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Exploring Parental Perspectives: The Impact of Assistive Technologies on Inclusive Education for Children with Disabilities

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Abstract

This study investigates parental attitudes towards the efficacy of assistive technologies in facilitating inclusive education for children with disabilities within mainstream educational settings. The research aims to address the pressing need for insights into parental perceptions regarding the utilization of assistive technologies to support their children's learning experiences in inclusive classrooms. A questionnaire-based methodology was employed to gather comprehensive data from parents of children with disabilities enrolled in mainstream schools. The survey encompassed inquiries about parents' familiarity with assistive technologies, their perceived effectiveness, challenges encountered, and overall satisfaction with their child's educational journey within inclusive settings. The results of the research reveal multifaceted insights into parental attitudes towards assistive technologies. Findings indicate a generally positive outlook among parents, acknowledging the potential of these technologies to enhance their child's educational outcomes and promote inclusion. However, notable challenges such as accessibility, affordability, and adequate training emerge as significant barriers hindering the optimal utilization of assistive technologies. The discussion delves into the implications of the findings for policymakers, educators, and practitioners, emphasizing the necessity for targeted interventions to address existing barriers and enhance the accessibility and efficacy of assistive technologies in inclusive education. Moreover, the study underscores the importance of fostering partnerships between parents and educational institutions to ensure the holistic support and empowerment of children with disabilities within mainstream educational settings. This collaborative approach is essential for creating an inclusive educational environment that meets the diverse needs of all students. The study concludes that while parents recognize the benefits of assistive technologies, overcoming the existing challenges requires a concerted effort from all stakeholders involved. By addressing issues of accessibility, affordability, and training, the potential of assistive technologies can be fully realized, thereby improving educational outcomes for children with disabilities.

Keywords: assistive technology, inclusion, parents, parental attitudes, disabilities

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INTRODUCTION

Over the last thirty years, the evolution and application of assistive technologies (AT) have significantly benefited individuals with disabilities. The advancements in these technologies, alongside developments in information and computer technologies, have enabled their application in educational settings for students with disabilities. Assistive technologies (ATs) can be defined as 'any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customised, that is used to increase, maintain, or improve the functional capabilities of a child with a disability (World report on disability. World Health Organisation; 2011).

These tools are designed to enhance the overall participation of people with disabilities in society. Recognizing the importance of AT, international legal frameworks, such as the United Nations Convention on the Rights of Persons with Disabilities, advocate for the rights of individuals with disabilities to have access to quality and affordable AT to facilitate their societal participation (United Nations, 2007).

Assistive technology is a broad term encompassing products and related services used by people with disabilities to enable and improve their inclusion in all areas of social life. AT can be utilized by individuals of all ages and with various impairments, including motor, visual, hearing, speech, or cognitive disabilities, for short or long periods. The combination of products and strategies to meet an individual's needs is termed an "AT solution," developed through processes of assessment, testing, and adaptation (Andrich et al., 2013).

Assistive technology encompasses a range of tools, devices, and software specifically designed to enhance the abilities of people with disabilities, enabling them to overcome barriers and carry out activities that might otherwise be difficult for them. These innovative solutions promote independence, accessibility, and inclusion and lead to an improvement in the quality of life of users in various areas. A variety of assistive technologies and accessible devices and software, with careful planning and guidance, can play a significant role in the education of students with disabilities (Duhaney & Duhaney, 2000).

According to the World Health Organization (WHO), "assistive technology" is a generic term that denotes all systems and services related to the use of assistive products and means of performing services (WHO, 2001). Broadly speaking, and under the Assistive Technology Act of 1998, in the US, assistive technology is defined as "any object, piece of equipment, or system, whether purchased commercially, modified, or adapted, that is commonly used to augment, maintain, or improve the functional abilities of persons with disabilities" (Bunning et al., 2004, p. 98). For Lewis, R. B. (1993), AT has two main goals: first, to increase a person's abilities, thereby mitigating the consequences of any disability, and second, to provide alternative access to a particular activity to compensate for the disability. The term AT refers to devices or services used to compensate for functional limitations, to facilitate independent living, to enable older people and people with activity limitations to realize their full potential, and to have an equal place and equal rights in social life. Some technologies, even if not intentionally designed for people with activity limitations, can be modified in such a way that they are accessible and useful when working with people with disabilities.

