hardware to facilitate education. However, special education teachers still face obstacles when incorporating AT into their lessons. According to Al-Harthy (2019), a scarcity of AT devices and inadequate educational training and support were two of the biggest obstacles to adoption. They advocated for the necessity of further training and assistance and the creation of policies and guidelines to facilitate the use of AT in special education. More study, publicity, and funding for AT in special education are all needed in Oman. Access to and use of AT in special education in Oman could benefit from establishing laws and guidelines and increased training and support for teachers and students.

g. AT in the UAE

Students with disabilities can benefit significantly from AT in the classroom since it allows them to overcome obstacles and reach their full potential. The United Arab Emirates (UAE) has been pushing hard to get more schools to adopt AT for students with disabilities. The current landscape of AT in special education in the United Arab Emirates will be analyzed critically, along with the potential and obstacles in this subject. The government of the United Arab Emirates (UAE) has taken many measures to promote the use of AT in the classroom. For instance, the 2017 Dubai Inclusive Education Policy Framework aspires to create a fully accessible and inclusive educational environment for all students, including those with special needs. The policy framework emphasizes AT and suggests ways to implement it in the classroom.

Several groups in the UAE advocate for the inclusion of AT in special education, complementing the government's efforts. For instance, the Abu Dhabi Rehabilitation Centre (ADRC) evaluates AT and training for parents and educators of disabled children. Support for students with ASD can also be found through the Dubai Autism Centre (DAC) through services and resources (Dubai Autism Centre, n.d.). Despite these gains, several obstacles regarding AT's usefulness in UAE special education still need to be overcome. The widespread lack of knowledge and understanding among teachers and parents is a significant barrier. Alghamdi (2022) found that many teachers lacked knowledge about accessible technology and its successful use in the classroom. When students with disabilities could benefit from using AT, they may be reluctant to do so because of this.

The restricted supply of AT in the UAE is another difficulty. Some groups and service providers offer AT evaluations and instruction, but the selection may be limited, or the costs too high for some people (Alqahtani et al., 2021); because of this, schools and families may be hampered in their efforts to gain access to and benefit from AT. In addition, there is a dearth of studies examining the efficacy of AT in special education in the United Arab Emirates. While there are studies of AT's application elsewhere, more studies tailored to the UAE are needed. These studies would aid in determining how best to employ AT tools and practices for students with disabilities in the UAE classroom. Despite these obstacles, however, the UAE presents an opportunity to implement AT in special education successfully. The widespread adoption of technological solutions presents one such chance. Increased access to online education and digital resources in the UAE due to the COVID-19 epidemic may open fresh avenues for implementing AT (Alqahtani et al., 2021).

The United Arab Emirates (UAE) increasing interest in inclusive education is another possibility. For instance, the Dubai Inclusive Education Policy Framework argues that all students deserve the same high-quality educational opportunities regardless of their background or physical capabilities. Students with disabilities can benefit significantly from using AT in general education settings, and this emphasis on inclusion makes a compelling argument for its usage in special education. Another study that looked into how educators and parents in the UAE felt about AT was undertaken by Al-Shamma'a and Al-Qaroot (2019). Researchers found that educators viewed AT favorably and believed it could improve student learning and classroom inclusiveness.

On the other hand, parents were more wary and worried about AT's price and availability. Although progress has been made in implementing AT in special education in the UAE, some obstacles must be removed. Lack of teacher training in the usage of AT is one such issue. Studies have shown that many educators need more expertise to successfully incorporate AT into their classrooms. Because of this, kids with disabilities may not reap the full benefits of using AT. The price and accessibility of AT also pose a challenge. Many educational facilities may need more financial means to purchase AT,

despite its apparent benefits, which can lead to disparities in the availability of AT for children with impairments, which can worsen existing educational disparities. To rephrase, AT may help facilitate the education and growth of students with special needs in the United Arab Emirates. There are prospects for its expansion and integration into the school system, despite various hurdles to its practical usage, such as limited awareness and availability of AT and a need for more research on its usefulness in the UAE environment.

h. AT in Sudan

Despite some recent progress, AT is still in its infancy in Sudan. Despite this, there has been some development in recent years regarding the accessibility of AT tools and programs. The government of Sudan has taken measures to increase accessibility to AT for individuals with disabilities due to this recognition. The government of Sudan formed the National Council for Disabilities in 2010 to coordinate the country's efforts to improve the lives of individuals with disabilities. In addition to the government, a few NGOs and private businesses in Sudan offer AT equipment and services. For those who are blind or visually impaired, resources, including Braille printers, screen readers, and other AT equipment, are available at the Khartoum Centre for the Rehabilitation of the Blind (KCRB) (El-Bashir et al., 2019).

