Innovative Technologies for Inclusive Education

A Review of Best Practices from Global Resource Centres

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Innovative Technologies for Inclusive Education:
A Review of Best Practices from Global Resource Centres

This publication, developed as part of the UNESCO—Chengdu project 'Integrating Artificial Intelligence and Digital Innovations to Strengthen Inclusion and Equity of Education in Africa', presents the real-life experiences of resource centres across various regions and countries and showcases the meaningful and rewarding use of information and communication technologies (ICT), artificial intelligence (AI) and assistive technology (AT) to support and enrich the education and socialization of persons with disabilities and special learning needs.

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PREFACE

Dear colleagues,

It is with great enthusiasm and a profound sense of purpose that we present this collection of best practices for the impactful integration of technology and digital pedagogy in the education and socialization of learners with disabilities and special needs. This publication, developed as part of the 'Integrating Artificial Intelligence and Digital Innovations to Strengthen Inclusion and Equity of Education in Africa' initiative — implemented by UNESCO IITE with the esteemed support of the Chinese National Commission for UNESCO — showcases cutting-edge efforts to harness information and communication technologies (ICT), artificial intelligence (AI), and assistive technology (AT) in advancing equity, inclusion, and cohesion in education and beyond.

The chapters in this publication describe the real-life experiences of resource centres around the world. These centres have demonstrated how technology and digital pedagogy can be used in meaningful ways to support and enrich the educational journeys and social interactions of individuals with disabilities and special learning needs. We begin our narrative by emphasizing the vital role resource centres play in addressing the diverse and unique needs of vulnerable learners. By highlighting the power of humane dedication augmented by technology, we demonstrate how these centres can significantly enhance access to education, enrich personalized learning experiences and facilitate greater social integration.

We look closely at specific applications of ICT, AI and AT in these resource centres, from adaptive learning tools and communication aids to sensory devices and other groundbreaking solutions. The best practices and success stories showcased here are testament to the transformative power of technology and digitally enhanced pedagogy in improving educational outcomes and promoting social engagement among persons with disabilities.

However, the journey towards inclusive education is not without its challenges. Therefore, this publication candidly discusses the obstacles that stand in the way of the impactful integration of ICT, AI and AT, including issues relating to accessibility, affordability and digital literacy. Overcoming these challenges requires a commitment to capacity-building activities, such as specialized training programmes, which are essential for enhancing the competencies and motivation of dedicated professionals in the field. The importance of collaborative efforts among key stakeholders is underscored, reflecting our collective responsibility for advancing inclusive education.

As you engage with this publication, you will find that it serves not only as a resource but also as an inspiration for all committed professionals and the broader education community. It is rooted in UNESCO's affirmation, as emphasized in *Enhancing Disability Inclusion Across UNESCO's Programmes (219 EX/32),* which underscores the importance of strengthening programmes and policies anchored in the Organization's mandate. These efforts aim to better address the needs and challenges of persons with disabilities — particularly women and youth — while raising the visibility of this issue in the national and international agendas.

Let us embrace this journey together, as we harness the power of technology with unwavering dedication to build a more inclusive, equitable and enriched future for all learners.

Yours sincerely,

Tao ZHAN
Director of UNESCO IITE

GLOSSARY

TERM	DEFINITION
Artificial intelligence (AI)	'There is no universal definition of artificial intelligence (AI). AI is generally considered to be a discipline of computer science that is aimed at developing machines and systems that can carry out tasks considered to require human intelligence. Machine learning and deep learning are two subsets of AI. In recent years, with the development of new neural network techniques and hardware, AI is usually perceived as a synonym for "deep supervised machine learning".' (WIPO. n.d. Frequently Asked Questions: AI and IP Policy Basics: *What Is Artificial Intelligence?*)
Assistive technology (AT)	'An umbrella term for assistive products and their related systems and services. Assistive technology is of fundamental importance for persons with permanent or temporary functional difficulties as it improves their functional ability and enables and enhances their participation and inclusion in all domains of life. Assistive products may be physical products such as wheelchairs, spectacles, hearing aids, prostheses, walking aids or continence pads; or they may be digital, occurring in the form of software and apps that support interpersonal communication, access to information, daily time management, rehabilitation, education and training etc.' (WHO and UNICEF. 2022. *Global Report on Assistive Technology.*)
Augmentative and alternative communication (AAC)	'Augmentative and alternative communication (AAC) describes multiple ways to communicate that can supplement or compensate (either temporarily or permanently) for the impairment and disability patterns of individuals with severe expressive communication disorders.' (American Speech-Language-Hearing Association. n.d. *Augmentative and Alternative Communication (AAC).*)
Best practice	'Commonly defined as "a technique or methodology that, through experience and research, has proven reliably to lead to a desired result". The term is used frequently in areas such as health, government administration, the education system, project management, and others… The use of the word 'best' should not be considered in the superlative sense. In other words, the term "Best Practice" is not about "perfection", the "gold standard" or only elements that have been shown to contribute towards making interventions work or successful.' (WHO Regional Office for Africa. 2008. *Guide for Documenting and Sharing "Best Practices" in Health Programmes.*)

TERM	DEFINITION
Equity	'In education, the extent to which access and opportunities for children and adults are just and fair. This implies reduction of disparities based on gender, poverty, residence, ethnicity, language, and other characteristics... This criterion refers to a universally accepted goal of schooling: the quest for fairness in access to educational opportunities, resources and outcomes by gender, social class, race, language origins and geographical location of students.' (UNESCO-IIEP Learning Portal. n.d. *Glossary: Equity.*)
HelpKidzLearn	An online platform offering a collection of accessible software specifically designed for children with special needs.
Inclusive education	'An inclusive approach to education means that each individual's needs are taken into account and that all learners participate and achieve together. It acknowledges that all children can learn and that every child has unique characteristics, interests, abilities and learning needs.' (UNESCO. 2024. *What you need to know about inclusion in education: How does inclusion relate to the right to education?*)
Information and communication technologies (ICT)	'A diverse set of technological tools and resources used to transmit, store, create, share or exchange information. These technological tools and resources include computers, the Internet (websites, blogs and emails), live broadcasting technologies (radio, television and webcasting), recorded broadcasting technologies (podcasting, audio and video players, and storage devices) and telephony (fixed or mobile, satellite, visio/video-conferencing, etc.).' (UNESCO Institute for Statistics. 2009. *Guide to Measuring Information and Communication Technologies (ICT) in Education.*)
IT infrastructure	'The collection of hardware, software, networks, facilities, and related services that deliver IT operations. IT infrastructure components include servers, storage systems, networking devices, operating systems, databases, and other software applications.' (Atlassian. n.d. *Understanding IT infrastructure: What is it and why is it important?*)
Mainstreaming/ mainstream education	'The inclusion "of learners with special needs into general educational settings or regular schools" (IBE-UNESCO, n.d.). Mainstream education settings should ensure that the needs of all students are addressed and that all barriers which can potentially hinder their participation be removed.' (UNESCO-IIEP. n.d. *Mainstreaming/Mainstream education/settings. Education Policy Toolbox.*)

TERM	DEFINITION
Technology-enhanced education	'The use of technology to maximise the student learning experience. This includes learning with technology e.g. using communication, information and relates technologies to support learning, teaching and assessment e.g. computer assisted design (CAD), use of media in the classroom etc.; and learning through technology e.g. online learning, mobile learning, and technology enhanced classrooms.' ([Learning and Teaching Academy. n.d. Technology Enhanced Learning: A Glossary. Heriot Watt University.](#))
Resource centre (RC)	'Also known as a learning resource center or educational resource center, a centralized hub that offers a diverse range of materials, tools, and services to facilitate teaching, learning, and research activities. These centers are typically found in schools, colleges, universities, libraries, and other educational institutions. RCs serve multiple functions that cater to the needs of students, educators, and the community.' ([Learning Corner. n.d. *Education Glossary: Understanding Resource Centers in Education.*](#))
TD Snap, Grid 3, CBoard, Boardmaker	Specialized communication software.
Tobii PCEye 5, PCEye Mini, Tobii Dynavox PCEye	Compact eye-tracking devices.
Universal Design for Learning (UDL)	'The deliberate design of instruction to meet the needs of a diverse mix of learners, providing all students with an equal opportunity to learn through flexible approaches, and distinguishing between the desired learning outcome and the means of achieving them.' ([International Disability Alliance (IDA). 2021. *Universal Design for Learning and Its Role in Ensuring Access to Inclusive Education for All.*](#))

ACRONYMS

3i-learning system	integrated intelligent intervention learning system
a2i	Aspire to Innovate
AAATE	Association for the Advancement of Assistive Technology in Europe
AAC	augmentative and alternative communication
ABA	Applied Behavioural Analysis
ADHD	attention deficit hyperactivity disorder
AI	artificial intelligence
AIAS Bologna	Associazione Italiana per L'Assistenza Agli Spastici Provincia di Bologna/ Italian Association for the Assistance to People with a Disability)
AR	augmented reality
ARASAAC	Aragonese Center of Augmentative and Alternative Communication
ASC	autism spectrum condition
ASD	autism spectrum disorder
AsTeRICS	Assistive Technology Rapid Integration and Construction Set
ASTRI	Hong Kong Applied Science and Technology Research Institute
AT	assistive technology
CAST	Centre for Applied Special Technology
CCN	complex communication needs
CoP	community of practice
CPD	continuous professional development
CRS	Caritas Resurrection Schools
CSNT	Chartered Special Needs Tutor
DTB	digital talking book
EASTIN	Global Assistive Technology Information Network
EAT	electronic assistive technology
ECARO	Europe and Central Asia

ECCE	early childhood care and education
ECOSOC	United Nations Economic and Social Council
EdTech	educational technology
EHC	Education, Health and Care
ESIPP	Equity and Social Inclusion through Positive Parenting
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
HKSAR	Hong Kong Special Administrative Region
ICCHP	International Conference on Computers Helping People with Special Needs
ICF	International Classification of Functioning, Disability and Health
ICT	information and communication technologies
ICT-AID	ICT Accessibility and Inclusive Design Competency Framework
IDEA	Individuals with Disabilities Education Act
IEP	Individualized Education Programme/Plan
IFIP	Emergence of the Inclusive Practitioners Forum
IIT	Indian Institute of Technology
INCO	inclusive education coordinator
INDIRE	Institute for Documentation, Innovation and Educational Research
IoT	Internet of Things
IRCD	Information, Communication and Technology Resource Centre on Disability
ISO	International Organization for Standardization
ITP	Individualized Training Plan
ITU	International Telecommunication Union
LAN	local area network
LSE	learning support educator
MINEDUC	Ministry of Education
MOOC	massive open online course

NGO	non-governmental organization
OER	open educational resources
PECS	Picture Exchange Communication System
PEP	Personalized Education Plan
PRP	Partnership Research Programme
PUC	Pontificia Universidad Católica de Chile
RCSPIE	Regional Centers Supporting the Process of Inclusive Education
RHOSEY	Rodney House Outreach Service Early Years
SEMH	social, emotional and mental health needs
SEN	special educational needs
SENADIS	El Servicio Nacional de la Discapacidad
SESI	Serviço Social da Indústria
SETT	Student, Environments, Tasks, Tools
SKATE	Skills & Knowledge on Assistive Technology in Early childhood inclusive education
SLI	specific language impairment
SoScieAtH	Social Sciences, the Arts and the Humanities
SRHR	sexual and reproductive health rights
SSP	Systematic Synthetic Phonics
TPACK	Technological Pedagogical Content Knowledge
TUI	tangible user interface
UDL	Universal Design for Learning
UNICEF ECARO	UNICEF Europe and Central Asia Regional Office
VOCA	vocal output communication aid
VR	virtual reality
WCAG	Web Content Accessibility Guidelines

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EXECUTIVE SUMMARY

Representing the tangible output of the UNESCO–Chengdu project 'Integrating Artificial Intelligence and Digital Innovations to Strengthen Inclusion and Equity of Education in Africa', this publication highlights the real-life experiences of resource centres (RCs) in a variety of regions and countries. It showcases the meaningful and impactful use of ICT, AI and AT to support and enrich the education and socialization of persons with disabilities and special educational needs (SEN).

The report highlights the significance of RCs in addressing the diverse needs of persons with disabilities and special developmental requirements. It emphasizes the evolving role of technology in improving access to educational materials, facilitating personalized learning experiences and promoting social interaction and integration.

The document also provides a close look at the specific applications of ICT, AI and AT within RCs, encompassing adaptive learning tools, communication aids, sensory devices and other innovative solutions. Through an examination of best practices and successful implementations worldwide, it demonstrates the transformative impact of technology and digitally enhanced pedagogy on the educational outcomes and social engagement of persons with disabilities.

The publication considers the challenges and barriers associated with the adoption and implementation of ICT, AI and AT in RCs, including issues related to accessibility, affordability and digital literacy among stakeholders. Overcoming these challenges and promoting inclusive practices requires dedicated capacity-building activities, such as specialized training programmes, to enhance the competencies and motivation of committed specialists. The report emphasizes the importance of collaboration among key stakeholders.

In light of these insights, the publication underscores the pivotal role played by ICT, AI and AT in RCs for persons with disabilities and special learning needs. By harnessing the power of technology, these centres create inclusive and empowering environments that encourage and enable individuals to thrive academically, socially and personally.

This collection of best practices and success stories from around the world is intended for all dedicated professionals and the wider education community who believe in and actively contribute to advancing the benefits of inclusive quality education and fostering rewarding socialization through innovation in technology and pedagogy.

I

INNOVATIVE HORIZONS:

BEST GLOBAL PRACTICES FROM RESOURCE CENTRES

COMMITTED TO TECHNOLOGY-ENHANCED INCLUSIVE AND SPECIAL NEEDS EDUCATION

Asociación en Defensa del Infante Neurológico (AEDIN)

About the organization

Located in Buenos Aires, Argentina, the Asociación en Defensa del Infante Neurológico (AEDIN) aims to foster inclusion and a decent quality of life among children who have neurological conditions. It is dedicated to providing specialized treatments tailored to each child's unique needs, thus ensuring they receive the specific care and support they need to thrive in both special education and regular school settings. AEDIN has its own school for children who have cerebral palsy and plays a crucial role in training teachers in augmentative and alternative communication (AAC) and literacy-related topics. This training equips teachers with the skills and knowledge they need to facilitate the best possible learning environments for the children they teach. Furthermore, AEDIN offers comprehensive AAC and literacy assessments, ensuring that students in mainstream schools are given the tools and support they need to succeed. Its activities are regulated in accordance with the Programa Médico Obligatorio (legislation that ensures persons with disabilities receive funding to meet their needs).

The key beneficiaries of AEDIN are children and adolescents aged 3–21. The centre welcomes persons with a wide range of disabilities and SEN, including physical and intellectual disabilities, autism spectrum disorder (ASD), specific language impairment (SLI), genetic syndromes and cortical visual impairments. The parents (caregivers) of children (learners) with disabilities also benefit from the centre's activities.

AEDIN has forty members of staff. Occupational therapists, pedagogists and speech-language therapists conduct activities relating to the use and implementation of AAC. ICT technicians and psychologists are also on staff.

The centre operates primarily on a fee-for-service basis. All users, including parents (caregivers) and schools, must pay for the services they use and receive. However, these fees are reimbursable, which gives users some financial flexibility. Notably, the centre does not rely on public funding for its operations. Instead, it is financed largely by donations from various benefactors. It uses its funding to buy the AAC and AT products it uses but does not provide products directly to students and schools. (In Argentina, people must pay for this type of service and are later reimbursed through public funding.)

AEDIN staff primarily conduct AAC assessments with a focus on functionality. An integral part of these assessments involves listening to the feedback and concerns of the parents (caregivers), teachers, therapists and, most importantly, children (learners). Collaborative discussions are

used to identify the problems each child is facing, and various products and strategies are then tested as potential solutions. The centre assesses an average of ninety students with disabilities or SEN every year.

ICT, AT and AI in education and rehabilitation

AEDIN actively provides support through AAC to assist students who have disabilities or SEN and are enrolled in mainstream schools. Although it does not supply the required products directly, it plays a vital role in selecting and prescribing suitable tools for students. To determine the most appropriate AAC solutions for individual students, staff, usually occupational therapists and speech-language pathologists, conduct a specific assessment. Regular therapists — that is, licensed professionals such as psychologists, social workers and counsellors who provide therapy or counselling services on a daily basis — often consult with the centre's team or the students with whom they are working for an AAC assessment. In terms of pedagogical strategies, AEDIN uses the Universal Design for Learning (UDL) framework and the Student, Environments, Tasks, Tools (SETT) framework. These frameworks guide the effective implementation and use of the AAC and AT products in mainstream schools. Approximately 100 male and female students per year benefit from the centre's product-based support.

AEDIN plays an active role in advancing the inclusion of students with disabilities and SEN in mainstream schools. Its activities include providing direct support in various forms to both teachers and parents (caregivers) — for example, offering courses and workshops on inclusive education. Furthermore, the centre has published a comprehensive handbook on AAC. This handbook is expected to be a useful guide for both

professionals — for example, teachers — and students' parents (caregivers). In a typical academic year, approximately forty teachers benefit from the centre's assistance. AEDIN uses specific digital solutions, including email and Zoom, to reinforce its connections with teachers and parents (caregivers) and ensure the effective and efficient dissemination of information and best practices for inclusive educational methods.

IT infrastructure (internet connectivity, main types of hardware and software)

AEDIN uses a variety of mainstream and specialized hardware and software products for assessment purposes. Some of its key tools are tablets, special/adapted keyboards, eye-gaze systems, AAC software and simple communication devices such as AbleNet speech devices. These tools play a pivotal role in the assessment process, helping staff to effectively gauge students' needs and capabilities. Internet access is through broadband connectivity.

AEDIN has a room dedicated to training students, teachers and parents (caregivers) on the use of AAC products. This space encompasses a standard classroom as well as an AAC room, which serves as an assessment room, therapy room and storage area.