The WHO and UNICEF Global Report on Assistive Technology (2022) shows significant inequality in access to assistive technology. As few as 3% of people in some low-income countries were reported to have access to the assistive products they needed, compared to 90% in some high-income countries. Examples of unmet global need for specific AT include:

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➤ Of the 80 million people who need a wheelchair, only 5–35% have access to one, depending on the country they live in.

➤ Globally, 1.5 billion people have hearing loss, yet the production of hearing aids currently meets less than 10% of global demand (Global Report on Assistive Technology, 2018).

At the level of the European Union, the UN Convention on the Rights of Persons with Disabilities is implemented through the European Disability Strategy (ESD). The report on the implementation of the European Disability Strategy, adopted by the Employment and Social Affairs Committee of the European Parliament, highlights the role of assistive technologies in education and employment. At the same time, the report encourages the EU institutions to improve the availability of AT to enhance accessibility in the future. Non-discrimination towards persons with disabilities is part of the European Pillar of Social Rights, and the EU is obliged to respect the Charter of Fundamental Rights of the EU, including Articles 21 and 26, on non-discrimination and integration of persons with disabilities (European Commission, 2021, Strategy for the Rights of Persons with Disabilities 2021-2030).

In the Republic of North Macedonia, there is no systematic approach to assessing the needs of people with disabilities for assistive technology, nor are there initiatives for its introduction in various social spheres. This indicates a lack of systemic efforts to provide assistive technologies and a gap in knowledge and skills for recognizing the need for their use (Jachova & Stojkowska-Aleksovska, 2013). By addressing these gaps and promoting the widespread use of assistive technologies, we can work towards a more inclusive society where individuals with disabilities can fully participate and thrive.

The needs of assistive technologies

Inclusive schools, teachers, and inclusive education systems have specific needs related to assistive technologies (AT). These schools aim to create environments that accommodate the diverse needs of all students, including those with disabilities, ensuring equal access to education and opportunities for success. Teachers play a critical role in implementing AT to support students with varying learning needs. Understanding the needs of inclusive schools and teachers is essential for fostering an environment where AT can maximize its impact on student learning, engagement, and academic achievement.

Research indicates that a significant barrier to the selection, implementation, and integration of assistive technology is a lack of funding (Abner & Lahm, 2002). Additionally, a study by Thompson, Siegal, and Kouzoukas (2000) surveyed over 200 special educators and rehabilitators from Illinois. More than 60% of these educators reported a lack of knowledge about assistive technologies and expressed a need for additional professional development to use AT effectively.

Parents are the key stakeholders in supporting children with disabilities to access rehabilitation services. Specifically, parents advocate for the best for their children by making decisions with and/or on behalf of their children (Loreman, McGhie-Richmond, Barber, et al., 2009).

The efforts of parents to make ATs available to their children with disabilities will help to maximise the children's potential in society (Holthe, Jentoft, Arntzen, et al., 2018). As parents are the primary agents of their children's socialisation, principal agents in their rehabilitation (Shields, Zhou, Taylor, et al., 2012), decision-makers and advocates for their children with disabilities (Loreman, McGhie-Richmond, Barber, et al., 2009), it is important to understand their experiences regarding the usage of ATs and their benefits for their children. This lends support to understanding the views of parents of children with disabilities on the extent of the usage of ATs and the possible barriers they encounter.

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METHODS

Problem of the Research:

The primary problem addressed in this research is the integration of assistive technologies in inclusive education for children with disabilities. Despite the potential of these technologies to transform educational experiences, there is limited understanding of their real-world impact from the perspective of parents. This gap in knowledge hinders the effective implementation and optimization of assistive technologies, potentially limiting their benefits for children with disabilities.

Subject of the Research:

The subject of this research is the exploration of parental perspectives on the use and impact of assistive technologies within inclusive education environments. It focuses on understanding parents' views, experiences, and perceived outcomes related to the use of these technologies in supporting their children's education.

