Benefit of Incorporating Technology in Special Education

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

The objective of this study is the application of technology in the process of learning by students with special needs. The author argued that the integration of information technology and various technological device help in enhancing learning outcome and social skills of students with disabilities., whether in the educational process or in socialization. The research methods used are of the combined type: quantitative and qualitative. Quantitative methods are part of the empirical research that involves parents, support teachers, school management, and representatives of associations of persons with disabilities. On the other hand, the qualitative method was employed to the focus group with 6 participants, with disabilities and a support teacher, where the discussion was assisted by the support teacher.

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1. INTRODUCTION

Our research on the application of technology in the learning process for students with special needs requires a comprehensive understanding of modern technological equipment suitable for both school environments and other spaces where learning occurs for students with disabilities. To assess the level of technological knowledge among students with special needs, their utilization of technology, and the accessibility of technology, various stakeholders must be involved in the research process. These include: Special Schools Management, Inclusive school Representatives, Support Teachers for Children with Special Needs, Parents, Technology Experts and Associations for the Deaf, Blind, and Others.

There is no school today can be imagined without the supply of technology that facilitates the learning process, concretization, illustrations with practical and visual examples, and facilitating students in terms of understanding, analysis, comparison, synthesis, abstraction, and generalization as thinking operations, for the issues being taught.

The advent of technology has significantly transformed the landscape of education, particularly in special and regular schools catering to children with disabilities. Technological advancements have become powerful tools in enhancing the lives of these children, fostering easier integration into society, promoting more efficient learning, saving valuable time, and bolstering independence. Through the application of assistive technologies, adaptive learning platforms, and innovative communication aids, children with disabilities can experience a tailored educational journey that aligns with their unique needs. The inclusive use of technology in education not only addresses specific challenges but also opens avenues for these children to actively participate in academic and social spheres, contributing to a more equitable and supportive educational environment.

Mobile phone is already part of every person, especially in Kosovo, the degree of coverage of rural and urban terrain with the internet is at the maximum level. Most families have internet in their homes. After the war in Kosovo, many new schools were built by the Government of Kosovo,

international donors, and in recent years, it has been invested in equipping schools with information technology, but not to the required degree, especially the presence and type of technology adequate is still lacking in special schools and regular schools, for the children of students with disabilities.

The development of globalization, technology and the opening of Kosovar society to educational practices in different countries, has helped Kosovo to be included in the contemporary dynamics of education and the inclusion of technology in the educational process, especially among students with disabilities. But schools are changing more slowly compared to such a rapid change of technology, and there is often a need to update the old technology and schools to be equipped with the most advanced technology, especially for people with hearing, vision, physical mobility, etc.

The purpose of applying the scientific methodology in this research will be to collect data, how much they know, how much they use and how much they are trained in technology, people who have problems with hearing, sight, walking or hand movements, in general students with disabilities. In Chart 1, some examples of support technology concepts for different fields are presented, depending on the type of sensory impairment for people with disabilities.

1.1 Applying Technology In Special Education: Breaking The Barriers

There are many ways of how technology can help students with special needs. For example, some kinds of disabilities don't allow students to use handwritten text that is an integral part of "traditional" education. Using technical tools intended for human speech recognition and synthesizing, you can avoid the necessity to use paper and pen during the lessons. Such technology would also be helpful for students with disorders that don't allow to process visual information correctly.

The adaptive computing technology allows using digital devices to bypass challenging tasks. Screen reader applications such as JAWS along with specially designed Braille keyboards allow visually challenged students to use the computer