Teachers' ICT, AT and AI competencies and skills development

- **in relation to the educators of the centre**

Staff participate in continuous professional development (CPD) at the centre to keep their AAC competences up to date. AEDIN encourages its staff to participate in specific academic courses on various topics, including AT. It also promotes peer-learning, whereby professionals meet regularly during working hours to discuss cases and share their knowledge of best practices.

- **in relation to the educators of mainstream education settings**

AEDIN is actively involved in fostering capacity-building to promote inclusive practices in education. The centre offers graduate courses on AT and literacy designed specifically for therapists and teachers who work with individuals with complex communication needs (CCN). Additionally, it organizes workshops on the effective use of AAC solutions. The centre also published a handbook to further inform and guide teachers in the use of AAC solutions to promote inclusion and participation.

Digital teaching and learning materials (including games, applications, e-books, OER, websites, educational portals, videos, etc.) and ways of integrating ICT, AT and AI into the curriculum

Specialized games available online are an important resource for AEDIN. For example, HelpKidzLearn is a collection of software for young children and students who have learning difficulties. The collection has five sections: Games & Activities, ChooseIt Maker, ChooseIt Readymades, Inclusive Stories and Insight. AEDIN uses HelpKidzLearn not only to let the children play simple games using an eye-tracker but also to understand whether a child is aware of cause-effect relationships between two events (this is a fundamental skill for using AT). HelpKidzLearn is a commercial website, but the demo versions of its games can be useful for initiating the implementation of a specific AT or AAC activity. AEDIN staff can also use MS PowerPoint to create simple cause-effect activities.

Another digital resource used by AEDIN is the AsTeRICS grid, a web application that can be used for AAC and as a smart home control device.

AEDIN also uses the Aragonese Center of Augmentative and Alternative Communication (ARASAAC) website. It offers graphic and other resources with a Creative Commons licence to build low-cost AAC communication solutions.

Other frequently used resources include head-tracking devices such as a camera mouse, eye-tracking, switch-assisted scanning and partner-assisted scanning options.

Facilitators, challenges and impact of ICT, AT and AI products as viewed by the centre

A predominant challenge that arises in the proper use and implementation of AT in general, and AAC solutions in particular, for fostering inclusive practices in education is the widespread lack of knowledge and expertise on the subject matter. To address this knowledge gap, AEDIN offers training on AT and AAC products and practices. AEDIN stresses that if AAC and other assistive products are to have a positive impact, robust, validated frameworks such as UDL and SETT must be used to implement them. UDL is designed to create curricula that cater to the diverse needs of all students. It has been identified as a key tool for harnessing the potential of AAC products in mainstream educational settings. SETT's focus is making decisions about support solutions based on a comprehensive understanding of a student's needs, the environments in which they function and the tasks they need to complete. It is also recognized as an effective tool for leveraging the benefits of AAC-related technologies.

Case study

AEDIN's approach to supporting students with disabilities in mainstream schools is exemplified by AAC provision. Children and adults who

have severe speech, language or communication difficulties or disabilities might need to find alternatives to talking to communicate. AAC comprises a variety of products and strategies to enable people to communicate and participate in society. AEDIN has a crucial role to play in the local mainstream educational environment: it identifies and ensures the correct implementation of solutions for complex situations. In some cases, its role is to challenge the prevailing perception within the mainstream educational environment that high-tech solutions are a panacea. Students who have severe dystonia and communication difficulties, for example, do not always find high-tech technologies beneficial. Mainstream educators, parents (caregivers), teachers and students themselves need sound, reliable advice about the most adequate and effective means of communication that is both available and appropriate for a student's specific level of ability. AEDIN staff therefore make sure they understand a student's needs and carefully assess the available resources to ensure that any technology provided will benefit the student in terms of learning achievement, self-determination and quality of life. AEDIN can be seen as a useful mediator within the network of the available health and social services to help achieve the ideal balance between the use of complex, high-tech solutions that support communication (e.g. eye-gaze solutions) and low-tech solutions and strategies (e.g. partner-assisted scanning).

ASSIST
Assistive Technologies Foundation
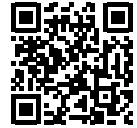
About the organization

ASSIST — Assistive Technologies Foundation (ASSIST) is an independent, non-profit non-governmental organization (NGO) that has been operating in Sofia, Bulgaria, since 2014. ASSIST plays a crucial role not only in raising awareness of AAC and AT but also in procurement, training and publishing activities related to AAC and AT. It provides access to specialized AAC software through eye-control devices and appropriate mounting solutions. AAC and access to computer AT allow children and adults who are non-speaking or have impaired speech and/or severe motor disabilities to communicate, study, work and have a fulfilling social life.

The level of qualifications of the professionals who work with persons who have communicative disorders and need AAC — for example, speech-language pathologists, occupational therapists, resource teachers and psychologists — is a major barrier to the wider deployment and use of AAC in the inclusive education system. Therefore, training professionals in AAC has become one of ASSIST's central activities. It designs and provides relevant courses, including on-the-job courses that are accredited by the Bulgarian Ministry of Education and Science.

The accreditation of the Foundation's courses highlights the significance of its training for professionals in both the inclusive and special education systems. Recently, university courses have been developed and offered to students in the Bachelor of Science and Master of Science speech-language therapy programmes at New Bulgarian University. ASSIST has also designed and conducted several trainings for professionals in the Regional Centers Supporting the Process of Inclusive Education (RCSPIE), which has played a central role in the Bulgarian inclusive education system since 2018. These efforts were conducted in partnership with UNICEF Bulgaria, which also provided financial support for the annual International Conference on AAC. Additionally, through a partnership with the UNICEF Europe and Central Asia Regional Office (UNICEF ECARO), a symposium was organized for countries in Europe and Central Asia, along with a planned series of AAC training sessions.

In addition to providing training, ASSIST (through its own company) became the first provider in Bulgaria of specialized AAC software and access to computer AT (mainly eye-gaze control devices) for families (caregivers), kindergartens, schools within the inclusive education system and social services for children and adults with communication disorders. To this end, it has collaborated with the Ministry of Education and Science on large-scale projects since 2015.

The primary beneficiaries of ASSIST's work are children aged 3–17 with communication difficulties resulting from various health conditions, as well as their parents (caregivers) and the professionals who support them.

ASSIST employs a team of six staff members. Some are members of the managing council, and some are AAC and computer AT experts.

ASSIST does not receive any public funding. Instead, it relies on funding from projects and income generated from the company that it owns. This company focuses on AAC training and the provision of AAC and AT products, and its revenue is a key support for the organization. While professionals and the organizations they work for are charged a fee for training courses, parents (caregivers) of children (learners) with disabilities can register in the courses for free. Consultations, including evaluations of AAC needs, are free for families (caregivers) and professionals. Technical support for AAC software and related hardware purchased from ASSIST is also free.

ICT, AT and AI in education and rehabilitation

ASSIST is involved in identifying and assessing students with communicative impairments who need AAC. The ASSIST team conducts the assessments in collaboration with families (caregivers) and the professionals who support them. The assessment involves using an AAC system and, when needed, access to a computer device and positioning system to evaluate the students' AAC needs and identify an appropriate AAC system for them. The process is comprehensive and tailored to each student to give the team a thorough understanding of their specific requirements and capabilities. At the end of the assessment, the team provides recommendations based on their findings. ASSIST assesses approximately ten children aged 2–17 who have communication disorders every year.

A key aspect of the support ASSIST provides to families (caregivers) of children who need AAC includes the occasional temporary provision of AAC systems equipped with eye-gaze control for testing purposes. This specific technology is essential for children who have severe

communication needs and motor impairments, as it enables the team to assess to what extent the children can interact and communicate effectively.

The process of identifying and providing the most appropriate AAC solution involves a member of the ASSIST team who is an expert in AAC conducting assessments with the participation of the child's (learner's) parents (caregivers) and/or a professional from their centre, school or kindergarten. At the end of the assessment, the AAC expert completes a form with their suggested recommendations for an appropriate AAC system to be used at home or in an educational setting. If a child is identified as needing eye-gaze technology, ASSIST can provide an AAC system with gaze control for a limited period to further assess and support the child's communication and learning needs. In terms of pedagogical frameworks and didactic approaches, ASSIST focuses on assessing children's communication capabilities and their capacity to use an eye-gaze system, if needed, along with specialized AAC software. By providing tailored ICT, AT and AI solutions and expert assessment, ASSIST ensures that children can more effectively participate in and benefit from inclusive educational environments.

ASSIST provides support to parents (caregivers) of children with communication disabilities by offering consultations on AAC and related software and devices, including eye-gaze control

and mounting devices. The organization also provides both assessments of children and expert recommendations for AAC system configurations.

In addition to its previously mentioned roles, ASSIST is an active participant in the National Council for the Protection of the Child. Its contribution is focused mainly on consulting and promoting policies that involve the provision and use of AAC solutions that guarantee children's rights to therapy, access to information and inclusive education and freedom from violence.

IT infrastructure (internet connectivity, main types of hardware and software)

ASSIST has broadband internet connectivity and Wi-Fi. The organization's equipment includes mainly hardware and software products used to identify the most appropriate AAC support for each student. Its inventory includes gaze-controlled computer devices such as Tobii PCEye 5 and PCEye Mini eye-tracking devices, which can be fitted with specialized communication software such as Communicator 5, TD Snap and Grid 3. The organization also uses specific software for early interventions with eye-gaze access to computers such as Look to Learn and Inclusive Eye Gaze Learning Curve.

ASSIST offers a range of services related to both AAC and AT products. It provides free maintenance for these products through the company it owns. Additionally, students with disabilities or SEN and their teachers can potentially borrow equipment, although this service is used infrequently due to limited capacity. It is available primarily when there is a clear expectation that it will be beneficial to a child in the future. Refurbishing services are also offered for free, and usually include providing information

to new users about older AAC systems that are no longer in use and have been made available by former users. This service is especially useful when financial constraints are a concern.

The company owned by ASSIST adheres to the ISO 9001:2015 standard for training and provision; the Chair of the managing council is responsible for operations and outcomes. Furthermore, the organization is actively involved in research activities aimed at developing innovative AAC products to enhance inclusive educational practices. This research includes studying attitudes towards, knowledge of and use of AAC among professionals in Bulgaria and occasionally elsewhere in Europe, and designing and developing communication and educational systems based on AAC.

Teachers' ICT, AT and AI competencies and skills development

- **in relation to the educators of the centre**

The ASSIST team regularly participates in training programmes and workshops organized by AAC and AT solutions producers, distributors and manufacturers to stay up to date with innovations in the field. ASSIST also encourages its staff to participate in AAC conferences.

- **in relation to the educators of mainstream education settings**

ASSIST is actively engaged in helping teachers in mainstream schools foster the inclusion of students with disabilities and SEN. The organization's involvement includes consulting with resource teachers who help students in schools increase their capacities in the use of AAC solutions such as communication boards and specialized communication software for eye-trackers (e.g. Communicator 5).

On a larger scale, ASSIST has been organizing international AAC conferences since 2018; the sixth conference was held in 2024. These conferences involve thousands of participants, including teachers, from throughout Central and East Europe. Additionally, ASSIST, in collaboration with UNICEF Bulgaria, has contributed significantly to the creation of the Bulgarian AAC team of experts and their training.

Digital teaching and learning materials (including games, applications, e-books, OER, websites, educational portals, videos, etc.) and ways of integrating ICT, AT and AI into the curriculum

The collection of videos available on ASSIST's YouTube channel is a useful free resource. The channel includes a series of presentations from the AAC annual conferences. Some of the videos are in English and showcase a variety of applications and experiences of AT solutions to address communication disabilities in educational contexts for learners with a variety of health conditions.

Facilitators and challenges

The primary challenges to implementing and using AAC and AT products in mainstream education for inclusive practices relate to the often inadequate or inappropriate qualifications of professionals such as speech and language therapists, ergo therapists, resource teachers and teachers in mainstream schools. To overcome this challenge, the ASSIST team suggests on-the-job training courses and the incorporation of practice-oriented courses into the curricula of higher education programmes related to these fields. Another significant challenge is funding for and access to AAC systems for families (caregivers), including early evaluation, choice, adaptation and support for their

sustainable usage. As for the most valuable pedagogical approaches or principles to make the use of AT and other technological products effective in mainstream educational settings, ASSIST emphasizes the importance of early intervention. It also highlights the need for a team of experts who are accessible to professionals and families (caregivers). Moreover, ASSIST sees a need to establish national standards and requirements for AAC and technology provision and use so that these technologies can be used effectively and to their full potential in education.

Case study

ASSIST is a prime example of a commendable approach to fostering inclusive education through tailored AAC interventions. Its strategy involves a comprehensive assessment of students, which it then uses to recommend an AAC system, or systems, tailored to each student's individual needs. The students are often young children with significant communication and motor disabilities (i.e. complex or multiple disabilities). A key element of the Foundation's approach is the integration of technologies such as eye-gaze controlled systems, which are pivotal in enhancing communication and educational engagement and are ideally suited for use by children who have severe physical limitations but strong intellectual and cognitive abilities. Funding partnerships, such as those with British-Bulgarian foundations, play a crucial role in providing essential technology such as eye-trackers and specialized software. This type of support can be life-changing, as it opens up access to computers and facilitates effective communication. The process of integrating children into mainstream education is gradual and collaborative, and involves detailed discussions with families (caregivers) and local resource

centres (i.e. centres that support the process of inclusive education and centres for specialized educational support in Bulgaria). The journey from initial assessment to full inclusion in a mainstream school setting can take several years, and so it involves a significant transition period for both the child and the educational system. However, the success of this approach is evident in the children's (learners') academic performance, which is assessed in accordance with mainstream school criteria, and their ability to participate fully in typical school activities. This success underscores the transformative impact of AAC systems and the essential support provided by regional RCs, both of which are vital for effectively assessing daily communication and educational needs and offering appropriate solutions. ASSIST's role in these interventions highlights the potential of AAC technology to create inclusive educational environments in which every child has the opportunity to flourish.

Regional Centre for Support of the Inclusive Education Process in the Targovishte Province

About the organization

The Regional Centre for Support of the Inclusive Education Process (the centre) operates in the Targovishte province of Bulgaria. Situated within a special education school, this public institution collaborates with regional education stakeholders, various schools and pre-schools across the province. The centre is a critical part of the local mainstream educational system, and its primary role is to support children with disabilities and SEN and their families (caregivers). Its activities and functions are regulated by specific national, regional and local policy frameworks. In Bulgaria, inclusive education is an integral component of the legal system, as enshrined in the *Preschool and School Education Act.* This legislation mandates that educational institutions — including kindergartens, primary and secondary schools, personal development support centres and specialized service provider units — provide supportive conditions for the personal development of children and students. Moreover, both this Act and the ordinance on inclusive education specify two distinct types of support for personal development: general and additional (additional support refers to including children in the educational process and providing learning support with schools' study materials). These frameworks ensure that the centre's operations align with the country's educational standards and legal requirements, and emphasize the centre's role in promoting inclusivity and support for students with diverse needs.

The centre focuses its activities on male and female children and adolescents aged 3–18 who have a wide range of needs, including visual, hearing and physical disabilities and impairments; educational, communication and speech difficulties; and behavioural issues. It also supports teachers in mainstream and special schools, as well as parents (caregivers) of students who have disabilities or need any type of support.

The centre employs sixty staff, including teachers, occupational therapists, pedagogists, psychologists, special education teachers and speech-language therapists. These professionals actively participate in the use of ICT and AT products to promote inclusive education in mainstream schools.

The centre is government-funded and provides its services free of charge to users, who include parents (caregivers), teachers and schools. It sources its ICT and AT equipment from various organizations that specialize in these types of technology. Users do not pay for the ICT or AT products they receive from the centre. The centre uses its funding to pay for the products and provides them to the users at no cost.

ICT, AT and AI in education and rehabilitation

The centre actively participates in identifying and assessing students who have disabilities or SEN. The assessment process begins when parents (caregivers) submit a request that their child be evaluated. The child's school (or pre-school or kindergarten) assigns specialists from the centre to carry out the student evaluation. On average, the centre assesses approximately 200 students every academic year. The students who are assessed have a wide range of disabilities, including visual, hearing and physical disabilities or impairments; educational, communication and speech difficulties; and behavioural issues.

The centre uses ICT or AT products, as required, to support the education and socialization of students who have disabilities or SEN and are integrated into mainstream schools. They most commonly use AAC software and devices tailored for use by these students. To ensure each student receives the best support possible, a dedicated team of specialists from both the centre and the school collaboratively assess each student's individual needs and determine the most suitable ICT or AT (including AAC) product, or products. The centre provides ICT and AT product-based support to approximately 500 students, ranging in age from 3 to 18 years, every academic year.

The centre offers support and co-teaching (i.e. a member of the centre is in the classroom with the schoolteacher) to approximately 600 schoolteachers every academic year. However, staff from the centre do not use specific ICT products to assist teachers in implementing inclusive educational practices. The centre also provides support to parents (caregivers) of students who have SEN. Specialists conduct regular meetings to discuss and address each child's unique educational requirements.

IT infrastructure (internet connectivity, main types of hardware and software)

The centre uses various ICT, AT and AAC products for both assessments and supportive interventions. The technological equipment available can be categorized according to its main functions: ICT solutions such as neuro-stimulators, respiratory rehabilitation devices, biofeedback apparatus and neuro-relax devices are used to help students with specific learning disabilities or attention-related disorders. Specific high-tech AAC systems such as Tobii Dynavox PCEye fitted with Communicator 5 software are used to support students who need help

communicating. More affordable communication solutions such as tablets fitted with Cboard or Boardmaker communication software are also available. For certain functions (e.g. web browsing), some AAC systems need an internet connection. The centre has wireless access and schools allow students to use their Wi-Fi connection.