Goal of the Research:

The goal of this research is to analyze and document the perspectives of parents regarding the role and effectiveness of assistive technologies in inclusive education. By gathering and examining these insights, the study aims to:

1. Identify the benefits and positive outcomes associated with the use of assistive technologies.
2. Understand the challenges and limitations faced by parents and their children in utilizing these tools.
3. Provide recommendations for improving the implementation and support of assistive technologies in inclusive education settings.

Instruments

Through a review of the literature, various themes and issues identified were used to develop the survey instrument. For example, in reviewing studies by Borg et al. and Copley et al. themes such as funding was identified. The questionnaire consisted of two parts and included closed-ended questions to assess parent's perspectives about the use of ATs, its benefits and barriers among their children. In the first part demographic information of the parents are asked (e.g., social status, education level and the child's disability type). The second part consisted of nine questions with closed-ended responses.

Participants

The participants in this study were parents of children with disabilities who were learning in mainstream schools in N. Macedonia. Purposive sampling was used to select 72 parents of children with disabilities.

Data analysis

The data collected for this study were analysed in two stages. First, the responses to the dichotomous questions were entered into the IBM SPSS Statistics programme 24. To answer research questions one, two, three and four, we computed percentages to understand the use of ATs by children with disabilities, support provided by teachers/special educators/professional service in integrating assistive technology for your child in the inclusive classroom, the impact of assistive technology on academic achievement, attendance of a parents on

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workshop/training/seminar related to the use of assistive technology (AT). To answer research question five, six, seven, eight and nine we calculated Chisquared tests of independence to understand the association between demographic variables and the attitudes of the parents related to ATs. By addressing these aspects, the research aims to provide comprehensive insights into the real-world impact of assistive technologies in inclusive education from the perspective of parents, thus contributing to the optimization of these tools for enhancing educational outcomes for children with disabilities.

RESULTS

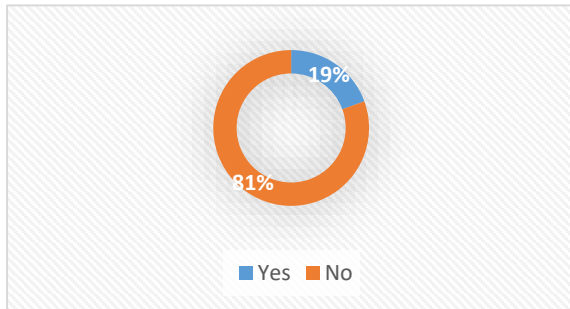
Overall, 72 parents took part in this study. The details regarding the percentage representation of parents of children with different types of disabilities, levels of education, and social status are shown in detail in Table 1.

Table 1. Demographic characteristics of participants

Variables	Frequency (N=72)	Percentage (%)
Type of disability		
Autism	31	43.1%
Intellectual disability	14	19.4%
Hearing impairment	2	2.8%
Physical disability	13	18.1%
Visual impairment	1	1.4%
Speech problems	4	5.6%
Other	7	9.7%
Level of education		
Basic education	3	4.2%
Secondary education	29	40.3%
High education	38	52.8%
Other	2	2.8%
Socio-economic status of the family		
Low	13	18.1%
Medium	57	79.2%
High	2	2.8%

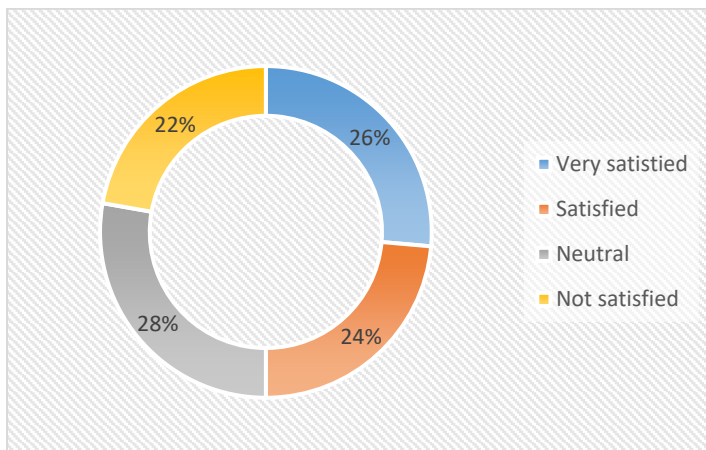
Regarding the first question, whether a child uses assistive technology (AT), 58 parents (80.6%) responded negatively, while the remaining 14 parents (19.4%) stated that their child uses some form of assistive technology.