Chart 1. Examples of support technology depending on the domain

	Low- to Mid-tech	Mid- to High-tech	Apps for Mobile Devices
Receptive	Notepad – Notepads are an excellent way to record information. Students with learning disabilities (LDs) may appreciate having the information color-coded based on the purpose, topic, or function of the information.	Audio recorders – Audio recorders that store hundreds of hours of audio can be purchased as cheaply as $30-$40. Talking dictionary – Students with LDs can use talking dictionaries to verify definitions and spelling. Talking dictionaries are small enough to be carried in a pencil case and are not as expensive as computers or tablets. Visuwords – This free online dictionary allows students to look up words to find their meanings and associations with other words and concepts.	Audiobooks – Provides a simple way to listen to many of the best classic books and modern titles .
Speaking	Cue cards – Cue cards provide helpful hints for the oral presentation of information, and the process of composing cue cards can help organize the information beforehand.	Prezi – A free 3D graphic organizer which can be used to create presentations. Prezis can be collaborative as students can comment and build upon other Prezis.	ShowMe Interactive Whiteboard –In order to reduce anxiety, students may opt to record presentations on their iPad beforehand. Video recordings can be uploaded on YouTube or a more private domain.
Reading	Highlighter strips – Translucent rectangles of color can help eliminate extra visual clutter by blocking out the rest of the text. Sticky notes – Students with LDs may find it useful to summarize the main ideas of the text with sticky notes which can be stuck directly on the page.	Kurzweil 3000 – Text-to-speech software, such as Kurzweil 3000, can read aloud digital or printed text. Storyline Online – A free online streaming video program featuring books read aloud. Each book includes accompanying activities and lesson ideas. Project Gutenberg – Over 45,000 free e-books. Wikipedia – The Simple English function on Wikipedia allows content to be "translated" into plain English which is easier to read.	Speak Selection –Located in the accessibility features of Apple devices, Speak Selection can be used to read aloud electronic text. Free Books – This app contains more than 23,000 free booksNotes, highlight options, bookmark, and dictionary tools are provided. GoodReader – This PDF reader allows you to add sticky notes, highlight and take notes.
Writing	Pencil grips – For students who struggle with handwriting, pencil grips can provide a surface that is easier to manipulate. Computerized pens – These pens can automatically transmit handwriting into digital text. Some computerized pens have audio-recording functions that allow the writer to listen to specific sections of the audio file by tapping on the written notes.	Word processing – functions such as spell cpredictiononary options, synonym support, and word-prediction features are helpful for students with learning disabilities.	Pages – The Pages app allows you to compose, edit work, and share. It also includes word prediction, speech-to-text, and spell check functions. iWordQ – iWordQ provides reading assistance, word choice and proofreading functions. Dragon Dictation – This easy-to-use voice recognition application allows you to speak and instantly see your text or e-mail messages. You must be connected to the Internet for this application to work.

|	**Low- to Mid-tech**	**Mid- to High-tech**	**Apps for Mobile Devices**
Reasoning	*Graphic organizers – Organizing ideas visually allows students with LDs to see the connections between ideas.Audio recorders – Many students with LD experience difficulty translating oral language into written text. Recording ideas early in the thinking process can provide a record for later recall and clarification.*	*Inspiration – This software helps students organize ideas visually without the challenge of handwriting or spelling requirements. The content can be instantly translated into outlines for essays or compositions.* *Spark-Space – This software supports the writing of students who are visual learners through the use of functions such as the idea mapping essay writer tool.* *Audacity – Audacity is a free software program that allows you to record and edit sounds.*	*SimpleMind+ – This app allows you to brainstorm and organize your ideas. Completed concept maps can be automatically converted to an outline.*
Math	*4-function calculator – Depending on the type of work being done, a 4-function calculator can be a great help without providing a disproportionate advantage to students with LDs.*	*Graphing calculator - Graphing computers can solve complex equations, and the dynamic display screen allows the student to verify the results before solving on paper.* *Math Dictionary for Kids – An animated, interactive online math dictionary that explains over 600 common mathematical terms in simple language.* *Braiing Camp – Animated lessons and interactive activities to assess student understanding.* *IXL Math - IXL's math practice skills are aligned with pre-K through Grade 8 provincial curricula, and student's performance is assessed on each objective.* *Sumdog – Sumdog's learning engine adapts its math questions to each student's ability. Covering number operations through to simple algebra, it is designed for students aged 6 to 14.*	*ShowMe and ScreenChomp – These apps provide an interactive whiteboard interface to solve problems. The actions on the screen and audio can be recorded and shared as a video file.*