The centre does not have a showroom of available ICT, AT or ACC solutions, offer maintenance or repair services, provide lending or refurbishing services, or have a quality assurance system for product provision and use in place. However, it engages in research activities aimed at fostering innovative products for inclusive education. This research is spearheaded by the centre's

Director and his deputies. Additionally, the centre has a dedicated room for training students, teachers and parents (caregivers) in the use of ICT, AT and AAC solutions. This room, referred to as the teachers' room, is fully equipped with technology and managed by the centre's staff.

Teachers' ICT, AT and AI competencies and skills development

- **in relation to the educators of the centre**

The centre places a strong emphasis on continuous training and offers advanced training opportunities to professionals, including professionals who are not employed by the centre. The training programmes focus on specific areas of specialization, including psychology, speech therapy, resource teaching, occupational therapy and AAC. Capacity-building opportunities in AT and ACC for the centre's staff include workshops on the technical aspects of using and implementing communication software such as Communicator 5 and Cboard run by outside experts. Staff also have opportunities to build their capacity by participating in national seminars and conferences, including the annual AAC conference, organized by the ASSIST foundation since 2018.

- **in relation to the educators of mainstream education settings**

The centre currently organizes two types of initiatives: open days and more structured training opportunities. The annual open days are designed to allow stakeholders (e.g. local policy-makers, parents/caregivers, teachers) to find out more about the centre's activities, including those related to the use of technology to promote communication and inclusive education. The more structured training opportunities are offered by the centre's staff to both teachers and parents (caregivers). For example,

as part of the UNICEF Bulgaria project 'A Voice for Every Child', the centre is providing both training and mentoring to teachers and parents (caregivers) on the use of tablets fitted with Cboard to increase their ability to use these solutions both at school and at home.

Digital teaching and learning materials (including games, applications, e-books, OER, websites, educational portals, videos, etc.) and ways of integrating ICT, AT and AI into the curriculum

The centre's pedagogical approach emphasizes that when staff are recommending AT or AAC products to support students with disabilities in mainstream education, they must tailor their suggestions to meet each child's unique educational needs. Therefore, the centre has developed an online database that parents (caregivers) and teachers can consult to access dedicated educational software or educational websites (both in Bulgarian) as a supplementary source of support and information. The database can be accessed via the centre's website.

Facilitators and challenges

The main challenges to implementing ICT, AT or AAC products in mainstream education for inclusive practices are the high costs and the need for professional training. The centre aims to address these issues by ensuring that its specialists are well trained and can instruct parents (caregivers) and teachers in using the technology. The most effective pedagogical approaches for these products emphasize accessibility and convenience. Furthermore, the products offered by the centre promote social equity by offering equal access to children with SEN, thus integrating them into the regular education system.

Case study

A notable example of a successful practice at the centre is the provision of support for children with complex disabilities through high-tech AAC solutions. Children with complex (or multiple) disabilities are defined as those presenting with more than one of the following health conditions: intellectual or learning disability, motor disability and sensory impairments. Given the complexities associated with these conditions, students might find it difficult to participate in important life activities — including learning, socializing and playing — alongside their peers. The centre can help students with complex disabilities engage in meaningful social interactions and participate in a variety of activities through technology solutions such as gaze-controlled software products. These products enable a child with a motor disability to control a computer interface through their eyes. Communication software, to take another example, allows children to 'speak' with their peers and other important people in their life. The centre makes particular use of the Tobii PCEye

tracker and Communicator 5 software to enable children to communicate. As children grow, their needs are likely to change, and the technology they use will need to change as well. The centre's dedicated team of specialists must therefore continually refine and customize applications, tailoring them to meet every learner's distinct and changing educational needs. A notable strength of the centre is that it facilitates the engagement of teachers, parents (caregivers) and other community members at both the regional and national level. The collaboration between and support from all stakeholders throughout the ICT and AT provision process is a cornerstone of the successful application of the technology to support the mainstream education of children with complex disabilities. The availability of services such as those offered by the centre can be seen as instrumental in supporting the current deinstitutionalization of children with disabilities throughout the country.

Centro de Desarrollo de Tecnologías de Inclusión (CEDETi)

About the organization

Centro de Desarrollo de Tecnologías de Inclusión (CEDETi) is part of the School of Psychology of the Pontificia Universidad Católica de Chile (PUC). The centre specializes in the development of educational software that helps students who have sensory and cognitive disabilities learn mathematics, science, reading and writing. The CEDETi team also develops, conducts and validates cognitive evaluation tests. Through the PUC, CEDETi offers diploma courses, workshops, courses and conferences in inclusive education, and carries out basic and applied research in the field of cognitive and neuropsychological evaluation. The centre has a collaborative relationship with the local mainstream education system and regularly applies for funding from entities such as the Ministry of Education or El Servicio Nacional de la Discapacidad (SENADIS), the government-run national service for persons with disabilities.

CEDETi's primary beneficiaries are male and female students with disabilities and SEN aged 5–16. Other beneficiaries are teachers and parents (caregivers).

The centre employs thirty-five staff who include qualified educators, engineers, designers, mainstream schoolteachers, pedagogists, psychologists, special education teachers, speech-language therapists and technicians or ICT experts. All these professionals play a role in the provision and/or use of ICT products to support inclusive educational practices in mainstream schools.

In some cases, the centre charges users a fee. These are generally registration fees for workshops, courses or diploma courses requested by the centre's professionals for further training. However, such payments are reimbursable. For example, users can claim them as an expense or a tax deduction. The centre does not receive direct public funding for its operations. Instead, its primary source of funding comes from grants and revenue from the sale of psychometric tests.

ICT, AT and AI in education and rehabilitation

CEDETi participates in the identification and assessment of students with disabilities or SEN. To this end, the centre has pioneered the creation of tablet-based assessment applications specifically designed for neuropsychological evaluations and executive function tests. These tools help staff to allocate special resources for students who need them and to designate special allowances for individuals with cognitive disabilities. Overall, approximately 100,000 students, generally aged 5–16, have been assessed using the centre's technologies. The primary disabilities or needs addressed by CEDETi are cognitive and learning disabilities.

The centre supports students with disabilities or SEN in mainstream schools mainly through the development of novel ICT solutions, including software that helps children with impaired sight or hearing learn to read, inclusive digital books tailored for children who are blind or deaf, and tablet applications to help

improve the reading skills of children who have a cognitive disability and the mathematics skills of children who have learning difficulties. All these innovative tools are available to end-users free of charge. Based on the number of downloads, CEDETi estimates that approximately 3,000 students benefit from its ICT products every year. Its products help students who have visual, auditory and cognitive impairments, as well as a range of learning disabilities.

CEDETi also supports parents (caregivers) of students who have disabilities or SEN. For example, it routinely offers inclusive technology workshops tailored for parents (caregivers). The inclusive software it uses encompasses distinct learning and mediation modules crafted not only for students but also for parents (caregivers). A notable feature is the Cantaletras software (available in English under the title Jumping Letters), which is used for teaching Braille (see below) and is aimed at both children (learners) and their parents (caregivers).

In addition, CEDETi offers other services related to ICT products within the university. It assists students with disabilities in their thesis projects in various disciplines, including engineering, design and education. Moreover, the centre actively supports the university's disability-inclusion programme.

IT infrastructure (internet connectivity, main types of hardware and software)

CEDETi has a wide range of ICT solutions at its disposal. In particular, it has mobile devices (e.g. smartphones, tablets) that are used mostly to develop and test the educational programmes that are the core mission of the centre. Internet connectivity within CEDETi is ensured through a broadband connection and Wi-Fi.

CEDETi provides free maintenance services to students and teachers who use its ICT products as part of their everyday routines (see below). This support is delivered by a dedicated customer service department that addresses queries and offers technical support through online and phone channels. However, the centre does not offer lending or refurbishing services for ICT products. To ensure the efficiency and effectiveness of the products, CEDETi established a quality assurance system. This system focuses on routinely updating software and applications in line with the latest operating system advancements. Innovation is a central tenet of the centre, which actively engages in research endeavours with the aim of creating cutting-edge technological products that foster inclusive educational practices. The centre's research unit organizes these efforts, reinforcing the centre's commitment to fostering state-of-the-art technological innovations. In addition, the centre has a specialized training room in which to host education and training sessions for students, teachers and parents (caregivers) on the use of ICT to promote inclusive practices. The room can accommodate up to twenty people and serves as a multipurpose classroom on the centre's premises.

Teachers' ICT, AT and AI competencies and skills development

- **in relation to the educators of the centre**

To ensure they remain up to date and proficient in their respective areas, CEDETi provides continuous training opportunities to its professional employees. These opportunities encompass a range of advanced/professional training programmes, and the centre facilitates and finances various workshops, courses and diploma courses as per the professionals' requests.

- **in relation to the educators of mainstream education settings**

CEDETi offers various capacity-building opportunities, such as workshops, training events and courses on the use of ICT products to foster inclusive practices. It also offers a diploma course titled 'Evaluation and Intervention for an Integral Approach to Special Educational Needs at School Age' which includes technology use as a fundamental component of the course. CEDETi's workshops on technology-mediated cognitive assessment of children and courses such as 'Inclusive Technologies for Learning to Read' showcase the centre's commitment to combining inclusive practices with innovative technology solutions.

Digital teaching and learning materials (including games, applications, e-books, OER, websites, educational portals, videos, etc.) and ways of integrating ICT, AT and AI into the curriculum

CEDETi's approach to identifying the most appropriate ICT products for students is rooted in its collaboration with special education centres and experienced professionals who provide essential input. A learning-through-play approach is at the core of CEDETi activities, as it facilitates engagement in the learning process. The centre applies this approach in the context

of developing a range of inclusive educational strategies designed to help people who have hearing and visual disabilities with early-stage reading and writing and general communication. CEDETi's inclusive educational programs are free for users and include:

- Aumentativa: To help teachers use pictograms to develop educational content on different topics.

- Cantaletras/Jumping Letters: To support children who are blind as they learn to read and write. (Available in Spanish and English.)

- The Magic Touch: To facilitate access to pre-school content for children who have visual impairments.

- GraphoGame: To help children learn to read.

- La Mesita/The Tiny Table: A virtual desktop to aid the reading development of children with SEN. (Available in Spanish and English.)

- Rakin: An inclusive application for learning mathematics and science in kindergarten.

- RoboBraille: To enable people who are blind or have impaired vision to access written information through audio or Braille.

- Sueñaletras: A support tool for teaching reading and writing to students who are deaf or have impaired hearing.

The above programs can be used without an internet connection once they have been installed, thus ensuring that they can be used in remote areas.

Facilitators and challenges

From the perspective of CEDETi, one of the most significant obstacles in mainstream education is the incorporation of inclusive ICT into the initial training for special education teachers. The pedagogical methods and principles associated with ICT products must reflect the users' requirements and feedback so that they are tailored to fit the users' needs effectively. Additionally, they should be designed and developed with direct input from these users. CEDETi ensures that all the products it provides align with the principles of full inclusion, without any discrimination based on gender, race, religion or any other characteristic, thus fostering both social equity and gender equality.

Case study

CEDETi's objective is to pioneer technological mediation systems and assessment tools that will enhance the living standards of marginalized groups such as seniors, migrants and persons with disabilities. It specializes in developing educational software that helps students with sensory and cognitive impairments address their learning needs, with a focus on subjects such as mathematics, science and reading and writing. What sets CEDETi apart from its peers is its commitment to developing technologies grounded in user-centred research and design, with an emphasis on continuous development and growth. Noteworthy innovations include Sueñaletras (Letter Dreamer), a pioneering software that uses sign language, alphabets and lip-reading to facilitate written language learning for students who are deaf or have impaired hearing. This software has been adapted for eleven countries and translated into six languages. Another innovative offering is books that have been modified to address the specific needs of children who are deaf or blind; these books have undergone meticulous usability testing by the communities they serve. CEDETi's commitment to inclusivity is further underscored by the annual CEDETi 3D exhibition, which showcases innovative and cost-effective AT tailored for persons with disabilities. Crucially, in every phase of the development process, CEDETi ensures the active participation of individuals with a disability, thereby ensuring that the products are not just for this community but also by them.

CEDETi's educational programmes attract students from various countries, illustrating their potential to be adapted to different national contexts. The centre's dedication to innovation has earned it international recognition: it won the WISE award for educational innovation in 2011 and the Premio Reina Letizia 2018 en Rehabilitación e Integración (Queen Letizia award for rehabilitation and integration) in 2018.

Assistive Technology, Disability and Inclusive Education Multi-Disciplinary Research Unit (MRU)

About the organization

The Assistive Technology, Disability and Inclusive Education Multi-Disciplinary Research Unit (MRU) operates on the premises of the Centre of Excellence in Research & Innovation in Social Sciences, the Arts and the Humanities (SoScieAtH) of the European University Cyprus, a private university. Its activities are regulated by national legislation related to education, including regulations of the Pedagogical Institute of Cyprus and the Centre of Educational Research and Evaluation, as well as the regulations of the European University Cyprus under which the MRU operates. The MRU's mission is to conduct research projects in collaboration with the local mainstream education system and implement projects within the local educational system such as teachers' professional development programmes, learning activities for children and parent (caregiver) education. The learning activities for children include, for example, the implementation of programmes such as the use of AT in the classroom, the application of specific methodologies (e.g. tangible user interfaces — TUIs — and storytelling) and accessibility- and disability-awareness activities for children.

Through its projects and research work, the MRU provides support to male and female students aged 4–15 who have physical, intellectual or learning disabilities and attend mainstream schools. Other beneficiaries include parents (caregivers) of students who have disabilities or SEN, and teachers and educators working primarily in early child education and care and pre-university education.

The centre generally has approximately twelve members of staff, who are employed by the European University Cyprus either as faculty members or as scientific and research associates. Its activities relating to the use and implementation of AT and ICT products are conducted by professionals with a variety of expertise and backgrounds — for example, educators, mainstream schoolteachers, occupational therapists, pedagogists, special education teachers, speech-language therapists and technicians/ICT experts. The MRU provides its services for free but does not receive any public funding. It is funded through grants for research projects, and an array of volunteers, including collaborators, graduates and students (undergraduate, postgraduate and PhD students), support its work by getting involved in all its activities (e.g. research work, reporting, training and education for stakeholders and children in collaboration with schools or NGOs — mainly disability-related organizations). The centre can only lend AT or ICT products to stakeholders or buy them if they are to be included in specific research projects or used in the courses taught at the European University Cyprus programmes. The centre uses its budget for research projects or funding from the university budget allocated to the Centre of Excellence and each of its units to purchase AT and ICT products.

ICT, AT and AI in education and rehabilitation

Support for stakeholders, including teachers, families (caregivers) and children, is provided through the MRU's research projects and professional development activities. The centre works with schools and students that have already been identified by local public (e.g. special education departments of the education system) or private (e.g. private professionals, AT companies) entities. The centre's team may suggest an appropriate AT so that parents (caregivers) can apply for funding or AT provision through public procurement. The MRU's work is mostly undertaken by volunteers, such as students and researchers. Its activities are pedagogically grounded in UDL principles and differentiated instruction as defined by C. A. Tomlinson.

The MRU provides support primarily through consultations. Parents (caregivers) can contact the centre for advice about how to secure their children's rights to state-funded digital AT, for example. In addition, the centre runs seminars and open days to teach families (caregivers) about ICT and AT. Some projects — for example, the 'Equity and Social Inclusion through Positive Parenting in Cyprus' (ESIPP) project — have been focused on providing education and support for parents (caregivers). Also, because it operates under the European University Cyprus, the centre collaborates with other centres at the University, such as the Plasticity Occupational Therapy Laboratory, which offers practicums to occupational therapy students. Through these collaborations, occupational therapy students and their mentors are supported by the MRU, when needed, in the use of AT during rehabilitation sessions with both children and adults.

The MRU also uses its research activities and products to develop position papers and recommendations for policy-makers. It collaborates with NGOs and disability advocates, including parents (caregivers), to influence policies in Cyprus about both inclusive education in general and the use of technology in inclusive education. Some of the MRU team members (mainly European University faculty or academics) are also members of advisory boards of NGOs or members of the national Digital Education Policy Advisory Committee.

IT infrastructure (internet connectivity, main types of hardware and software)

Internet connectivity within the centre is through wireless access. Regarding the equipment available, MRU focuses on promoting the use of digital AT solutions. The AT that it uses includes, but is not limited to, the following:
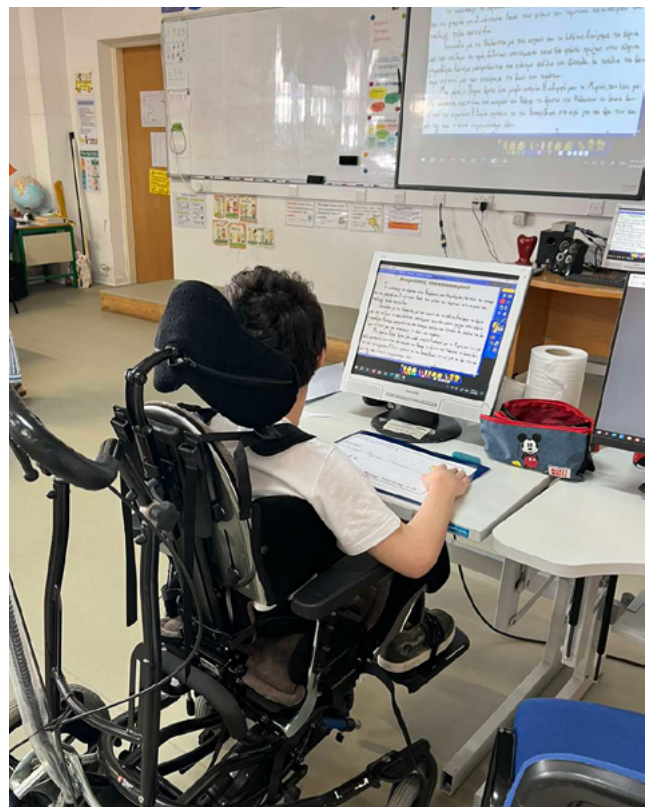
- Low-tech (e.g. communication boards) and high-tech (e.g. mobile technologies fitted with open or commercially available special communication software) AAC solutions

to support students who have communication difficulties or intellectual disabilities.