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Graphic 1. Child use AT

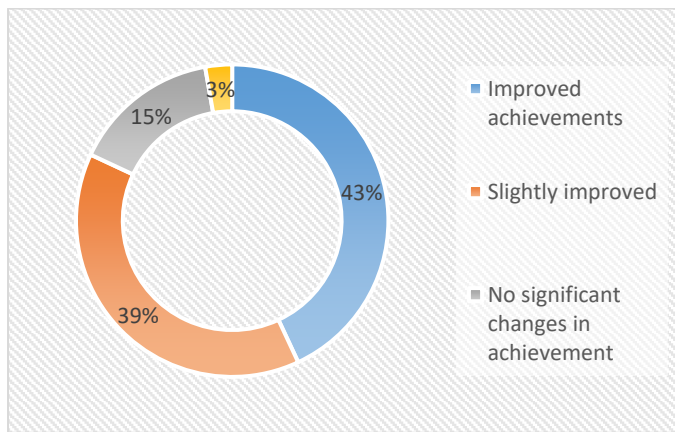
There is almost an equal number of parents' answers to the second question where they declare their satisfaction with the support they receive from regular schools, so 19 of the respondents are very satisfied with this support, while 17 parents are not satisfied.



Graphic 2. Parents' satisfaction with the support provided by teachers/special educators/professional service in integrating assistive technology for your child in the inclusive classroom

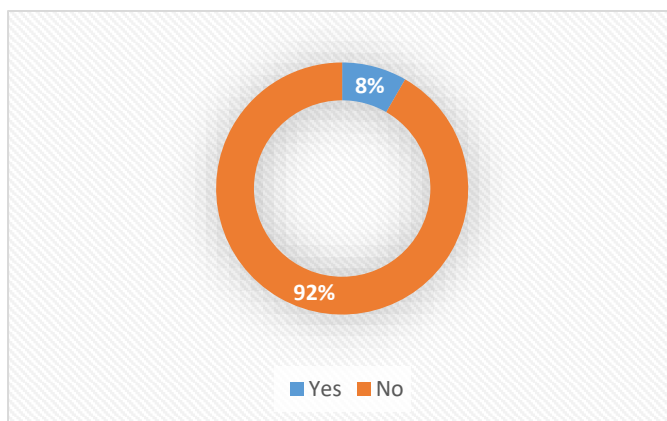
A greater number of parents, i.e. 31 or 41.3% believe that their children's academic achievements have improved significantly, 28 of the respondents or 38.9% believe that they have improved slightly, 11 parents or 15.3% believe that there are no significant changes in academic achievements, while only 2 parents or 2.8% believe that there are reduced achievements.

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Graphic 3. Impact of assistive technology on academic achievement

Only 6 or 8.3% of parents who are part of this research attended a workshop/training/seminar related to the use of assistive technology (AT), while the percentage of those who did not attend is greater than 90.



Graphic 4. Parents attended a workshop/training/seminar related to the use of assistive technology (AT)

Chi-squared tests for independence were computed to ascertain the association between demographic variables and survey items. The results show that only one demographic variable (**socio-economic status of the family**) was associated with some survey items. The results of demographics which had associations with some of the items are summarised in the following table.