Source: (Young & MacCormack, n.d.)
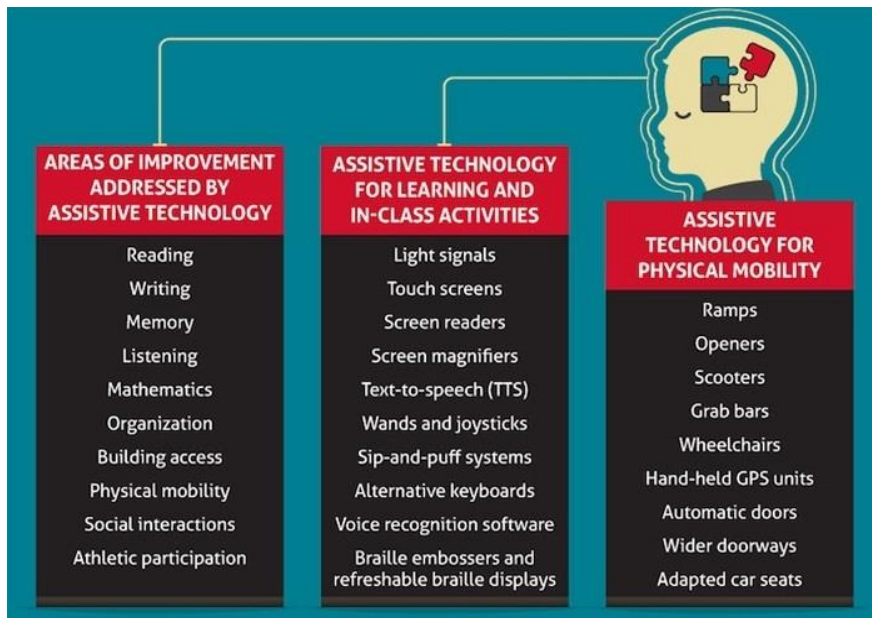
Fig. 1. Applying technology in special education [1]
Source: University of Cincinnati

Augmentative communication systems help students with speech problems to overcome the communication barrier. Such systems use picture charts, books, and specialized computers providing functions of word-prediction for more effective communication. Dikusar [1].

Before applying for services of a company that develops technologies for special education, consider the following advice:

- Pay attention to the cost of a given solution and its potential effect on the learning process.
- Prefer a technology that is not difficult to master.
- Make sure that the application you're going to choose is reliable and will naturally integrate into the educational process.
- Focus on user-friendly and intuitive solutions.
- Possibility to implement custom functionality that meets your requirements or customize the existing solution.

2. METHODS

The research methods that will be included in this paper are of the combined type: quantitative and qualitative. Quantitative methods will be part of the empirical research, involving parents, support teachers, school management, and representatives of associations of persons with disabilities. While the qualitative method will be available in the focus group with 6 participants, with disabilities and a support teacher, where the discussion will be assisted by the support teacher.

2.1 Samples and Research Techniques

The research sample comprised 100 respondents, including students, support teachers, parents, representatives of associations of persons with disabilities, and school management. Both quantitative and qualitative methodologies were employed in this research, utilizing questionnaires for the quantitative aspect and focus groups for qualitative insights. Different types of questionnaires were administered, tailored to specific disabilities, encompassing those for individuals with hearing impairments, visual impairments, intellectual disabilities, physical disabilities, and learning difficulties such as dyslexia, Down Syndrome, and autism.

Each questionnaire will have 12 closed and open type questions, divided into four sections:

1) the section on technology availability for people with disabilities;
2) the section on the degree of knowledge of technology;
3) the section on the degree of application of technology of learning;

4) the section to present the challenges of technology application by people with special needs.

The questionnaires were implemented with the support teachers and teachers of people with disabilities, the management of special and regular schools, and with parents and representatives of associations of the deaf and blind in the Municipality of Gjilan.

2.2 Focus Groups

The focus group sessions are set to include individuals with disabilities and their support teachers, engaging in collaborative discussions with researchers across four municipalities in Kosovo: Prizren, Peja, Prishtina, and Gjilan.

Each of the four focus groups will comprise 6 participants, distributed as follows: 4 individuals with disabilities, 1 support teacher, and 1 representative from school management. Alternatively, there is flexibility to include a representative from associations advocating for individuals with limited abilities.

The structured questions incorporated into the focus groups will explore the participants' perspectives on the degree of knowledge, usage, and accessibility of various technologies, including: Computers in the Learning Process, Sign Language Translation, Assistive Devices, Devices for Physical Movements, Devices for Walking and Orientation

2.3 Importance of Research

It was nessary to conduct this study owing to the lack of reserch in this flied in Kosovo the result of which would be useful in providing valuable recommendations to benefit educational institutions, NGOs and government institutions to change policies in accessing people limited abilities, in the most modern technologies for learning. The findings of this research are expected to contribute to the improvement of the way of teaching by supportive teachers in school settings where there are students with disabilities. Considering the application of appropriate methods and strategies in relation to students with special needs and experimenting with different ways of presenting information can facilitate the teaching and learning process, both for teachers working with these students and also for these students themselves. As a result, the application of technological equipment is

expected to help increase the motivation, communication, engagement and self-confidence of students with disabilities.