- Alternative input devices to support students who have motor disabilities (e.g. adapted keyboards and joysticks).

- Non-commercial products developed through specific research and innovation programmes — for example, TUIs used in the 'I'M IN TALES' project to enable students who have visual and/or other disabilities to participate in storytelling activities by manipulating digital objects.
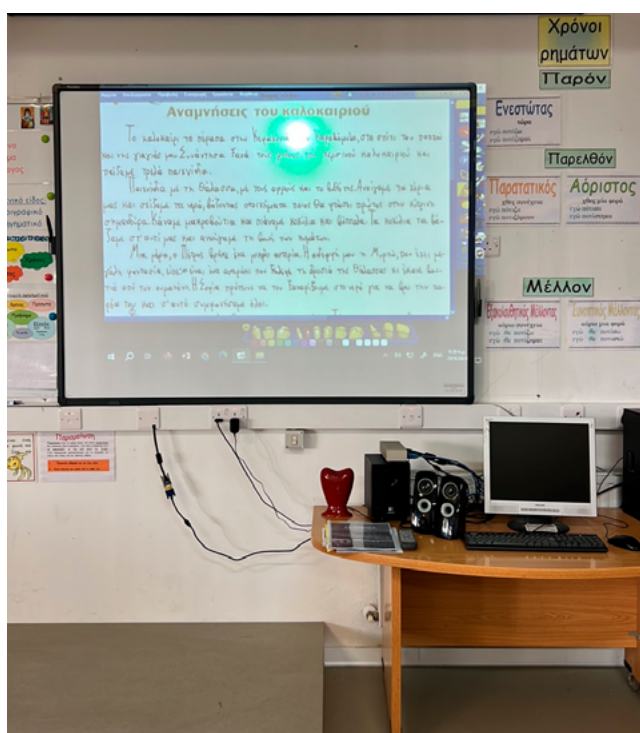
The centre has a dedicated space on its premises where the technological products are set up to be used for educational purposes. In addition, families (caregivers) and children can try the products out, and professionals and students can use them for hands-on practice. Teachers or parents (caregivers) can borrow an AT or ICT product by simply registering their name and the loan period. If a product needs to be returned before the end of the loan period, the centre helps users obtain a replacement using the state funding schemes.

Teachers' ICT, AT and AI competencies and skills development

- **in relation to the educators of the centre**

Staff at the centre receive CPD opportunities to keep their proficiency and hands-on expertise in the application of AT and ICT up to date. Such opportunities are provided at the beginning of each semester. They generally include courses related to disability issues, accessibility and UDL and are delivered either face-to-face or remotely through Blackboard Learn. Other competency- and skill-development opportunities within the MRU are provided through peer support and peer-training, and attendance at local and international conferences and workshops. It should be noted that MRU staff often include graduate students of the European University Cyprus and research collaborators who can attend courses such as 'Occupational Therapy Course on Assistive Technology in Occupational Therapy' (within the BA in Occupational Therapy) and 'Technology and Disability' (within the MA Education Sciences: Special and Inclusive Education, the MA Education Sciences: Learning and Communication Technologies and STEAM Education programmes).

- **in relation to the educators of mainstream education settings**

The centre provides capacity-building opportunities to educators in mainstream education settings through a variety of professional development activities including open seminars (organized in collaboration with the Ministry of Education and the Pedagogical Institute) and workshops (in collaboration with NGOs such as disability organizations and organizations for parents/caregivers of children/learners with disabilities). The focus of the seminars is generally the use of AAC solutions, alternative input

devices, tablets and low-tech AT. The academic staff and scientific collaborators are involved in providing this type of support by delivering seminars and workshops in collaboration with other professionals such as speech-language therapists, occupational therapists and special educators — for example, 'Capacity-Building of Early Childhood Education Teachers for AT in Inclusive Early Child Education and Care' and 'E-Learning (Distance) Programme on Inclusive Education'. The MRU also organizes capacity-building opportunities in digital and inclusive education for higher education settings.

Digital teaching and learning materials (including games, applications, e-books, OER, websites, educational portals, videos, etc.) and ways of integrating ICT, AT and AI into the curriculum

The MRU has produced an open access guide for teachers and school teams (under the leadership of the unit's coordinator) that contains an overview of the basic principles and steps that educators can follow to promote the use of AT for multiple learning delivery modes, including in-person, distance, blended and hybrid learning. The guide was published in English by UNICEF in 2023 and is available online.

It also developed a publication titled 'SKATE Guidelines: Inclusive Classrooms for ECEC Teachers' in collaboration with the SKATE ('Skills & Knowledge on Assistive Technology in Early childhood inclusive education') project consortium as part of the SKATE project. The guidelines cover several key areas: the basic concepts of disability, the use of digital technology in education and the principles of fostering creativity and learning in early childhood care and education (ECCE). They emphasize inclusive ECEC and explore how technology can be integrated into

education programmes designed to meet the needs of all learners. They highlight the importance of both high-tech and low-tech solutions in supporting children with unique or evolving special needs, especially when educational activities cannot be entirely and consistently inclusive. An accompanying online course is also available and can be accessed for free through Google Classroom (in Greek only).

Facilitators and challenges

Two key challenges to the use of AT and ICT products in mainstream education to foster inclusive practices have been identified. First, awareness levels among various stakeholders — for example, learners, families (caregivers), educators, policy-makers and others — present a recurring challenge. Despite prior and ongoing efforts to inform these groups about AT and ICT products, there remains a discernible gap in their understanding of and knowledge about them. Second, collaborative endeavours with other institutions are often stymied by bureaucracy. Red tape can present a substantial barrier to the fostering of inclusive practices using these technologies.

In summary, from the perspective of the MRU, while the potential of AT and ICT products in mainstream education is reported to be vast,

challenges such as gaps in awareness and bureaucratic hurdles persist. However, the tools can be effectively integrated into education by using pedagogical strategies such as UDL and differentiated instruction. To further promote gender equality and social equity through the use of AT and ICT products, the centre collaborates closely with a unit in the European University Cyprus that is specifically focused on gender equality and social inclusion.

Case study

The MRU uses an integrative approach to respond to diverse learning needs within mainstream schools. Classrooms are equipped with AT tailored to meet various educational requirements, such as touchscreen laptops with adaptive software installed, magnifying devices for printed materials and digital content

enhancement tools. This inclusive environment accommodates students with different abilities, thus ensuring that each student receives a personalized learning experience.

The centre's strategies are characterized by careful planning and a commitment to stakeholder inclusion; this ensures that both the technological aspects and pedagogical practices are tailored to the needs of individual learning profiles. Educators, family members (caregivers) and school stakeholders receive extensive training in the use of AT, activity-building software and inclusive teaching methods. This training is complemented by continuous support and mentorship, all of which fosters a sustainable inclusive educational setting from the early education years onwards.

The MRU's practices are grounded in the principles of UDL; content is made accessible through multiple methods to meet the diverse needs of all students, thus promoting accessibility, diversity and inclusion. The success of its initiatives is rooted in the collaborations between families (caregivers), educators, professionals and specialized professionals at the MRU.

The MRU plays a critical role in bridging the gap between need and provision. It facilitates the acquisition and effective use of AT through partnerships with ministries of Education and other stakeholders. Although external funding is not always available, the centre makes judicious use of volunteer networks and community collaborations to support its endeavours. The value of such concerted efforts is evident in the enriched learning experiences of students, which result from a holistic approach to inclusive education.

India

Kara + BJANA Vision Skills Lab

Kara + BJANA Assistive
Technology Vision Skills Lab

Antarjyoti Balika Vidyalaya

About the organization

The Kara/BJANA Vision Skills Lab is a private resource centre that operates on the premises of Antarjyoti Balika Vidyalaya, an all-girls boarding school for students aged 12–17 with impaired vision, in Patna, the capital city of Bihar, India. The Vision Skills Lab, established in collaboration with the Kara Medical Foundation, provides education, rehabilitation and life skills and vocational training to the students. Currently, it provides 110 girls with free education and training in computers, music, vocational skills, dance and judo. The school has been operational since 1993 and adheres to the standards of the Bihar education system and follows the curriculum set by the Bihar School Examinatio n Board, a governmental body under the Bihar government. In this way, it ensures that its operations align with national educational standards and policies.

The Vision Skills Lab is staffed by three main employees: a computer teacher who doubles as an ICT expert, a caretaker and an expert consultant such as IIT (Indian Institute of Technology) Delhi. The centre also has experienced special education teachers and technicians/ ICT experts on staff.

The Vision Skills Lab offers all its services free of charge to users. In addition to receiving public funding, it also relies on contributions from organizations such as the Rotary Club of Bihar and donations from individuals and families. The AT products it uses are granted by the Kara Medical Foundation; these products are provided to users at no cost. All the costs associated with the ICT and AT products are covered entirely by the Kara Medical Foundation.

ICT, AT and AI in education and rehabilitation

The Vision Skills Lab was established to enhance the digital literacy, classroom literacy and mobility skills of students with visual disabilities. In the lab, students in Grades 6–10 learn both basic computer skills, such as Microsoft Word, Microsoft Excel and email, and how to use refreshable Braille displays (e.g. Orbit reader), Braille typewriters and tactile books. Currently, twenty-five students are taking computer classes at the lab, and ninety-six students use tactile graphic books daily. Students aged 7–17 use these tactile books, and those aged 12–17 years use the computer lab.

IT infrastructure (internet connectivity, main types of hardware and software)

The Vision Skills Lab has broadband internet connectivity and Wi-Fi. The lab's equipment is geared towards persons with visual disabilities and includes:

- Hardware and software products to enable access to mainstream ICT (e.g. personal computers, laptops) and to support learning (e.g. adapted keyboards, Orbit screen readers, text-to-speech applications and note-takers).

- Products to support the mobility of students who have a visual disability (e.g. white canes).

- Products to support daily activities (e.g. talking blood pressure monitor, sonic labeller, talking alarm clock).

The lab provides maintenance services for students who use AT products in their daily activities. However, to date there has been no need for these services, as the lab has been in operation for only one year. In addition, the lab has a dedicated room for training students in the use of computers by means of the AT products listed above.
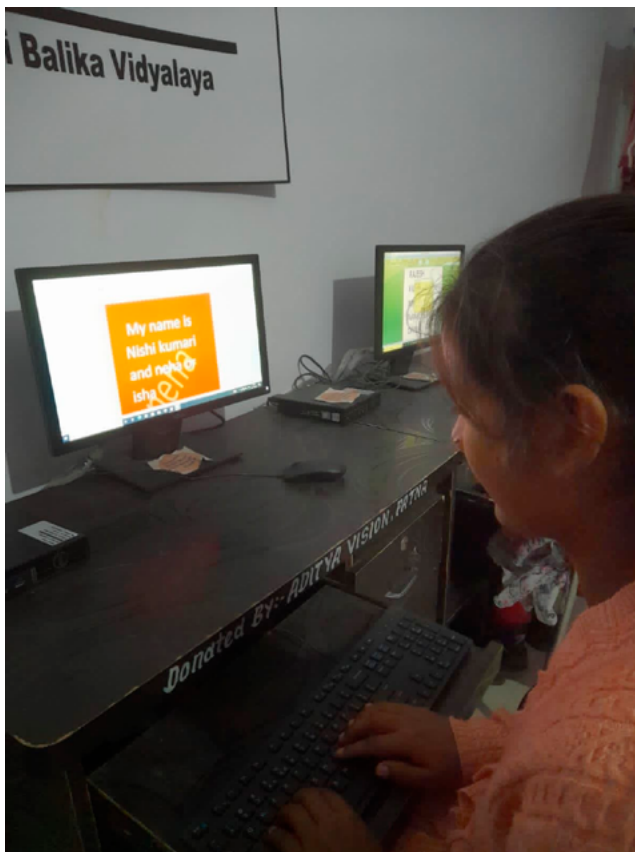
Teachers' ICT, AT and AI competencies and skills development

- **in relation to the educators of the centre**

Professionals at the Vision Skills Lab receive continuous training opportunities related to the use of ICT and AT products. For example, the

Vision Team from the IIT in Delhi has conducted training sessions for teachers that focus on the use of Orbit readers and accessing online audio libraries. Additionally, the Raised Lines Foundation organized the 'Touch Learn and Shine' programme in April 2023. This programme provided training sessions for students and teachers from various grades on using tactile books and tactile geometry applications effectively.

- **in relation to the educators of mainstream education settings**

The Vision Skills Lab helps teachers in mainstream schools promote the inclusion of students with disabilities and SEN by providing them with access to an online audio library and training on how to use vision-related AT products effectively. These tools are also used by the teachers for their own purposes, such as preparing lesson plans or accommodating other students with diverse learning needs. In addition, the lab organizes workshops and training programmes for teachers and educators when new AT products enter the market, and teachers receive training on how to use tactile graphic books and how to teach students to use them effectively.

Digital teaching and learning materials (including games, applications, e-books, OER, websites, educational portals, videos, etc.) and ways of integrating ICT, AT and AI into the curriculum

An important resource for the Vision Skills Lab is provided by the Raised Lines Foundation, a not-for-profit company originally established through IIT Delhi. The Foundation has a vast catalogue of tactile books on various subjects. It also developed Geomkit, a comprehensive set of accessible tools and accessories for doing

tactile geometry constructions on a standard Braille paper. The Geomkit was provided to the school as part of the Raised Lines Foundation's 'Touch Learn and Shine' programme, which offers training sessions for students and teachers from various grades on how to use tactile books and tactile geometry applications effectively. The Geomkit is available for purchase on the Foundation's website.

Facilitators and challenges

Implementing technology, especially for students with visual impairments in a low-income school in Bihar, India, has it challenges — for example, acquiring the right equipment, training students and teachers, and ensuring the availability of accessible lessons and materials within a limited infrastructure and budget. The Vision Skills Lab plays a crucial role in addressing these challenges by training teachers, sharing best practices, providing the necessary equipment and software, understanding student needs, collaborating with organizations and customizing solutions. Its approach not only facilitates learning but also attracts external support from stakeholders such as IIT Delhi to enhance the educational experience. Personalized learning, tailored to meet the needs of individual students at Antarjyoti Balika Vidyalaya; comprehensive teacher training; and collaborative decision-making among students, parents (caregivers) and teachers all contribute significantly to the effective and beneficial use of AT. These methods not only foster inclusive practices but also ensure the successful integration of technology for improved learning outcomes.

The AT products provided by the Vision Skills Lab are instrumental in promoting gender equality and enhancing educational opportunities for girls who have visual impairments and come from underprivileged backgrounds in Bihar. By offering these tools to the girls and training them in their use, the centre empowers the girls to access education, thereby breaking down barriers caused by gender and disability discrimination. This not only improves the girls' self-esteem but also challenges societal norms and prejudices. Furthermore, it helps narrow the gender-related education gap, as girls with disabilities often encounter more significant obstacles in accessing quality education. The girls' increased access to education and technology serves as a testament to gender equality and inclusion and fosters broader societal acceptance and integration.

Case study

The Vision Skills Lab at Antarjyoti Balika Vidyalaya in Bihar, India, has made a significant impact in terms of empowering girls aged 7–17. It has been instrumental in enhancing the girls' digital literacy, focusing on essential computer applications, including Microsoft Word, Microsoft Excel, email communication and internet browsing. This training equips the girls with the essential skills required for advanced computer lessons, enhances their confidence and ensures parity with their peers who do not have visual disabilities.

Previously, the students were taught using screen readers with a more regional Indian

accent. However, the screen readers now use software featuring American or British accents, a change that is particularly beneficial for the girls' future employability. Being trained in these globalized accents helps the girls become accustomed to the working environment, which increases their chances of securing jobs in sectors where such accents are preferred. For girls from low-income backgrounds, these skills are vital in breaking barriers to employment and achieving economic independence, as they enhance their competitiveness in a globalized job market.

Additionally, the use of tactile graphic books alongside Braille textbooks offers a multisensory learning experience, enriching the girls'

educational journey. The Vision Skills Lab takes a holistic approach to inclusive education, addressing the unique needs of students with visual impairments through a combination of AT, digital literacy, global accent training and multisensory learning methods.

This initiative was developed with active collaboration from students, teachers and parents (caregivers) so that it was tailored to meet the students' specific learning needs. By combining these various elements, the Vision Skills Lab has successfully transformed the girls into digitally proficient, confident and independent learners, and in doing so, has improved their educational and career prospects.

Territorial Support Centre for Disabilities through Technologies (CTS Bologna)

CTS Bologna
Sportello Autismo

About the organization

The Territorial Support Centre for Disabilities through Technologies (CTS Bologna) operates in a mainstream school in the municipality of Bologna, Italy. It is part of the Comprehensive Institute of Ozzano dell'Emilia, a state school, and operates within the jurisdiction of the Regional School Office for Emilia-Romagna in Bologna.

Students with SEN attend the same schools as neurotypical students in Italy, and CTS Bologna plays a pivotal role in supporting inclusion in schools. It is tasked with collecting and disseminating knowledge, best practices and technological resources to promote educational inclusion and success for students with SEN. In recent years, it has also been responsible for purchasing educational devices and supports and lending them to schools. CTS Bologna focuses on using methodological strategies for inclusive teaching and supporting the development of educational projects and teacher training and has a specific focus on ASD. The first Territorial Support Centres were created in Italy in 2006 thanks to the Italian Ministry of Education's 'New Technologies and Disability' project, which aimed to improve inclusive teaching through the use of new technologies. The centres' functions and areas of intervention are defined by various ministerial regulatory documents and national policy frameworks that have been published over the years. Their actions align with various national laws and international treaties, including the Italian

ratification of the United Nations Convention on the Rights of Persons with Disabilities and the 'Good School' reforms, which collectively emphasize the importance of inclusion and the provision of individualized support for students who have disabilities. The Emilia-Romagna region, where CTS Bologna is located, has a total of nine Territorial Support Centres. The schools in which the centres are based signed a network agreement in the last nine years to integrate and coordinate their technological and human resources and create a territorial structure that enhances teacher training and actions related to school inclusion.