However, substantial obstacles still need to be overcome in creating and using AT in Sudan. According to research by El-Tahir and Hassan (2019), adopting AT in Sudan is hindered by several factors, including a lack of AT competence among professionals, a scarcity of appropriate devices, and prohibitive costs. Another study by Hamza and Alashry (2017) found that there should be more public education and training about AT for individuals with disabilities and that there should be policies and guidelines to back up the creation and use of AT in Sudan. Overall, more education, training, and funding are required to advance the use of AT in Sudan. People with disabilities in Sudan need the government, non-governmental organizations (NGOs), and the private sector to work together to overcome these obstacles and expand the availability of AT and related services.

Countries in Arabic-speaking Africa, such as Tunisia, Palestine, Algeria, and Morocco, are seeing a growth in interest and development of AT. Mobility aids, hearing aids, and communication aids were reported to be the most commonly requested pieces of AT by the respondents of a survey conducted by Ben Slama et al. (2018) in Tunisia. Khemakhem and Karray (2019) dug into incorporating AT into regular classrooms for intellectually disabled pupils. AT, such as multimedia materials and interactive whiteboards, increased students' participation and engagement in classroom activities for those with intellectual disabilities. Masmoudi et al. (2019) created a mobile app with visual aids, communication boards, and social stories for children with ASD in Tunisia who speak Arabic. According to research by Alareeni et al. (2020), there is a need for education and advocacy, as well as a shortage of resources, which prevents Palestinians with disabilities from using AT. In Palestine, a web-based software developed by Khader et al. (2016) successfully treated Arabic-speaking infants with speech sound problems. Ammor et al. (2017) developed a smartphone app to assist the visually handicapped in Morocco with cash recognition. According to studies conducted by Ennaji et al. (2020), persons with hearing loss in Morocco primarily use hearing aids and cochlear implants as their primary types of AT. Students on the autistic spectrum (ASD) have been the focus of Bouabid et al.'s (2020) investigation of the efficacy of AT. Students with ASD were found to benefit significantly from AT, such as communication aids and visual timetables, in terms of both increased communication and decreased challenging behaviors.

According to Elzbieta and Abou-Zahra's (2020) survey of web accessibility in Arabic-speaking African countries, few sites use the guidelines available to them. Ibrahim et al. (2015) developed a speech recognition system for the Hausa language in Niger, which may pave the way for AT in other Arabic-speaking African countries. Benaouicha and Benachour (2016) looked into the difficulties of providing supplementary aids and services to high school pupils in Algeria who are blind or visually impaired. They concluded that the primary obstacles to efficient AT implementation were a need for more funding and more teacher preparation. Despite AT's growing interest and advancement in Arabic-speaking African countries, significant barriers regarding resources, device availability, expert and public knowledge, and training still need to be overcome. More study and teamwork are needed to remove these roadblocks to accessing AT for people with disabilities in these countries.

CONCLUSION

In conclusion, AT has become essential in Arabic-speaking countries in fostering inclusive education for students with disabilities. Accessible technology can aid students with disabilities in their academic and social pursuits, despite some obstacles, such as limited resources, lack of awareness and training, and problems in identifying acceptable solutions. According to the analyzed research, numerous Arab-speaking countries have tried incorporating AT into special education. The United Arab Emirates (UAE), Tunisia, and Morocco are just a few examples of countries that have set up centers and programs to offer AT services to students with impairments. Sudan, Palestine, and Egypt are just a few countries that have begun including AT in their special education curriculums.

To advance AT in Arab-speaking countries, however, further work is required. More money and resources need to be allocated by governments and institutions to help with the creation and distribution of AT services. Teachers, parents, and students would all benefit from increased familiarity with AT devices and software if awareness campaigns and training programs were implemented. Furthermore, more study is required to examine AT interventions' efficacy and determine the best solutions for various disabilities and settings. Finally, it must be stressed that AT is not a replacement for suitable pedagogical methods or for addressing the underlying causes of disability. Therefore, AT should be incorporated into special education as part of a holistic strategy that includes early detection and intervention, individualized lesson plans, and fully inclusive classrooms. By taking this stance, Arab-speaking nations may guarantee that their disabled citizens fully participate in and benefit from the educational system. When partners in Arab-speaking nations work together, the future of AT is bright, and the lives of students with disabilities can be significantly improved.

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