The computer is considered as an auxiliary device, with the help of which the teacher transmits information, which has a specific educational purpose. There are so many applications, platforms, opportunities, to make learning easier for students with disabilities. In the research, we will argue that information technology and various technological devices can be useful in achieving learning outcomes and objectives, achieving the most efficient integration of students with disabilities, whether in the educational process or in socialization. and in increasing their independence from others.

2.4 The Purpose of the Research

The purpose of this research is to discover and identify technological needs for students with special needs in primary schools and to test (show) how assistive technologies are able to help these students to be equal to other students and without many challenges, to be able to attend the lesson.

This paper focuses on the following areas:

- The level of technology being used by students with special needs;
- The degree of mastery and efficiency in their use by students with disabilities and by the teachers themselves and the support teacher;
- The need for new training in efficient use;
- Challenges of students' and teachers' use of technology.

This research is based on exploring the role of informatics technology in promoting the education of children with special needs within the classroom. It will delve into detailed options, describing how computer applications can enable students with special needs to access regular instruction like their peers.

Another purpose of this study is to investigate contemporary methods for students with disabilities using computers, as well as other technological and modern equipment. The aim is to argue that the application of new modern methods will lead to measurable progress in achieving school outcomes compared to the use of traditional teaching and learning methods [2].

2.5 The Object of Research

The object of this study is the application of technology in the learning process for students with special needs. The main idea of the paper is to identify the challenges associated with using modern technology by students with special needs in primary schools. This includes assessing the degree of technological application in teaching by teachers for students with special needs and exploring the opportunities offered by pre-university institutions in Kosovo for these special social categories in the use of technology for pedagogical and didactic purposes. The application of technology to overcome barriers in the learning, reading, memorization, and writing process is of great importance, emphasizing the increasing need for updating knowledge on the latest technological innovations for effective utilization.

Kosovo, emerging from the 1999 war, initially faced poor school and technological infrastructure. Despite significant investments, particularly in the last two decades, in constructing physical facilities and supplying school inventory, the region is still lacking in appropriate technological equipment. Although progress has been made with the establishment of laboratories and computer cabinets, and equipping teachers with basic technical tools and projectors, there is a continuous effort to foster an environment conducive to the use of technology in the learning process, especially for students with special needs. Kosovo, with a demographic majority of young people under 25, exhibits extensive use of technology, internet access, and social media. According to the Kosovo Agency of Statistics, internet usage in Kosovo from 2018-2020 was predominantly by the 35-44 age group, with mobile phones being the most widely used device, indicating a widespread coverage of information technology throughout the country.

Even in the use of internet devices in the last three months, such as mobile phones, laptops, tablets, and other mobile devices, Kosovar society owns equipment in most parts of the country. As seen in Chart 4, the use of mobile phones dominates, with a percentage of 84.9 in 2018, slightly decreasing to 78.9 in 2019.

Coverage with information technology is widespread throughout the territory of Kosovo, offering optimistic prospects for the broader use of modern technology by all social categories. This is particularly significant in teaching and learning at all levels of the education system, both pre-university and university, for people with disabilities. In Chart 5, households in Kosovo with internet access from home show that the absolute majority of households have had access in recent years.

Kosovo has laws, documents, and a constitution that protect the rights of people with special needs, and the country is committed to the application of all international conventions in the field of the rights of children with special needs. This commitment contributes to increased government investment, particularly by the Ministry of Education and Science, in promoting the use of technology to facilitate learning for students with special needs. This context facilitates access to learning technology. Non-governmental organizations play an important role in this area, focusing specifically on the rights

Chart 2. Use of the Internet by age groups in 2018, 2019 and 2020

Internet use by age groups for three years			
	2018	2019	2020
16-24	17,0	14,5	17,4
25-34	16,5	17,4	16,1
35-44	20,6	20,5	19,5
45-54	19,3	19,5	18,9
55-64	12,7	13,5	15,5
65+	8,4	9,2	10,1

Source: Kosovo Agency of Statistics [3]

Chart 3. Internet access from home to Kosovar families

Users according to gender, who have had internet access at home or apartment by gender and year			
	2018	**2019**	**2020**
Male	59,2	55,8	57,4
Female	35,4	38,7	40,2

Source: Kosovo Agency of Statistics [3]

Chart 4. Use of technological equipment in 2018 and 2019

Use of internet devices during the last 3 months and year	
Mobile phones	
2018	84,9
2019	78,9
Laptop/Portativ Computer	
2018	22,5
2019	21,7
Desktop Computer	
2018	18,1
2019	11,8
Tablets	
2018	9,6
2019	11,9
Other mobile equipments	
2018	0,7
2019	2,7