CTS Bologna primarily addresses the needs of male and female students with disabilities and SEN aged 6–19, from primary to high school; it also works with students who are older than 19 and are still in the school system. The types of disabilities and SEN that the students have include visual, hearing and physical impairments; ASD; communication difficulties; cognitive disabilities; attention disorders and ADHD; and multiple disabilities.

The CTS Bologna team consists of four staff members; three work full-time and one works part-time. There are two mainstream teachers, one special education teacher and one special education teacher who is also a pedagogist. These professionals are directly involved in the provision and use of technology products to support inclusive educational practices in mainstream schools. Technical support is also provided by mainstream school technical staff

or professionals from the Regional Centre for Assistive Technology, which is part of the Healthcare Services.

The centre provides all its services completely free of charge and is supported entirely by state funding. The procurement of technology products is managed through these state funds, which are administered by the school's secretary and head teacher in accordance with formal procedures. A portion of the funding is earmarked to provide supplementary training opportunities for school teachers. All technology products acquired by the centre are provided to users at no cost, with the state covering all the associated expenses.

ICT, AT and AI in education and rehabilitation

One of the key functions of CTS Bologna is to support the inclusion of students in mainstream education by identifying the most appropriate AT or mainstream technology products to meet their needs. To do this, the CTS Bologna staff collaborate with teachers, healthcare specialists and other relevant professionals, especially in the case of students who have severe disabilities. The products are primarily loaned free of charge by CTS Bologna, although some are loaned cost-free by healthcare organizations, municipalities or various local organizations. The pedagogical frameworks and didactic approaches adopted by CTS Bologna emphasize co-responsibility for the creation of personalized learning/education plans for students with disabilities. They promote cooperative learning and peer-to-peer interactions, both of which are seen as effective learning strategies for all students. The centre advocates a teaching/learning process that is hands-on and accommodates different learning styles, following the principles of constructivism and the biopsychosocial model. It supports approximately 250 students every year.

The centre supports teachers by providing them with general information and training initiatives, offering consultations for individual, often particularly challenging, cases, lending equipment when required and sharing collections of best practices for inclusion. In an average academic year, the centre provides assistance to approximately 150 teachers who participate in specific projects promoted by CTS Bologna and teach a range of classes in a variety of schools. It also supports approximately 300 teachers through training sessions, summer schools and assistance with specific cases every year. In addition, the centre provides support to parents (caregivers) of students who have disabilities or SEN. This support involves consultations for parents (caregivers) who are seeking clarification and information about specific situations. CTS Bologna aims to foster effective educational pathways through its close relationship with schools.

IT infrastructure (internet connectivity, main types of hardware and software)

CTS Bologna supports the education and socialization of students with disabilities and SEN who are enrolled in mainstream schools by providing various supportive products — for example, tablets (Android or IOS), notebooks, Chromebooks, convertible laptops, communication devices such as vocal output communication aids (VOCAs), accessibility features, communication apps, AAC software, Braille communication devices, special keyboards such as BigKeys, switches and trackballs. Broadband internet is available in the centre.

CTS Bologna provides comprehensive support services for the use and maintenance of the products it provides. Maintenance services are

offered for free, and primarily cover products and tools that are still under warranty. During the warranty period, schools are expected to bring non-functioning devices to the centre, which then sends them to authorized repair centres. Schools are responsible for the maintenance of any products that are no longer under warranty. The centre also offers a free lending service for both assistive and mainstream products. It issues an agreement that lists details about the product, borrower (the school attended by the student who will use the product) and lender (CTS Bologna). The agreement is signed by the heads of CTS Bologna and the student's school. Borrowers are expected to use the material responsibly, and solely for educational purposes, and return it at the end of the educational cycle or when it is no longer needed. Replacements are not provided in the event of loss or theft. CTS Bologna also provides free refurbishing services. When a product is returned because it is no longer needed or the student has completed their schooling, a staff member restores it to its original condition.

The centre has a quality assurance system in place. The effectiveness of its actions is monitored through meetings with schoolteachers involved in its various support actions and initiatives, evaluation questionnaires after training sessions, and reports written by the centre's teachers, which are evaluated by school head teachers and sent to the Director of the Regional School Office of Bologna.

The centre also engages in research activities aimed at developing innovative products for inclusive education. For example, it contributes to the ARASAAC AAC project and to the dissemination of AAC materials and best practices for their use. Staff members also conduct research to find applications and resources for supporting inclusive educational paths. The centre has

a dedicated training room where students, teachers and parents (caregivers) can learn about the use of both assistive and mainstream products. This room can accommodate a variety of training and activity formats and is equipped with desks on wheels that can be moved around as required and an interactive screen for presentations and sharing activities.

Teachers' ICT, AT and AI competencies and skills development

- **in relation to the educators of the centre**

Professionals at the centre have access to continuous training opportunities, particularly in the use of AT to promote inclusive practices in mainstream educational contexts. The advanced or professional training programmes available cover a diverse range of topics, such as the use of technology among students who have ASD, ADHD or general behavioural problems. Some programmes focus on how to create a personalized learning plan in accordance with the International Classification of Functioning, Disability and Health (ICF) framework, and others take the form of continuous training on AAC. Additionally, every teacher who works at CTS Bologna can choose individual training

programmes that align with their professional needs and interests, thus ensuring a personalized approach to their continuous development.

- **in relation to the educators of mainstream education settings**

CTS Bologna offers a range of capacity-building opportunities, such as workshops and training events, that are focused on the use of AT and AAC products to promote inclusive practices in education. These training sessions cover diverse topics, including technologies suitable for students with motor and sensory disabilities, managing multimedia stations for students who have severe disabilities, inclusive teaching using Apple and Android devices, visual storytelling, online apps for inclusive education and strategies for managing behavioural problems at school. Special emphasis is given to ASD, with courses on tools and strategies to use with students who have ASD and social stories and communication apps for students who have ASD. There is also a focus on creating and using AAC charts for communication and writing; CTS has a library dedicated to AAC and communication tools. Some examples of the recently conducted workshops include 'Technologies for Inclusion', 'Use of Devices (Apple and Android) as Inclusive Tools', 'Inclusion and Visual Storytelling', 'Online Apps for Inclusive Teaching', 'Autism Spectrum Disorder — Presentation, Tools and Strategies' and 'Social Stories for Autism: Social Stories with Book Creator App'.

Digital teaching and learning materials (including games, applications, e-books, OER, websites, educational portals, videos, etc.) and ways of integrating ICT, AT and AI into the curriculum

CTS Bologna places significant emphasis on the use of open access visual tools such as mind maps, concept maps, timelines, charts, etc., which are integral to the creation of accessible learning environments. The centre also focuses on AAC approaches and tools, using open-source apps and platforms such as ARASAAC to enable teachers to work effectively with AAC.

Facilitators and challenges

In CTS Bologna's experience, one of the main challenges to implementing and using assistive and mainstream products in mainstream education for fostering inclusive practices is two-fold: ensuring the availability of the necessary devices and tools and providing the guidance and training needed for their proper use. CTS Bologna addresses this challenge by lending products and helping teachers and schools use them effectively. Another significant challenge is teacher training — training for the entire teaching team, and not only SEN teachers. It is crucial to raise awareness among all teachers about not only inclusive education and disability-related issues, but also the importance of integrating the use of devices into inclusive teaching practices and methodologies. The centre acts as a stable reference point for information, training and support in establishing learning paths and using tools and devices. Regarding the most valuable pedagogical approaches or principles for the effective use of assistive and mainstream products in mainstream settings, CTS Bologna sees the involvement of the entire teaching team as crucial. An experiential, hands-on approach that allows for experimentation with tools and devices is highly effective. CTS Bologna encourages active teaching, cooperative learning and peer-to-peer interaction. Using tools such as mind maps, concept maps, timelines and charts, including AAC if necessary, for visual communication enhances learning and promotes an accessible

environment. In terms of social equity and gender equality, the technological products provided by the centre are distributed based on the educational and learning needs presented by teachers, schools and specialists, and are given to every student regardless of their background. This approach ensures equal opportunities for all students to actively participate in their educational journey, gaining autonomy and mastery of the tools that will be essential to them in their future lives as they do so.

Case studies

Let's Face Emergency

Since the 2018/19 school year, the Territorial Support Centre of Bologna has been running a pilot project for emergency situations involving individuals with intellectual disabilities and ASD. This project, titled 'Let's Face Emergency', is a joint project with a local school and the local fire service to enhance safety procedures for students with disabilities. It originated when firefighters expressed a desire to interact effectively with children and adults with ASD by using shared procedures and communication tools both on a daily basis and in the event of an emergency. The project includes training for teachers, staff, students, parents (caregivers) and local fire service volunteers, and involves collaborations with healthcare services, local authorities and the University of Bologna. The project's goals were to broaden knowledge of ASD both for firefighters and for school teachers, educators and assistants, create communication channels and symbols for emergencies, and establish a local intervention network. The plan was to expand the project regionally in its second year, but the COVID-19 pandemic prevented that from happening. Instead, there was a focus on supporting students' emotions and relationships, with teachers and students working together to create symbols for the pandemic in AAC and then distributing digitalized materials and games locally, both at school and in paediatricians' public clinics, to help children become acquainted with all the new objects and sanitary procedures linked to the pandemic. In its fourth year, the project continued promoting an inclusive culture: students implemented AAC tools in the home town of the school involved in the project and local shops agreed to use specifically designed charts and communication tools created by students and teachers. Moreover, with support from the municipality, symbols were placed at crosswalks and intersections in the vicinity of the school to provide visual help to anybody who wanted to cross the street, including students with SEN. The project's innovation lies in its use of a collaborative network of experts and hands-on approach to creating communication tools — students built these tools with their teachers after receiving training from experts. This approach fostered widespread awareness among students of their ability to improve accessibility for everyone and subsequently promoted active civic awareness. Students with disabilities were central to the project, working with their classmates to create tools for effective communication in emergency situations and in daily life settings such as shops or clinics. They familiarized themselves with the symbols used in AAC applications, thus enhancing their communication skills.

Robot Valley

Robot Valley was a collaborative project between the Regional Centre for Assistive Technology (CRA) of the Bologna Local Healthcare Authority — Associazione Italiana per L'Assistenza Agli Spastici Provincia di Bologna (AIAS Bologna) — and CTS Bologna. The aim was to create a network of local schools

that used social robotics for innovative and inclusive education. The project used the humanoid robot NAO, which is suitable for educational activities and can replicate human behaviours to facilitate social interaction. It is particularly beneficial for children with ASD or SEN. The project's innovation lay in its use of a robot to create learning scenarios that included students who were at risk of exclusion from traditional educational activities. A unique aspect of this initiative was the development of an app to simplify robot programming for teachers, thus enabling them to design various activities without needing extensive computer skills. This approach led to the formation of a network of teachers skilled in using NAO, implementing innovative educational activities and sharing those activities within the school system. Students with disabilities were actively involved in the project. They participated in activities specifically designed to enhance their social skills and promote their participation in social activities. No substantial ethical concerns were identified. The success of the initiative is attributed to several factors: the appeal of the NAO robot to students, the user-friendly app for teachers, the creation of a standardized intervention model, and the activity-sharing model, which made it possible to identify best practices. Initially, Robot Valley was not part of a larger initiative, but its success and the interest it generated have led to its being expanded on a regional scale for the 2023/24 school year, with the involvement of other territorial support centres in Emilia-Romagna. News about the project was not widely disseminated via social media platforms, but the initiative became a finalist in the MAKEtoCARE contest in Rome, organized by SANOFI, and information about its highlights and key achievements were disseminated through the official communication channels of the contest.

Ausilioteca,
Regional Centre for Assistive Technology

About the organization

Ausilioteca, Regional Centre for Assistive Technology in Bologna, Italy, is a publicly funded service that operates within the health and disability programme of the Bologna Local Health Trust. The centre is managed by AIAS Bologna, an NGO, independent member-driven association for persons with disabilities, their family members (caregivers) and friends. Its aim is to support children and adults with disabilities and their families (caregivers) in overcoming barriers and realizing their potential to live more fulfilled lives. Funded by the regional government of Emilia-Romagna and the public healthcare system, the centre provides persons with disabilities, their families (caregivers) and healthcare, educational and social services professionals with information and advice about using AT and IT, and promotes the participation of persons with disabilities in all realms of life, including education.

The centre's main stakeholders are persons of all ages with disabilities, their families (caregivers), health professionals and teachers. Ausilioteca supports persons with a wide range of disabilities and special needs, but it has a specific focus on motor and multiple disabilities, intellectual disabilities and ASD.

The centre has approximately twenty-five members of staff. Specific professionals, including psychologists, occupational therapists, social workers and AT and ICT technicians, conduct activities relating to the use and implementation of AT in mainstream education.

Ausilioteca provides all its services free of charge to users, including parents (caregivers), teachers and schools. It relies substantially on public funding, although AIAS Bologna co-funds part of the activities. The AT products in the centre's demo room are purchased with dedicated funding from the regional government. Additionally, some equipment is provided by private companies, who use the centre to demonstrate their products. Despite receiving products on a long-term loan basis and free of charge from these companies, Ausilioteca maintains full independence in its operations and has no commercial interests in or formal commercial relationships with any of them.

ICT, AT and AI in education and rehabilitation

Ausilioteca actively supports inclusive education by recommending AT products to students with disabilities or SEN who are enrolled in mainstream schools. The centre's work focuses on assessing students to identify AT solutions — including AAC strategies — that will enhance their access to educational environments, learning materials and communication opportunities. The process of identifying the most appropriate AT solutions begins when parents (caregivers) or teachers ask the healthcare professionals to submit a request for an assessment; they then offer input once that request has been accepted. The centre's team, along with the student's parents (caregivers) and teachers, assess the student and provide written recommendations for the necessary

technology and other equipment. The written recommendations are an essential component of the application for public funding. The centre does not supply the technologies directly but helps teachers implement them in classrooms. Ausilioteca's approach to implementing AT in schools is a user-centred one that aligns with UDL guidelines; the emphasis is on meeting the unique needs of each student. On average, the centre supports approximately 80–100 male and female school-aged students annually; the minimum age is 3. The most commonly assessed students have motor and/or multiple disabilities, intellectual disabilities and ASD.

The centre also provides direct support to both teachers in mainstream schools and students' parents (caregivers) to promote the inclusion of students who have disabilities and SEN. This support is provided through formal consultations; any teacher or parent (caregiver) can schedule an appointment with the centre's staff for assistance with using AT in their daily routines.

IT infrastructure (internet connectivity, main types of hardware and software)

Ausilioteca has broadband internet connectivity and Wi-Fi. The centre is equipped with a number of AT products that are used to identify the most adequate solutions for the students who are assessed. The software and hardware that are available to address the educational needs of students with disabilities include, but are not limited to, the following:

- To enable computer access (including mobile solutions such as tablets) for people with motor disabilities: special switches of different sizes (including microswitches to detect minimal movements), alternative keyboards and mice for people with limited hand mobility, eye- and head-trackers, hand and mouth joysticks, trackballs.

- To enable computer access for people with visual disabilities: high-visibility/high-contrast adapted keyboards, screen readers.

- To promote communication and social interaction: a variety of high-tech AAC solutions, including single and multimessage communicators, communication software (e.g. Boardmaker, Grid 3, Communicator 5).

- To increase reading accuracy and comprehension: text-to-speech software, conceptual maps, note-takers, scanning pen.

- To facilitate suitable position and posture, and adequate access to a workstation: mounting solutions (e.g. eye-gaze and tablet mounting, switch mounting, table mounts), ergonomic chairs and seating devices.

The centre also has a variety of adapted toys (e.g. switch-activated toys) to promote play in educational settings and learning software in Italian to promote the acquisition of both basic (e.g. cause-effect) and more advanced (e.g. reading, attention, memory) skills to support the learning and education achievement of all students.

Ausilioteca has a large demo room containing various AT products. The demo room features two demonstration apartments equipped with domotic (home automation) solutions — the technologies and automated systems used to control and manage a home's equipment and infrastructure centrally and intelligently. These solutions include all the devices that help persons with disabilities live independently in their home environment — for example, automatic doors and sensors that switch lights on or off without the need to press a button.

The centre offers free maintenance services for users who are having difficulties with digital solutions; these are provided under an agreement with the suppliers. It also lends out basic AT products, such as switches, adapted toys and tablets with educational or communication software, especially when their acquisition through public funding is delayed. In addition, the centre offers refurbishing services for technologies such as gaze trackers, computers and mobile devices. A quality assurance system, built on structured evaluation and feedback from users, is in place to ensure the effectiveness of the centre's interventions. The centre actively participates in European research projects aimed at improving educational practices and inclusive approaches by using AT and other technologies, including the 'I'M IN TALES' project and the 'NEMO' project. Moreover, Ausilioteca has a dedicated room for training students, teachers and parents (caregivers) in using AT products. This room doubles the centre's capacity for assessments and meetings, as well as its demo space; the centre's staff are responsible for keeping the demo rooms up to date and organizing the material on display.

Teachers' ICT, AT and AI competencies and skills development

- **in relation to the educators of the centre**

Ausilioteca promotes CPD among its staff. Specifically, it has dedicated funding to allow staff to participate in specialized training events such as webinars or seminars on specific products or approaches to technology use. The staff also regularly participate in collaborative research projects with other specialist centres or with partners from industry or academia. These projects are an invaluable opportunity to exchange best practices and stay up to date

with key advancements in the AT field. The centre also participates in national and international conferences dedicated to AT and its application in various areas, including education — for example, the biannual conference of the Association for the Advancement of Assistive Technology in Europe (AAATE) and the International Conference on Computers Helping People with Special Needs (ICCHP).