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Table 2. Association between demographic variables and survey items

Association	Chi-square	p-value	Degrees of freedom	Explanation
Types of disabilities and the perception of the impact of assistive technology on academic performance in the conditions of inclusive education.	11.044	0.525	12	The p-value (0.525) is greater than the common significance level (e.g., 0.05), indicating that there is no significant association between the type of disability and the perception of the impact of assistive technology on academic performance in the conditions of inclusive education.
Types of disabilities and the perception of the impact of assistive technology on social interaction with other children of the same age in the conditions of inclusive education.	14.486	0.697	18	The p-value (0.697) is greater than the common significance level (e.g., 0.05), indicating that there is no significant association between the type of disability and the perception of the impact of assistive technology on social interaction with other children of the same age in the conditions of inclusive education.
Types of disabilities and the perception of the extent to which assistive technology contributes to the independence of the child in an inclusive educational environment..	23.045	0.189	18	The p-value (0.189) is greater than the common significance level (e.g., 0.05), indicating that there is no significant association between the type of disability and the perception of the extent to which assistive technology contributes to the independence of the child in an inclusive educational environment.
Types of disabilities and the perception of potential improvements in a child's engagement in learning and independent functioning after the introduction of assistive technology in inclusive education.	13.583	0.756	18	The p-value (0.756) is greater than the common significance level (e.g., 0.05), indicating that there is no significant association between the type of disability and the perception of potential improvements in a child's engagement in learning and independent functioning after the introduction of assistive technology in inclusive education.
Types of disabilities and the perception of the role of assistive technology in promoting equal educational opportunities for the child in inclusive education.	15.024	0.660	18	The p-value (0.660) is greater than the common significance level (e.g., 0.05), indicating that there is no significant association between the type of disability and the perception of the role of assistive technology in promoting equal educational opportunities for the child in inclusive education.
Level of education and the perception of the impact of assistive technology on the academic performance of a child with a disability in the conditions of inclusive education.	10.327	0.112	6	The p-value (0.112) is greater than the common significance level (e.g., 0.05), indicating that there is no significant association between the level of education and the perception of the impact of assistive technology on the academic performance of a child with a disability in the conditions of inclusive education.
Level of education and the perception of the implementation of assistive technology contributing to changes in the social interaction of the child with other children of the same age in the inclusive classroom.	12.278	0.198	9	The p-value (0.198) is greater than the common significance level (e.g., 0.05), indicating that there is no significant association between the level of education and the perception of the implementation of assistive technology contributing to changes in the social interaction of the child with other children of the same age in the inclusive classroom.

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Level of education and the perception of the extent to which assistive technology contributes to the dependence of the child with a disability in an inclusive educational environment.	12.399	0.192	9	The p-value (0.192) is greater than the common significance level (e.g., 0.05), indicating that there is no significant association between the level of education and the perception of the extent to which assistive technology contributes to the dependence of the child with a disability in an inclusive educational environment.
Level of education and the perception of potential improvements in a child's engagement in learning and independent functioning after the introduction of assistive technology in inclusive education.	10.172	0.337	9	The p-value (0.337) is greater than the common significance level (e.g., 0.05), indicating that there is no significant association between the level of education and the perception of potential improvements in a child's engagement in learning and independent functioning after the introduction of assistive technology in inclusive education.
Level of education and the perception of the role of assistive technology in promoting equal educational opportunities for the child in inclusive education.	23.544	0.005	9	The p-value (0.005) is less than the common significance level (e.g., 0.05), indicating that there is a significant association between the level of education and the perception of the role of assistive technology in promoting equal educational opportunities for the child in inclusive education.
Socio-economic status of the family and the perception of the impact of assistive technology on the academic performance of a child with a disability in the conditions of inclusive education.	9.953	0.041	4	The p-value (0.041) is less than the common significance level (e.g., 0.05), indicating that there is a significant association between the socio-economic status of the family and the perception of the impact of assistive technology on the academic performance of a child with a disability in the conditions of inclusive education.
Socio-economic status of the family and the perception of the implementation of assistive technology contributing to changes in the social interaction of the child with other children of the same age in the inclusive classroom.	9.048	0.171	6	The p-value (0.171) is greater than the common significance level (e.g., 0.05), indicating that there is no significant association between the socio-economic status of the family and the perception of the implementation of assistive technology contributing to changes in the social interaction of the child with other children of the same age in the inclusive classroom.
Socio-economic status of the family and the perception of the extent to which assistive technology contributes to the dependency of the child with a disability in an inclusive educational environment.	2.549	0.863	6	The p-value (0.863) is greater than the common significance level (e.g., 0.05), indicating that there is no significant association between the socio-economic status of the family and the perception of the extent to which assistive technology contributes to the dependency of the child with a disability in an inclusive educational environment.
Socio-economic status of the family and the perception of potential improvements in a child's engagement in learning and independent functioning after the introduction of assistive technology in inclusive education.	7.660	0.264	6	The p-value (0.264) is greater than the common significance level (e.g., 0.05), indicating that there is no significant association between the socio-economic status of the family and the perception of potential improvements in a child's engagement in learning and independent functioning after the introduction of assistive technology in inclusive education.
Socio-economic status of the family and the perception of the role of assistive technology in promoting equal educational opportunities for the child in inclusive education.	9.025	0.172	6	The p-value (0.172) is greater than the common significance level (e.g., 0.05), indicating that there is no significant association between the socio-economic status of the family and the perception of the role of assistive technology in promoting equal educational opportunities for the child in inclusive education.