Source: Kosovo Agency of Statistics [3]

Chart 5. Internet access from home to Kosovar families

Households in Kosovo that have had internet access from home and year		
Don't know	2017	0,4
	2018	0,2
	2019	0,8
	2020	0,2
No	2017	10,8
	2018	6,6
	2019	6,1
	2020	3,4
Yes	2017	88,8
	2018	93,2
	2019	93,2
	2020	96,4
Total	2017	100,0
	2018	100,0
	2019	100,0
	2020	

Source: Kosovo Agency of Statistics [3]

and freedoms of children with special needs and collaborating with schools on various projects for the inclusive learning of students in this category. Therefore, our study will delve into the significance of NGOs, seeking their perspectives on the challenges faced by students with special needs and their efforts to incorporate as much technology as possible into the learning process.

An important role in this aspect of our study treatment has the implementation of the Pre-University Education Curriculum, with European standards, which is approved by the Ministry of Education, Science, and Technology and monitored by education inspectors in all schools in Kosovo, although the number of pedagogical inspectors is quite small and needs their growth.

In the continuation of the implementation of the pre-university curriculum, there is also the inclusion of people with special needs, the application of technology, etc. Therefore, in this paper will be treated the pre-university curricular aspects, which submit requests to practice technology in teaching and learning, getting acquainted with the legal, curricular, normative, administrative instructions, and especially with the documents issued by the Ministry of Education, Science and Technology. The focus of our research will be the following issues: the degree of application of modern technology in learning to people with special needs; type of technology used, application challenges; measuring the knowledge of teachers themselves and school staff about technology as a learning tool for categories with special needs; measuring teachers' attitudes about this issue; finding the difficulties faced by both students, teachers, but also the school management for technological equipment; understanding how much the school attaches importance to teacher training in the use of technology in teaching and learning by people with special needs, etc.

3. CONCLUSION

The use of technology in special education helps break barriers for people with disabilities, providing them access to the most relevant educational programs. Properly designed software and hardware allow students with special needs to receive a modern education and access any required information online [4].

Technology facilitates individualized learning experiences for students, offering increased flexibility and differentiation in educational methodologies. With modern technology, teachers can easily adapt to the specific needs of each student, selecting from dozens of available learning tactics designed to meet the unique requirements of individual learners [5].

4. RECOMMENDATIONS

1. Tailored ICT Integration

Recommend tailoring ICT systems to accommodate diverse learning needs. This could involve developing or selecting educational software and applications that provide customizable settings, ensuring a more personalized and inclusive learning environment for students with special needs.

2. Teacher Training Programs

Recommend implementing training programs for teachers to enhance their proficiency in utilizing ICT tools for special education. This could include workshops, seminars, or online courses to equip educators with the necessary skills to effectively integrate technology into their teaching methods.

3. Accessible ICT Infrastructure

Advocate for the establishment of accessible ICT infrastructure within schools. This involves ensuring that hardware and software used in educational settings are designed with features that facilitate easy access and use for students with various disabilities.

4. Collaboration Amongst Stakeholders

Recommend fostering collaboration among support teachers, regular teachers, school management, and parents. Creating a collaborative network ensures that everyone involved in a student's education is informed about and actively participates in the implementation of ICT solutions tailored to the student's needs.

5. Regular Assessment and Adaptation

Suggest implementing a system of regular assessments to evaluate the effectiveness of ICT interventions for students with special needs. This ongoing assessment allows for the identification of areas that may require adjustments or improvements, ensuring that the technology remains beneficial and supportive.

6. Parental Involvement and Education

Encourage initiatives that involve parents in the educational process and educate them about the benefits of ICT for their children with special needs. This can include workshops or informational sessions to increase parental support and involvement in their child's technology-assisted learning.

7. Advocacy for Inclusive Policies

Recommend advocating for policies at both school and governmental levels that promote inclusivity in education, specifically addressing the integration of ICT systems for students with special needs. This can involve engaging with educational authorities and policymakers to emphasize the importance of inclusive practices.

8. Continuous Research and Development

Encourage continued research and development in the field of assistive technologies and ICT solutions for special education. This ensures that schools stay abreast of advancements, allowing them to continuously improve and update their approaches to meet the evolving needs of students with disabilities.

These recommendations aim to create a more supportive and inclusive educational environment for students with special needs by leveraging the benefits of ICT systems [6-15].

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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