- **in relation to the educators of mainstream education settings**

In addition to the opportunities outlined above, Ausilioteca supports capacity-building among its teachers by regularly offering free workshops and seminars on the use of a variety of AT products and AAC solutions in education. The centre's competence-enhancement activities include, for example, its 'Technology for Inclusion' workshop and 'Introduction to AAC' seminar. Parents (caregivers) are also provided with capacity-building opportunities, including workshops dedicated to the design and development of adapted, symbol-supported books.

Digital teaching and learning materials (including games, applications, e-books, OER, websites, educational portals, videos, etc.) and ways of integrating ICT, AT and AI into the curriculum

When it carries out its targeted educational activities, Ausilioteca uses resources and insights from the Global Assistive Technology Information Network (EASTIN), an important information hub for teachers and other professionals who want to stay current on the use of AT products to support students with disabilities. It is the most comprehensive and up-to-date independent database of AT products currently available on the internet. Another significant resource is Essediquadro. This site, available

in Italian only, provides documentation and guidance on educational software and other digital learning resources developed by the Istituto Tecnologie Didattiche del Consiglio Nazionale delle Ricerche (Institute for Educational Technology of the National Research Council), in collaboration with the Ministry of Education and the Istituto Nazionale di Documentazione, Innovazione e Ricerca Educativa (INDIRE) (National Institute for Documentation, Innovation and Educational Research).
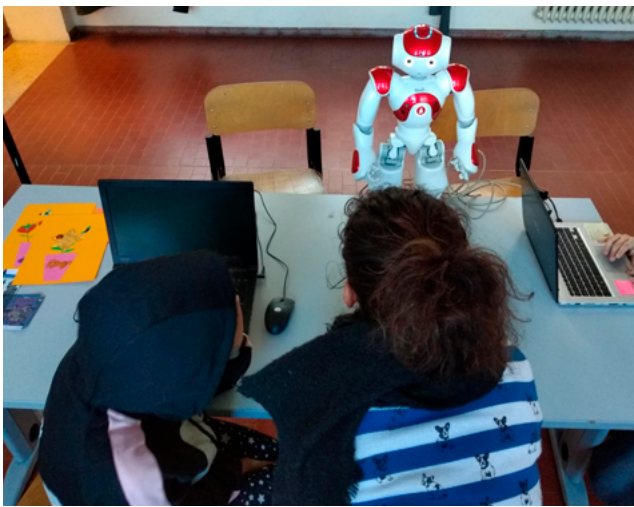
Facilitators and challenges

The main challenges to effectively implementing and using AT products in mainstream education to foster inclusive practices include a lack of local knowledge about how technology can support inclusive practices, a general lack of knowledge about using technology and insufficient funding for and attention to the evolving needs of a growing child. One way to address these challenges, and consequently facilitate AT product implementation, is to use robust pedagogical approaches or principles that can make the use of AT products effective and beneficial in mainstream educational settings — for example, UDL and the Technological Pedagogical Content Knowledge (TPACK) framework. These approaches emphasize the importance of considering diverse learning styles and integrating technology with pedagogy and content knowledge to enhance the learning experience for all students.

Case study

Ausilioteca exemplifies best practices by advocating for the use of mainstream digital technologies to foster inclusive educational methods. Educators in Italy are increasingly demanding access to technological solutions that, while not specifically designed for persons with disabilities, can be effectively adapted as AT products. This means that commonly used technologies such as smartphones and tablets could be used to great effect to support students with disabilities, often without the need for significant adaptations. The staff at Ausilioteca outline two primary benefits of using mainstream technologies rather than specialized AT whenever feasible. First, adapting mainstream technologies addresses concerns that specialized AT can present — for example, stigma, cost and the disconnect from the technology students use daily. Second, favouring mainstream over specialized technologies is particularly advantageous for students with high-incidence disabilities, including those with specific learning disabilities, emotional-behavioural disorders, mild intellectual disabilities or ADHD. For example, smartphones' built-in video cameras can record instructional videos. This feature could help students with intellectual or learning disabilities by providing them with a visual guide for tasks like solving mathematics problems or using a photocopier. Smartphones can also serve as speech output devices, generating speech without specialized software. Google's experimental applications for Android smartphones, such as Look to Speak, transform a device into an eye-controlled communication tool. Another

significant application of mainstream technology as AT involves geopositioning apps. Originally designed primarily as navigation aids, these apps can be used to monitor children at risk of wandering, such as those who have ASD. The humanoid robot NAO is another example of a technology being used in novel ways. Although NAO was not specifically developed to be used by and for students with disabilities, the staff at Ausilioteca use it to demonstrate social behaviours and facilitate interaction between students with communication or social difficulties and their peers who do not have these difficulties. In this capacity, the robot acts as a social mediator, enhancing social interactions among all students and contributing to a more inclusive educational environment.

Access to Communication and Technology Unit (ACTU), Aġenzija Sapport

About the organization

The Access to Communication and Technology Unit (ACTU) of Aġenzija Sapport is a public RC in Malta that serves as the national AT centre. Previously under the Ministry for Education, Sport, Youth, Research and Innovation, ACTU was transitioned to the Ministry for Inclusion and Voluntary Organizations to expand its services to adults. It is currently part of the services offered by Aġenzija Sapport, a parastatal organization that provides professional and innovative services to enhance the quality of life of persons with disabilities. The primary liaison between ACTU and schools is the inclusive education coordinator (INCO). They address concerns and facilitate school visits for on-site support, observations and training for learning support assistants who work with children with SEN.

ACTU works with children aged 0–16 and has separate provisions for persons over 16. It provides its services to male and female children and adolescents presenting with a variety of conditions, including CNN; physical and/or sensory difficulties; speech, language and communication needs or difficulties; and learning disabilities. A significant proportion of its current referrals are for children who have ASD. Other beneficiaries of its services are parents (caregivers) and teachers in mainstream schools.

ACTU employs seven members of staff with diverse qualifications, including speech and language therapy, occupational therapy and ICT expertise. Occupational therapists and speech and language therapists use AT and ICT products directly to foster inclusive educational practices in mainstream schools.

The centre provides all its services to users, including parents (caregivers), teachers and schools, free of charge. It operates entirely on public funding. In terms of technology procurement, it obtains its products primarily from AT suppliers. Many communication aids come from exclusive distribution companies; the centre purchases products directly from them once their trading status has been confirmed. However, whenever feasible, ACTU seeks at least three quotes in accordance with strict procurement procedures. After evaluating each quote, it chooses a supplier. Most products are sourced from European Union countries and the United Kingdom of Great Britain and Northern Ireland. ACTU helps users identify sources of funding to offset the costs of the products. For school-related needs, for example, the Ministry for Education might cover the expense. For AT meant for home use, charitable entities or Aġenzija Sapport might provide full or partial funding.

ICT, AT and AI in education and rehabilitation

ACTU participates in assessing students with disabilities or SEN, although it does not identify these students directly. In most cases, local educators and therapists take the lead in initiating the identification process, with ACTU stepping in when a child might benefit from AT, and specifically from AAC and electronic assistive technology (EAT), solutions. Referrals to ACTU come from

a child's speech and language therapist for AAC needs or the INCO for EAT needs. Local therapists, including occupational therapists and speech and language therapists, can also make referrals for EAT services. When ACTU's assessment team, which typically consists of a speech and language therapist and/or an occupational therapist, receive a referral, they work with local therapists to identify solutions. The process is inclusive. Parents (caregivers) can invite anyone they deem necessary to assessment sessions, including educators from mainstream settings or other specialist services. Learning support educators (LSEs) and speech and language therapists must be involved in AAC assessments. An assessment is a thorough process, and the team might need multiple sessions before they reach a conclusion, which may or may not result in a recommendation for AT. When AT is recommended, ACTU assists parents (caregivers) with the funding process, liaises with the Ministry for Education if an EAT solution is required, and helps with the initial set-up and customization of the equipment, including coordinating training for the relevant stakeholders. On average, ACTU assesses approximately fifty students every year.

The selection of appropriate EAT or AAC products involves a comprehensive assessment process that includes the student's family (caregivers), educators and health professionals. This process often involves trial periods with equipment to ensure the chosen technology meets the student's needs. All decisions are made collaboratively, with consideration given to the insights and expertise of the entire team. In terms of pedagogical frameworks or didactic approaches, ACTU relies on both the expertise of its professionals and the relevant professional health frameworks to guide the assessment and therapeutic processes. On average, the centre supports around 100 students annually through

various technologies. The duration of the support ranges from a single academic year to several years.

ACTU also provides hands-on support to teachers in mainstream schools. This includes assisting in the assessment of students who have physical challenges, contributing to Individualized Education Programmes (IEPs) by participating in goal-setting and strategy development, and offering cross-curricular support for students who use communication aids. In addition, ACTU conducts school visits and provides training to help teachers implement EAT and AAC. The number of teachers supported by ACTU typically corresponds to the number of students who are receiving assistance, which reflects the belief that active teacher engagement is crucial for successful AT and AAC outcomes. To facilitate inclusive educational practices, ACTU uses specific EAT and AAC products, including online resources and YouTube videos produced by both ACTU and its partners. ACTU also provides practical support to the parents (caregivers) of students with disabilities or SEN and

acknowledges the pivotal role they play in the assessment process. Parents (caregivers) engage by providing information about their children and trying out equipment at home. They are also involved in making final decisions, all of which underscores ACTU's commitment to empowering parents (caregivers). ACTU provides access to training videos to equip parents (caregivers) with the knowledge and skills they need to help support their children.

ACTU can also produce tailored products to meet specific needs when required. For example, the centre has undertaken the task of customizing systems to accommodate the Maltese language to address the lack of a Maltese language text-to-speech option. Moreover, ACTU collaborates with therapists to equip them with the skills they will need for implementing AAC. This step is crucial, as after the centre's involvement in a case concludes, these therapists continue to support the student. It is important to highlight that ACTU primarily operates as a consultative service.

IT infrastructure (internet connectivity, main types of hardware and software)

The support tools recommended by ACTU comprise a wide range of EAT and AAC systems, including adapted mice and keyboards, access tools such as switches and eye-gaze trackers, specialized software, websites (e.g. Clicker 8, Grid 3) and a mounting service for attaching equipment to wheelchairs. The facility has broadband internet access and Wi-Fi.

ACTU does not have a traditional showroom, but it provides tailored EAT and AAC solutions during student assessments. Recently, it hired an IT specialist to maintain and update its equipment and software, and it also offers free maintenance services. It works with suppliers

to identify whether repairs are required to equipment and, if so, discusses next steps with them. ACTU now has in-house capabilities to repair certain equipment. The centre also lends out EAT and AAC products for free; this is a crucial service during assessments or when regular equipment is out for maintenance. It has a library of devices for short-term loans, but it does not provide refurbishing services. The centre is contemplating implementing a quality assurance system to track the effectiveness of a proposed solution after an EAT or AAC product has been implemented (i.e. outcome assessment), as feedback is currently informal and inconsistent.

ACTU participates in research projects, in collaboration with the University of Malta, for the development of innovative EAT and AAC products. Its senior team members often have supervisory roles in these projects. There is a dedicated space on the Aġenzija Sapport premises for training in EAT and AAC product use, which ACTU team members can reserve. Aġenzija Sapport staff manage this process.

Teachers' ICT, AT and AI competencies and skills development

- **in relation to the educators of the centre**

The centre is committed to ongoing professional development. Capacity-building opportunities for the staff are delivered via peer support and informal training. The various professionals (e.g. occupational therapists, speech and language therapists) on the team are responsible for monitoring innovations in the field of AT or AAC and for organizing formal and informal meetings to update the other team members on these innovations. To this end, therapists have the autonomy to identify their training needs. They often focus on product knowledge

and strategies for implementing AT and AAC systems, including their application in mainstream environments. ACTU also organizes meetings with suppliers when new products come onto the market. The centre's active participation in international projects, such as the Erasmus project 'Emergence of the Inclusive Practitioners Forum (IFIP)', offers further opportunities for staff to develop their competencies. These projects allow ACTU staff to benefit from the insights of global practitioners.

- **in relation to the educators of mainstream education settings**

ACTU offers capacity-building opportunities, including workshops and training events, for teachers, students and parents (caregivers). These opportunities particularly emphasize the use of EAT and AAC products to further inclusive practices. While most of the capacity-building provided by ACTU revolves around communication, EAT and AAC products and goal-setting, the centre tailors its offerings according to students' needs and requests from schools.

Digital teaching and learning materials (including games, applications, e-books, OER, websites, educational portals, videos, etc.) and ways of integrating ICT, AT and AI into the curriculum

Aġenzija Sapport's YouTube channel is an excellent source of information for various stakeholders. It includes, for example, recordings from online workshops aimed at supporting the parents and caregivers of children and adults with a disability or disabilities. An external resource that ACTU recommends is Monarch Reader, formerly the Tar Heel Reader. Monarch Reader is a collection of free, easy-to-read and accessible books on a wide range of topics. Each book

can be speech-enabled and accessed using multiple interfaces, including touchscreens, adapted and special keyboards, and 1 to 3 switches. Users can also use Monarch Reader to write and publish their own accessible books. (Other products offered by Building Wings, the company behind Monarch Reader, are not free of charge.)

Facilitators and challenges

ACTU identified several key challenges associated with the use of technology to enhance educational experiences and has valuable insights to share about both challenges and facilitators.

- Knowledge gap: There is a significant disparity between the level of knowledge among staff at ACTU and the level of knowledge among staff in mainstream education. The primary challenge is how to bridge this knowledge gap effectively.

- Frequent turnover of educators: Although IEPs are designed to document every relevant detail, the frequent rotation of educators makes continuity difficult. Many of the educators are new to the realm of disability, AT and AAC, and they grapple with the concept of inclusive practices.

- Constraints on training: While ACTU offers training, multiple barriers impede its efficient delivery. The Ministry of Education allocates time for professional development in schools, but the two institutions often have competing priorities. Educators are seldom free to attend ACTU's specialized training sessions.

- Reluctance to use EAT and AAC products: Several educators lack either the technical expertise or the pedagogical knowledge needed to integrate these products into their classrooms.

- Educational level of support assistants: Some teaching assistants have only basic educational backgrounds, which can compromise their understanding of how AT and AAC tools can be used to promote inclusive practices.

Fostering a sense of ownership is a crucial strategy for tackling these challenges effectively. The entire school community must be involved in efforts to integrate AT, EAT and AAC tools right from the outset. A collective approach ensures that all stakeholders view themselves as integral parts of a team, working collaboratively towards the universal inclusion of all students. In essence, while the integration of EAT and AAC products could potentially revolutionize mainstream education and make it more inclusive, there are still barriers to overcome. As noted above, the challenges range from systemic issues such as training constraints and the frequent turnover of educators to individual hurdles such as negative attitudes and lack of technical knowledge. However, when stakeholders embrace collaboration and focus on achieving inclusivity, these tools can play a vital role in advancing social equity.

Case study

A good example of ACTU's activities is the use of AAC solutions to support students who have communication difficulties. As with other AT products, this type of solution requires a collective approach to assessment (i.e. identification of the most adequate device), implementation in life settings (e.g. in school, at home) and prolonged use if it is to be successful. Collaboration is essential not only among the ACTU professionals, the student and the teachers, but also between the student's parents or caregivers and all the professionals in the health and social

sectors who are involved in the student's life. Key factors that contribute to successful AAC interventions include the willingness of all parties to cooperate and the creativity and expertise of the ACTU team. The crucial role of specialized teams, such as ACTU, in addressing knowledge gaps and crafting viable solutions is especially evident when local service providers do not have sufficient knowledge about or expertise in identifying or addressing specific student needs. This is exemplified, for example, by cases in which students with motor and communication disabilities (e.g. cerebral palsy) need AAC solutions that not only meet the needs of their disabilities but also help the students overcome cultural challenges. For example, the ACTU team can create AAC solutions that are trilingual in order to respect a child's cultural reality. From a technological perspective, this can be done by embedding communication aids within eye-trackers. However, it is the ACTU team's combined competence and experience that makes it possible to turn such technological solutions into effective trilingual communication supports. In this way, ACTU gives students from all cultural backgrounds the opportunity to be included in all life situations, including, for example, participating in video-calls with extended family in other countries. AAC systems that are tailored to meet students' very specific needs therefore play a crucial role in helping students express their basic needs, answer questions, greet people and even interact with their peers using a variety of languages and communication strategies. Once these systems are embedded in a student's daily life, thanks to the continuous support of ACTU and the active participation and commitment of teachers and the student's caregivers, they can provide a further benefit: promoting the development of literacy skills.

Resursni centar
Milan Petrović, Novi Sad

About the organization

The Resursni centar Milan Petrović (Milan Petrović) is a public resource centre located in Novi Sad, Serbia. It operates on the premises of a special education school in an urban setting. Milan Petrović's key mission is to support children in mainstream schools and kindergartens not only in Novi Sad but also in surrounding municipalities. Its functions and activities are regulated by guidelines set by the Ministry of Education's National Policy Framework. However, specific procedures, including financing aspects, are currently under development.

Milan Petrović provides services to male and female children and adolescents aged 8–19 who have all forms of disabilities. It also supports teachers in mainstream schools and parents (caregivers) of students with disabilities.

The centre has forty-four members of staff. The staff members who are directly involved in the provision and/or use of AT products to foster inclusive educational practices in mainstream schools are educators, mainstream schoolteachers, pedagogists, psychologists, special education teachers and speech-language therapists. Notably, no ICT technicians or any other technical experts are involved.

Milan Petrović offers its services completely free of charge to users, who include parents (caregivers), teachers and schools, and is publicly funded. Most of the AT products it uses are sourced from the local companies that import them; their availability from local manufacturers

is limited. Despite limited dedicated funds for procuring these products, a significant volume of equipment was recently purchased through a project supported by the Ministry of Education and UNICEF Serbia. Any AT products provided to users — students, teachers or parents (caregivers) — are offered free of charge. The costs of these products are partly covered by local authorities, with the balance funded by donations.