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DISCUSSION

Parental attitudes and experiences with assistive technology (AT) are crucial in understanding how these tools are utilized and their impact on children with disabilities. Various studies have explored this aspect, revealing both positive outcomes and significant challenges.

Gabrielle Young et al. (2012) examined the perceptions of students and their parents regarding the use of AT in a specialized educational setting. Parents in this study generally perceived AT as a transformative tool that significantly enhanced their children's academic abilities and self-confidence. They noted improvements in their children's ability to complete tasks and demonstrate their academic potential. One parent, for example, highlighted how AT allowed their child to better grasp reading material and produce written work that reflected their intellectual capabilities. However, some parents also expressed concerns about the stigma associated with using AT, with their children feeling different or singled out in the classroom. In a study by Shikden Abani Gwanshak (2019), it was found that parents play a critical role in the implementation and success of AT. Parents often act as intermediaries, facilitating their children's use of these technologies. Despite their crucial role, many parents reported feeling inadequately supported and trained. This lack of support often led to frustration and, in some cases, the abandonment of the technology. Gwanshak emphasized the need for better training and resources for parents to help them effectively support their children in using AT.

Vanesa Ayon and Andrew Dillon (2021) explored the socio-technical challenges of AT design and implementation. They highlighted that parents' involvement and motivation are essential for the successful integration of AT into daily life. Parents often bear significant responsibility for setting up and maintaining AT devices, which can be stressful without adequate support and training. Ayon and Dillon pointed out that the current implementation of AT often fails to consider the broader socio-technical context, leading to user dissatisfaction and abandonment of technology. They advocated for a user-centered design approach that considers the needs and experiences of all stakeholders, including parents.

Karlsson et al. (2017) conducted a study focusing on children with severe physical impairments and their parents' experiences with gaze-based AT. The study found that parents were generally positive about the potential of AT to enhance their children's communication and participation in daily activities. However, they also faced challenges related to the setup and maintenance of these devices. Parents reported a need for more comprehensive training and ongoing support to ensure effective use of AT. The study highlighted the importance of involving parents in the design and implementation process to address their concerns and needs adequately.

These findings underscore the importance of parental involvement in the successful adoption and use of AT. Parents' attitudes towards AT are generally positive, recognizing its potential to significantly improve their children's educational experiences and overall quality of life. However, the lack of adequate support and training for parents remains a significant barrier. Addressing these challenges through comprehensive training programs, better support systems, and inclusive design approaches can enhance the effectiveness of AT and ensure that it meets the needs of all stakeholders involved.

Rashikj-Canevska and Chichevska-Jovanova (2021) also examined the use of AT in inclusive classrooms for students with motor impairments. They found that while parents recognized the benefits of AT in facilitating their children's learning, they often struggled with the lack of tailored support and training. The study emphasized the importance of providing specific educational tools and assistive technologies that are adapted to the individual needs of students

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with disabilities. This tailored approach helps in maximizing the effectiveness of AT and ensures that students can participate fully in their educational activities.