ICT, AT and AI in education and rehabilitation

Milan Petrović is involved in identifying and assessing students with disabilities or SEN. The identification process is carried out by the Team for Additional Support, which comprises the student, their parents (caregivers), teachers, a pedagogue, a psychologist and specialists affiliated with the centre. The team begins by assessing the student's needs and uses their findings to decide if the student should be referred to the centre, where a more comprehensive assessment is performed. The selection of AT products is determined by the outcomes of this assessment. Every year, the team at Milan Petrović assesses approximately thirty students,

ranging in age from 8 to 15 years. The centre is equipped to assess all forms of disabilities. Students can test the AT products first-hand, with guidance and support from the centre's experts.

Milan Petrović uses ICT and AT products to promote inclusive education, socialization and communication among students who have disabilities or SEN and are enrolled in mainstream schools. It supports the implementation and use of a range of software specifically tailored for people who are blind, as well as other AT solutions such as switches and adapted keyboards. The identification and provision of the most suitable ICT or AT products for students is a collaborative effort. Students are presented with a selection of potential products and say which ones seem most appropriate for them. The experts from Milan Petrović make the final decision based on a combination of the students' preferences and their requirements and strengths. As highlighted in the preceding section, approximately thirty students, aged between 8 and 15 years, with all forms of disabilities benefit from the centre's support every year.

Of all the activities that Milan Petrović engages in, supporting students' parents (caregivers) and teachers in mainstream schools is key to promoting inclusive educational practices. Support for teachers involves a range of initiatives that include help with developing IEPs, modifying learning materials, revising teaching methodologies and optimizing the accessibility and adaptation of school facilities. Over the course of an average academic year, the centre assists approximately 300 teachers. Support for parents (caregivers) is provided primarily through consultations with speech therapists and special education teachers.

IT infrastructure (internet connectivity, main types of hardware and software)

Milan Petrović has a stable internet connection accessible throughout its premises via Wi-Fi. The centre is equipped with a variety of ICT and AT products that are used to support the education of children with a variety of disabilities. These products were selected from the official 'Catalogue of Assistive Technologies', which includes an overview of resources and AT solutions that can be procured and provided to students with disabilities in Serbia. Some of the main AT products available in the centre are:

- Products to facilitate access to ICT devices (e.g. smartphones, tablets) and personal computers. Examples of such solutions include switches of different sizes, adapted keyboards, screen readers, smart pens, DAISY players and eye-trackers.

- A combination of low-tech and high-tech products to support communication, including AAC solutions. Examples of such products include books adapted with symbols (e.g. using Picture Exchange Communication System — PECS) and voice output devices (e.g. SuperTalker).

The centre has a showroom in which it displays a range of ICT or AT products (see above) that can be used to promote inclusive educational practices. This space doubles as a training room

in which students, teachers and parents (care-givers) can be trained in the use of ICT or AT products. The centre's Assistant Director is responsible for managing this multifunctional space. In addition, the centre operates a lending service, allowing students with SEN and their teachers to borrow AT products for a specified period, free of charge. The student receives the necessary equipment and signs a receipt that shows the duration of the loan. The expert who initially assessed the student's needs oversees this specific process.

Teachers' ICT, AT and AI competencies and skills development

- **in relation to the educators of the centre**

The staff of Milan Petrović recently began participating in a series of capacity-building activities to strengthen their knowledge and practices in the area of AT provision to students who have disabilities and are enrolled in mainstream schools. The capacity-building activities were organized as part of the 'We Learn Together' project, implemented by the Ministry of Education of the Republic of Serbia and UNICEF Serbia, with the support of the European Union Delegation in Serbia. The first two capacity-building modules, both delivered in 2023, were titled 'Promoting Inclusion in Educational Settings through AT: Introduction to Key Principles, Strategies and Tools' and 'AAC: From Assessment to Implementation'.

- **in relation to the educators of mainstream education settings**

Milan Petrović contributes to the capacity-building of teachers in mainstream schools mainly through its support activities (as described earlier). Throughout the AT and AAC assessment, selection and implementation processes, the Milan Petrović staff work side by side with mainstream teachers. The teachers have noted that this makes them feel safer and more capable of providing support. In the future, dedicated training events and workshops on the use of AT and AAC in inclusive education settings will be organized for mainstream teachers.

Digital teaching and learning materials (including games, applications, e-books, OER, websites, educational portals, videos, etc.) and ways of integrating ICT, AT and AI into the curriculum

An important resource used by Milan Petrović's staff is a free (but with some paid options) AAC application called Cboard. It is designed for children and adults who have speech and language impairments, and uses symbols and text-to-speech to aid communication. Because it runs on web browsers, it can be operated on almost all platforms (e.g. iOS, Android) and is completely open-source. The symbols have been translated into more than forty-five languages and can be adapted to meet each user's specific needs, including language preference. Through its participation in the 'We Learn Together' project (see above), the Milan Petrović team, along with other selected resource centres in Serbia, has recently started to encourage the use of this application in educational settings to address communication difficulties among students who are enrolled in mainstream education.

Facilitators and challenges

The primary challenges to implementing ICT or AT products in mainstream education for fostering inclusive practices relate to financial constraints. There is a need for a consistent annual budget for these technologies, with transparent information about the financiers and their contribution limits.

Case study

The Milan Petrović centre sets a commendable standard by consistently providing AT solutions to support students with visual impairments throughout their educational journey. For example, early in their schooling, students learn to use basic tools such as a Braille typewriter for writing and a white cane for navigation. Mastering these low-tech solutions is a crucial step before the students are introduced to advanced technologies. For example, traditional white canes can be replaced by innovative devices such as Anora Technology's smart gloves. These gloves allow users to sense the distance to nearby objects through vibrations, detect colours and detect the denomination and currency of banknotes. They also announce time and dates and assist with orientation. If users lose their way, the gloves can transmit their location to friends, family or caregivers. Moreover, the gloves can identify medicines and other items in a user's immediate vicinity. The centre's support extends beyond the classroom as students age. For example, it gave a student with visual impairments a selection of ICT solutions, including Sibelius music notation software. She could then independently compose and perform music. The success of this particular example is unarguable: the student nurtured her inherent talent and won prestigious music awards.

Centre on Inclusive Technology & Education Systems (CITES)
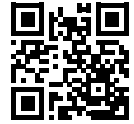
About the organization

The Centre on Inclusive Technology & Education Systems (CITES) is a public institution and functions as a US federal technical assistance centre. Its main mandate is to help districts create and sustain inclusive technology ecosystems that foster intentional collaboration between educational technology (EdTech), AT and IT sectors to benefit all students, including those who have disabilities. CITES also provides technical assistance to local education agencies, educators and families (caregivers) to ensure that students with disabilities can use the technology tools they need to foster learning and life success. The centre is hosted by CAST, the international non-profit organization that created the UDL framework and guidelines, now used all over the world to make learning more inclusive. CITES's functions and activities are bound by certain policy frameworks, one of which is the US Department of Education's National Educational Technology Plan. In addition, the centre adheres to the *Individuals with Disabilities Education Act* (IDEA) and other federal regulations pertinent to students with disabilities and accessibility and AT requirements.

CITES operates as a federally funded national technical assistance centre, which means it maintains close ties with local education agencies and state education agencies throughout the country. Its direct beneficiaries include school administrators, IT professionals, AT professionals and educators, students with disabilities and families (caregivers) of students with disabilities. It has a team of six staff members, some of whom work part-time. They are mainly professionals in the field of education and design.

The centre offers all its services for free. Its operations are sustained entirely through public funding.

ICT, AT and AI in education and rehabilitation

CITES supports teachers directly by equipping school and district administrators with necessary resources. For example, it offers guidelines on best practices and actionable steps for district leaders. Its aim is to ensure that teachers are adequately equipped with the right tools and training to establish inclusive technology practices in education. Furthermore, CITES showcases its commitment to inclusive education by maintaining an online platform dedicated to teaching on which it provides resources related to the National Educational Technology Plan. To foster a sense of community and shared growth, CITES hosts an open community of practice (CoP). The CoP offers educators a platform on which they can network and exchange knowledge with their peers, especially those who are keen on embedding inclusive technology practices in their classrooms. Through this community, educators also gain insights into AT and accessible educational materials that they can use to support students with disabilities.

In recognition of the vital role that families (caregivers) play in the inclusive education process, CITES has curated a specialized Get Started section, designed specifically for families (caregivers), on its website. This resource helps parents (caregivers) understand their role and the means by which they can actively participate in inclusive technology systems. A key attribute of CITES is its emphasis on family (caregiver) engagement practices. These are a central component of the CITES framework and comprise involving families (caregivers) in leadership roles, infrastructure practices, teaching, learning and assessment. To ensure that the family (caregiver) engagement practices are comprehensive and effective, CITES applied its meticulous knowledge development process, including a thorough literature review, supplemented by a landscape analysis involving surveys of more than 300 family members (caregivers) of students with disabilities. The CITES team then engaged in focus groups with families (caregivers) and conducted interviews with district teams to further refine its understanding of effective family (caregiver) engagement.

IT infrastructure (internet connectivity, main types of hardware and software)

CITES does not provide ICT or AT products directly to students and families (caregivers). However, it supplies administrative tools such as self-assessments designed to aid in the deployment of inclusive technology. This ensures that all students, particularly those with disabilities, have full access to quality educational content and tools.

In terms of facilities, CITES is embedded within CAST, an organization based in the Boston, Massachusetts, area. CITES staff are spread across the country and work mainly remotely.

Teachers' ICT, AT and AI competencies and skills development

- **in relation to the educators of the centre**

CITES places a strong emphasis on professional growth and ensures that its professionals receive continuous training opportunities in promoting inclusive practices using inclusive and AT products. To this end, staff members participate in advanced training sessions on topics related to accessibility organized by CAST and attend national conferences.

- **in relation to the educators of mainstream education settings**

CITES plays a proactive role in offering capacity-building opportunities. Between 2019 and 2023,

the centre collaborated with various school districts across the United States with the aim of cultivating and establishing a framework focused on inclusive technology practices. In anticipation of the subsequent phase of development, plans are in place for the 2023–2028 funding period. Three states have committed to being part of this next stage — Nebraska, New Jersey and Pennsylvania — and each one is currently in the process of soliciting district participation. The goal is to single out two districts from each state and to give each district intensive technical support to bolster district leaders' expertise. In addition, CITES conducts workshops at national conferences to promote the adoption of inclusive technology practices. These workshops cover a diverse array of topics, from inclusive technology planning (including AT), family (caregiver) involvement and virtual learning to infrastructural development and teaching methodologies. As an added initiative to empower educators, CITES also maintains a CoP. This platform is tailored to be member-driven, fostering a collaborative environment in which educators can spearhead discussions and share their experiences and learnings with their peers.

Digital teaching and learning materials (including games, applications, e-books, OER, websites, educational portals, videos, etc.) and ways of integrating ICT, AT and AI into the curriculum

A key resource is the CITES framework. It offers school districts a step-by-step process for identifying and removing systemic barriers to the implementation of ICT and AT, thus creating an ecosystem of inclusive technologies that can benefit all students. According to the CITES framework, creating such an ecosystem requires intervening in five distinct areas —

leadership, infrastructure, teaching, learning and assessment — for which specific practices have been developed:

- Leadership practices: Help district leaders develop a plan to support a district-wide vision for inclusive technology. This will ensure that access to inclusive technology is built into the decision-making processes at the highest levels of a school district. Specifically, these practices help AT, IT and EdTech departments that previously worked in isolation to collaborate on plans to implement technology in the district.

- Infrastructure practices: Make sure that districts procure, implement and manage inclusive devices and materials right from the planning stage.

- Teaching practices: Help educators use accessible learning technology tools in the learning experiences they are designing.

- Learning practices: Highlight the importance of focusing on students' agency to support their own learning. Such practices include, for example, outlining specific expectations that districts might set for learners (e.g. learners need to understand their technology options so they can make independent choices about which options are most useful to them).

- Assessment practices: Provide district leaders with a roadmap for developing comprehensive and balanced assessment systems that are inclusive and accessible.

Family (caregiver) engagement practices are also streamlined across the entire framework in recognition of the need to engage families (caregivers) in every aspect of the creation of an inclusive technologies ecosystem.

In addition to the resources listed above, CITES offers administrators self-assessments. These self-assessments are specifically designed to help schools and districts pinpoint both their strengths and areas where growth is needed, particularly in the realm of inclusive technology practices. The self-assessments have an open licence, so any educator can easily download and use them.

Further useful material is included on the Resources page of the centre's website. The following resources are particularly worth noting:

- *Literature Review: Teaching, Learning, & Assessment Practices for Inclusive Technology Systems:* Explores the current literature base on using technology for teaching, learning and assessment instructional practices based on the CITES framework.

- *Family Engagement Literature Review:* Explores the current literature base related to family (caregiver) engagement within the inclusive technology ecosystem.

Facilitators and challenges

One of the key challenges to successfully deploying inclusive and AT products in mainstream education to promote inclusive practices is the pervasive lack of understanding about these technologies. This challenge is intensified by a lack of professional learning opportunities and a noticeable absence of dialogue about inclusive technology practices. However, to maximize the effectiveness and benefits of using technologies in education, a fruitful approach is to equip school, district and state leaders with the requisite resources. By tailoring strategies to reflect local needs and experiences, these leaders can initiate, supervise and assess inclusive technology practices. Offering tools and

guidelines that administrators have specifically requested ensures not only their relevance but also their consistent use.

CITES has created a series of videos — including one that provides an overview of the CITES framework — to support education leaders in the area of inclusive practices and accessibility. Each video has a facilitator guide that can be customized to support a professional learning workshop or training.

Case study

Since 2020, the leadership team at Jenks Public Schools, Jenks, Oklahoma, has been dedicated to fostering a more inclusive technology system by collaborating with various technology departments such as EdTech, IT and AT. Their goal was to create a comprehensive EdTech plan and thus address the lack of a documented vision specific to technology and its integration in various areas. The need for such a plan became particularly evident at the onset of the COVID-19 pandemic, which underscored the importance of implementing a cohesive and effective technology strategy to support virtual learning.

The process began with a self-assessment, led by the EdTech lead on the CITES district team. The district team at Jenks quickly realized there was no district technology plan and set about creating one. The aim was to make the plan a living document that would be continually updated to guide the district's technology-related decisions. In 2021, Jenks started developing a formal technology plan using data collected from internal and external partners, including students and families (caregivers). The plan was designed to align with state and district goals and accessibility standards, covering areas such as leadership, assessment, teaching, learning,

infrastructure and family (caregiver) engagement. By 2022, the team had identified five key areas for continuous evaluation: innovation, stakeholder support, evolution of practices, safety and security, and accessible and equitable practices.

Jenks also established benchmarks throughout the development of the technology plan. These benchmarks were crucial for enhancing infrastructure, teaching practices and student learning outcomes and included developing a vision and mission for the technology system, setting short-term and long-term goals, improving wireless networks and data centres, and procuring accessible materials and AT. Key aspects of these benchmarks involved UDL credentialling, training in accessibility guidelines and involving families (caregivers) and students in the planning process.

Another significant challenge was overcoming the siloed nature of different departments. To tackle this issue, the leadership team created a collaborative framework that brought together various leaders from EdTech, AT, IT and other departments. The experts met regularly to devise actionable strategies aimed at fostering a more inclusive technology system.

Upon completion of the CITES project and the implementation of the technology plan, communication across previously siloed departments improved noticeably. This change facilitated access to a broader range of resources for educators, which ultimately benefited students such as Mercy. Mercy has cerebral palsy and uses a wheelchair. Although the cerebral palsy prevents her from speaking, she has a brilliant and curious mind. Thanks to the implementation of the technology plan, she was provided with an iPad with text-to-speech software attached to her wheelchair. Mercy had difficulty moving her hands, but she could control her right foot and use her big toe to type. Using a series of letters, symbols and pre-loaded phrases, she used her foot to form sentences, and the iPad read aloud what she had typed.

The technology plan's impact continues to be significant, and the district regularly reviews and revises its technology choices based on feedback from families (caregivers), educators, administrators, community partners and students. Mercy's story exemplifies how the plan fostered a unified approach to technology, creating a positive and ongoing impact on the district and its community and encouraging reflection among all those involved.

Young Power in Social Action (YPSA)

About the organization

Young Power in Social Action (YPSA) is a voluntary, non-governmental and not-for-profit sustainable development organization. In 2005, it founded the ICT and Resource Centre on Disabilities (IRCD) and became a partner in the DAISY consortium. YPSA-IRCD produces and distributes DAISY digital talking books (DTBs).

The centre's mission is to ensure the best use of ICT for persons with disabilities, including promoting the development of their abilities. YPSA-IRCD has hands-on experience in using technology to assist boys/men and girls/women with visual impairments. It has developed accessible reading materials for students with visual impairments who are in primary, secondary and tertiary education. It created Accessible Books and the Accessible Dictionary. Accessible Books is a unique initiative in Bangladesh to bridge the access to information gap between persons who have print disabilities and those who do not.

With respect to beneficiaries, IRCD-YPSA's dedicated activities focus on:

- Students with visual impairments.

- Students with a neurodevelopmental intellectual disability.

- Students with a physical disability.

In total, 3,000 students with disabilities have benefited from IRCD-YPSA's support to date.

IRCD-YPSA comprises a seven-member Executive Committee, General Council, Advisory Council, full-time and part-time staff and local and international volunteers. The General Council, Executive Committee and Advisory Council members have a variety of professional backgrounds, including academia, business, development, journalism and research. The Member Secretary of the Executive Committee is the Chief Executive of the organization and is responsible for the overall management and representation of the organization. Four directors work under the Chief Executive: Field Operation/Social Development Division, Finance Division, Human Resource Management and Development Division and Micro Finance and Enterprise/Economic Development Division.