In 2015, Lazovski and Stojkovska Aleksova conducted a study on the introduction and application of assistive technology in 31 regular primary schools in Macedonia. This research highlighted the positive impact of assistive technology on the inclusiveness of the educational process, enhancing participation opportunities for students with disabilities. The study utilized surveys involving schools, teachers, students with disabilities, and their parents, conducted between February and March 2015. The findings indicated that the model of applying assistive technology met the needs of students with disabilities and helped schools improve their daily interactions with these students. The combination of equipment procurement, capacity building for teachers, and providing resource materials led to increased educational opportunities for students with disabilities. All four respondent groups confirmed the relevance and quality of implementation and the success of the chosen model.

In another study from 2014 by Lazovski and Gulevska, the focus was on the needs of secondary schools in Macedonia for assistive information technology. This research, conducted by the Association for Assistive Technology "Open the Windows," covered three-quarters of all regular secondary schools in the country. The study identified key areas: the prevalence of students with special educational needs (SEN), the inclusiveness of secondary schools regarding these students, and the use of computers to include students with SEN in teaching. The findings showed that nearly two-thirds of secondary schools had at least one student with SEN, indicating a need for schools to adapt their approaches and provide adequate support. However, significant challenges remained, including physical accessibility, inadequate staffing of specialist teams, and a lack of teacher training. Despite these challenges, many schools reported positive experiences with SEN students who had acquired the necessary basic knowledge and successfully completed regular secondary education. The study recommended introducing and using assistive technology to enhance the inclusion of students with disabilities in secondary education.

Peterson's 2017 study, "Parental and Teacher Perspectives on Assistive Technology," focused on the barriers and challenges of effectively implementing assistive technology for students with cognitive impairments, such as autism and ADHD, from the perspectives of parents and teachers. This qualitative study explored their perceptions regarding the role of assistive technology in supporting students with disabilities. Using interviews, literature reviews, IEP forms, and reviews of technological requirements for teacher preparation programs in Minnesota, the study provided insights into the attitudes, needs, and challenges faced by parents and teachers in integrating assistive technology. The results revealed that knowledge of assistive technology, along with a lack of awareness and training for teachers, posed significant barriers to its use. The study emphasized the need for teacher education programs to include training on assistive technology, highlighting the importance of equipping educators with the necessary skills to work with students with disabilities.

Peterson's research also delved into parents' views on assistive technology for their children with disabilities. The interview protocol included questions about their child's challenges at school, available resources, their understanding of assistive technology, and its potential to help their child succeed. The findings indicated that parents had limited understanding of assistive technology, although they viewed its implementation positively as a tool for their children's success. The study found that teachers' perceptions of assistive technology varied based on experience, with more experienced teachers feeling more confident in recommending and integrating assistive technology into their work. Both parents and teachers recognized the

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potential of assistive technology, but challenges in understanding and implementation needed to be addressed to provide effective support for students.

In conclusion, while parents generally recognize the benefits of assistive technology (AT) for their children's education, the success of these technologies heavily relies on the support and training provided to them. Studies by Young et al. (2012), Gwanshak (2019), Ayon and Dillon (2021), and Karlsson et al. (2017) highlight the critical role of parents in the implementation of AT. Their involvement, motivation, and the support they receive are essential to the effective use of these technologies, underscoring the need for a more comprehensive and inclusive approach to AT design and implementation.

Additionally, research from Rashikj-Canevska and Chichevska-Jovanova (2021), Lazovski and Stojkovska Aleksova (2015), and Lazovski and Gulevska (2014) demonstrates the positive impact of AT in inclusive educational settings, while also emphasizing the ongoing challenges related to tailored support, training, and resource availability. These findings highlight the necessity for educational systems to prioritize AT integration through strategic planning, resource allocation, and capacity building.

Overall, addressing these challenges through comprehensive training programs, better support systems, and inclusive design approaches can enhance the effectiveness of AT and ensure that it meets the needs of all stakeholders involved. By fostering a collaborative environment where parents, educators, and policymakers work together, we can ensure that assistive technologies fulfill their potential in transforming the educational experiences and outcomes for students with disabilities.

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