Since 2005, the centre has received funding from a variety of high-profile authorities, international organizations and trusts. Its financial supporters include (among others) the World Bank and Microsoft Sri Lanka, A.K. Khan Foundation, Nippon Foundation, Australian Direct Aid Program (DAP), German Embassy in Bangladesh, Accessible Book Consortium of WIPO, APNIC Foundation, Aspire to Innovate (a2i) and NCTB of the Bangladesh Government.

ICT/AT/AI in education and rehabilitation

IRCD-YPSA is housed on one floor with three rooms for ICT training. The centre also provides computer training for students who have visual impairments and has a book production room.

To help persons with disabilities find employment, the centre has a space with computers available for members to use. YPSA-IRCD staff members offer support in this space and also by phone and email. The staff answer technical questions about using, for example, computers and Android phones. They will try to research answers if necessary.

As a technology centre, and one of the country's innovations centres, IRCD-YPSA conducts a range of activities. One of its major commitments is to ensure the ongoing availability of accessible reading materials for students who have disabilities. Bangladesh is able to provide multimedia talking books and accessible reading materials every academic year for all students in Grades 1–10 who have a disability or disabilities. IRCD-YPSA also produces accessible reading materials for Grade 11 and 12 students and university students.

IRCD-YPSA works continuously with diverse student groups and teachers to train them in using accessible reading materials, including multimedia talking books and Braille-based accessible books. As of 2023, almost 300,000 students with disabilities had benefited directly from the centre's work. In 2021, UNESCO released a case study about an accessible reading material initiative of the Bangladesh Government. The report was titled _COVID 19, Technology-Based Education and Disability: The Case of Bangladesh, Emerging Practices in Inclusive Digital Learning for Students with Disabilities_ and includes a reference to the centre's work and achievements.

The centre's landmark innovation is the Accessible Dictionary, available in four language combinations: Bengali to Bengali, English to English, English to Bengali, and Bengali to English. The dictionary can also be used via an Android app. IRCD-YPSA offers training and

orientation for the students and teachers to learn how to use the dictionary. The centre works continuously to promote this resource.

IRCD-YPSA is dedicated to developing the capacity of teachers and students in using computers and other AT, such as screen-reading software and smartphone games. It has both a computer lab and a very resourceful team of trainers delivering both online and in-person training for teachers and students. IRCD-YPSA also established an accessible e-learning centre in the Central Library of Chittagong University — the first of its kind in Bangladesh — in collaboration with the Bangladesh Government. Almost 150 students with disabilities receive training with accessible material at the e-learning centre.

IRCD-YPSA is designing e-learning courses and working with the Bangladesh Government to make websites and applications accessible for students with disabilities in schools and universities throughout Bangladesh and in other countries.

One of its most important activities is empowering women and girls with disabilities. IRCD-YPSA has distributed around 2,000 smartphones; 60 per cent of them were distributed among female students with disabilities and the remaining 40 per cent were distributed among male students. Girls with disabilities

face triple discrimination in Bangladesh. In addition to experiencing gender- and disability-related discrimination, they face social stigma because of their disability. The centre is greatly concerned with providing learning opportunities for girls and women with disabilities and makes every effort to ensure increased participation and leadership among female students.

IT infrastructure (internet connectivity, main types of hardware and software)

IRCD-YPSA has a wireless internet connection. In terms of hardware, it has computers, a Braille printer, Braille devices, adaptive technology and mobile phone technology. In relation to software, it has NVDA, DDReader+ and Braille tutoring software, all of which help to enable and empower students with disabilities in their learning journey. It also has DAISY player technology, which comprises both hardware and software.

Teachers' ICT/AT/AI competencies and skills development

- **in relation to the educators of the centre**

Teachers are very enthusiastic about and motivated to use ICT and AI. They are somewhat confident in the use of these technologies in inclusive education. ICT is occasionally used to assess students' knowledge acquisition and skills development levels. Approximately 10,000 people have been oriented on the use of DTBs and accessible reading materials through blended learning since 2005. Each training cohort comprises twenty participants. A companion manual was developed for computer-based training.

- **in relation to the educators of mainstream schools/universities**

IRCD-YPSA organizes training opportunities for teachers on the use of DTBs. Depending on needs and requirements, up to 240 teachers are trained every six months in groups of twenty. These training sessions are restricted to teachers from schools for children with special learning needs, as mainstream schools are not currently accepting students with SEN.

Digital teaching and learning materials (including games, applications, e-books, OER, websites, educational portals, videos, etc.) and ways of integrating ICT/AT/AI into the curriculum

IRCD-YPSA has a wide list of products and resources designed to benefit persons with disabilities. They include 'DAISY FOR ALL — Production of Digital Talking Book', 'Empowering Visually Challenged People through ICT', 'Empowering Youth with Disabilities through Market Driven ICT Skills', 'Production of Multimedia Digital Talking Book (Class 1 to Class 10)', 'Empowering Women with Disabilities through Market-Driven ICT Training and Accessible Information on Sexual and Reproductive Health Rights (SRHR)' and 'Strengthening the ICT and Resource Centre for Persons with Disability in Chattogram'. The accessible e-learning RC, accessible reading materials and Accessible Dictionary all reduce the gap between persons with print disabilities and their peers who are print-enabled. IRCD-YPSA

also uses WhatsApp, Zoom and similar platforms to take learning beyond the physical boundaries of the classroom.

Facilitators and challenges

Facilitators

The main facilitators for the integration of ICT in education were participation in the DAISY consortium, government support and access to qualified trainers.

Challenges

The major challenge for the integration of ICT in education is financing. IRCD-YPSA also requires capacity-building activities. Localization of the AT and software is critical. The centre is currently advocating for Bangladesh to ratify the Marrakesh Treaty and amend the country's copyright law to include copyright exceptions for accessible book production in Bangladesh. A major, and alarming, challenge is the lack of appropriate software and digital materials for students who have visual impairments. Adequate physical devices are also in short supply.

Impact of ICT/AT/AI integration on inclusive education

Each project relating to the integration of ICT into education had great successes. ICT integration improved access to learning opportunities

and ways of learning, increased employment opportunities for students with disabilities and promoted the social-emotional development of students with SEN.

For example, the 'Empowering Youth with Disabilities through Market-Driven ICT Skills' project improved students' livelihood prospects, enhanced their dignity as individuals and paved the way for them to work their way out of poverty. It created positive awareness of the ability of youth with disabilities to participate in the labour market, either by working for someone else or through self-employment, and increased employers' confidence in their abilities.

The 'Accessible Reading Materials for Students with Visual Impairment (DAP)' project enabled college and university students with visual disabilities or impairments to get their textbooks in DAISY format. The students' learning experience and outcomes improved, which made them more confident they could achieve their aims and objectives in life. Their experience inspired other students who are blind to pursue their education and the drop-out rate among this group has declined.

Encouraged by the response of the current students, IRCD-YPSA is looking forward to providing DAISY books to graduate-level students, thus expanding its focus.

The centre is continuing its efforts to enable persons with disabilities to live independent lives, with all the freedoms that the rest of the population take for granted.

Case studies

'Accessible Reading Materials for Students with Visual and Print Disabilities' project
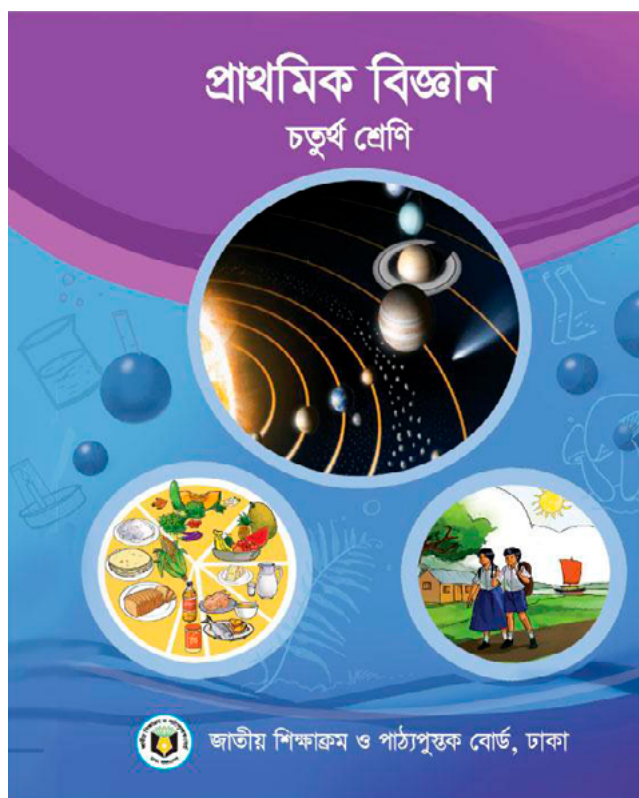
IRCD-YPSA, with the support of a2i, the Bangladesh Government Innovation Agency, has produced DAISY digital multimedia books, accessible e-books, digital Braille books and mathematics books for students in Grades 1–10. These resources have proven to be significantly more accessible and cost-effective for students who have visual, print or learning disabilities compared to traditional paper books, which are largely inaccessible to this group. Through this project, all Grade 1–10 textbooks were converted into DAISY digital multimedia format, and they can now be converted into DAISY full-text/full-audio textbooks, Braille and accessible e-books from the source DAISY file. Children throughout Bangladesh now have access to these universally designed reading materials. These books are perfect for everyone who needs accessible information and loves to read. Readers can play the audio and simultaneously watch and highlight the corresponding text.
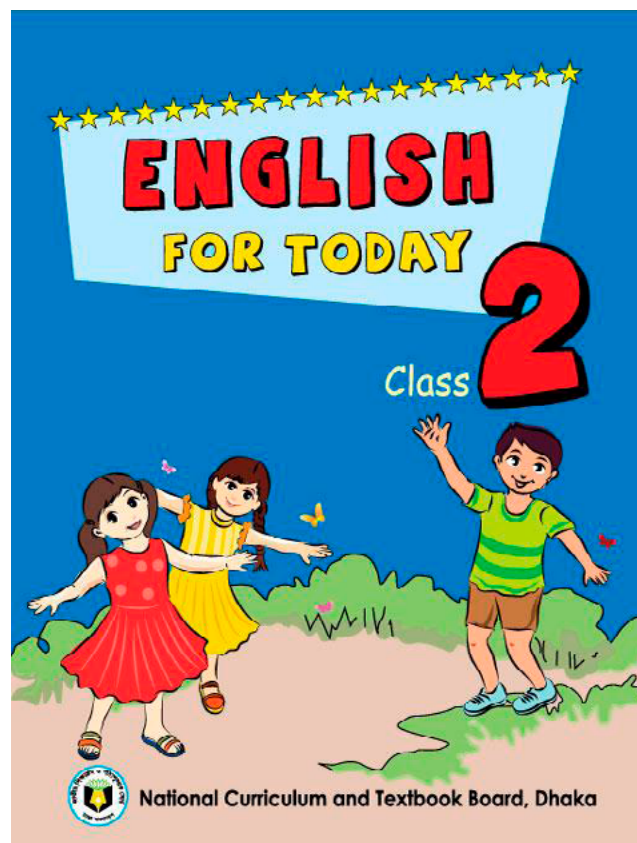
The accessible reading materials have made primary and secondary education inclusive (SDG 4.a) and accessible for all girls and boys (SDG 4.1). They have also contributed to improving literacy and numeracy levels among the user groups (SDG 4.6). Today, approximately 150,000 students who have a visual disability, print disability or learning disability can read and listen to their textbooks. The government is distributing these books for free, so now all girls and boys can get completely free, equitable and quality primary and secondary education that leads to relevant and effective learning outcomes (SDG 4.1). This is a huge step forward in ensuring that education facilities are child-, disability- and gender-sensitive and provide

safe, non-violent, inclusive and effective learning environments for all (SDG 4.a).

Chittagong University Accessible E-Learning Centre

Persons with visual impairments or print disabilities face discrimination and challenges in obtaining an equitable education in the traditional sense, as reading materials are frequently inaccessible to them. A number of students with visual impairments are now studying at university level. There is a severe lack of adequate study materials and books for them in both shops and libraries and there is no dedicated government or NGO policy or initiative to ensure university students who have a visual impairment have accessible study materials. Class notes and lectures are traditionally used by students, but they are never in an accessible format for persons with visual impairments.

To ensure equal access to higher education for students with a visual disability, IRCD-YPSA set up an accessible RC for students who have a visual impairment in the Central Library at the University of Chittagong. The set-up process entailed a series of steps as detailed below:

- Conduct baseline survey among students with visual impairments at the University of Chittagong.

- Arrange project inauguration ceremony at the University of Chittagong.

- Organize meeting between students and instructors at the University of Chittagong to understand their collective needs and share plans with them.

- Provide financial and wide-ranging logistical support to set up the accessible resource centre.

- Create a group of volunteers from among the students at the University of Chittagong to support students with disabilities who use the library.

- Produce twenty-five Braille books for study material.

- Produce 100 multimedia talking books textbooks — 15,000 pages in total.

- Organize formal and informal training programmes for students with visual impairments.

- Organize orientation session on face-to-face reading and transcribing for volunteers.

- Collect electronic and hard copy study materials from national and international organizations and libraries.

- Arrange training in using computers and technology for sixty students at the University of Chittagong.

- Print leaflets to advertise the new centre.

Assistiva Tecnologia e Educação

About the organization

The main goal of Assistiva Tecnologia e Educação (Assistiva) is to disseminate knowledge, provide effective training and contribute to research and development in the field of AT and inclusive education. Through a combination of professional and family- (caregiver-) centred initiatives, detailed assessments and practical implementation support, its staff, who are AT specialists, support the creation of inclusive and accessible environments for persons with disabilities. Assistiva works locally in the south of Brazil and remotely with other interested parties anywhere in the country.

The centre is a private independent institution with no religious affiliation. Its services are accessible in all regions of Brazil. Its team strives to promote the inclusion of persons with disabilities in every aspect of life, including education, work, leisure, culture and society, by using AT, particularly AAC and computer access. The centre offers courses in both distance and face-to-face formats to suit a variety of learning preferences. Assistiva's core functions are:

- Professional training: Trainings for specialists, including teachers, therapists and developers, with a particular focus on the intersection of AT and inclusive education.

- Family (caregiver) training: Specialized trainings for families (caregivers). These sessions aim to provide families (caregivers) with the understanding and skills needed to create an inclusive home environment and support the educational journey of their loved ones who have disabilities.

- AT assessments: Selection of the most appropriate set of AT solutions for a particular person that can facilitate communication, learning and general skills and social participation.

- Implementation support: Monitoring a person's direct use of AT and resources and developing proposals for adjusting those resources to optimize their effectiveness.

The number of beneficiaries of the centre's work is difficult to quantify because of the range of people and institutions that come seeking help and the purpose of their initial visit. The team's focus is on consistently delivering effective programmes and services to a wide range of beneficiaries.

As of December 2023, the centre was serving approximately twenty students locally who received face-to-face or online assistance to improve their language and academic skills through AT, primarily AAC, and computer access on a regular weekly basis. Fifteen of the students have ASD, four have cerebral palsy and one has Angelman syndrome.

Assistiva's beneficiaries include a wide range of people and institutions, including school-aged students who have cerebral palsy, Down syndrome or ASD; teachers involved in inclusive education; professionals (teachers, therapists, developers); families (caregivers) of persons with disabilities; and institutions (schools,

educational organizations) seeking support for inclusive practices for their organizations.

The centre also places considerable emphasis on cooperation and engages in volunteer activities such as the development of communication boards during the COVID-19 pandemic in partnership with the Federal University of Rio Grande do Sul and ISAAC-Brazil (the Brazilian Chapter of the International Society for Augmentative and Alternative Communication).

Assistiva is a private company. It generates income through paid in-person and online courses and has contracts to offer training sessions on inclusive education, AT, AAC and UDL to public and private sector organizations.

The centre does not have a special budget for staff training. Each Assistiva professional independently strives to improve their skills by taking specific courses tailored to their personal interests and needs. Local staff members usually join courses taught by their colleagues or invited professionals teaching at the centre. In this way, the centre is a venue for knowledge exchange.

ICT, AT and AI in education and rehabilitation

The centre is not currently working on the integration of ICT and has not received any funding for this type of project to date. However, the staff remain alert to potential opportunities for integrating ICT and continuously explore avenues for incorporating it into their programmes and services to enhance the support they provide to persons with disabilities. This reflects the centre's commitment to staying up to date with technological advancements.

In 2023, the centre secured a contract with Serviço Social da Indústria (SESI), the largest private education network in Brazil. This collaboration involved developing content for an online course and conducting teacher training for an initial cohort of fifty teachers from all across the country. The programme continued into 2024, expanding to train an additional fifty teachers.

A postgraduate programme on inclusive education, commissioned by SESI, is now underway with sixty participants. Topics such as AT and UDL are included in the curriculum. This initiative is being conducted in partnership with the Federal University of Goiás to promote inclusive education practices with reputable educational institutions.

IT infrastructure (internet connectivity, main types of hardware and software)

Assistiva's training centre and rooms are connected to the internet via a fibre optic and local area network (LAN). The centre covers the connection costs.

The centre has been in the vanguard of bringing pioneering AAC solutions to Brazil since 1997. Some of the software and tools it has used are:

- Mind Express: This powerful AAC tool provides customizable communication solutions, accessibility and environment control. It offers a full range of options and

features to support language accessibility through AAC resources and strategies such as SCORE, PODD, AlphaCore, Amego, Steps To Language, Gateway and SymChat, among others. It runs on Windows and should be multiplatform in the future.

- AsTeRICS Grid: This multiple-platform app uses symbol-based and text-based options to support communication. It is a cost-free solution.

- Predictable: Available for iOS, this AAC text-to-speech app incorporates predictive text and phrase banks to allow individuals to generate messages.

- Proloquo4Text: This iOS app focuses on text-based communication and has customizable features.

- TD Snap: This app uses both symbol-based and text-based options to support communication.

- CoughDrop: This cloud-based AAC app is accessible on multiple platforms, allowing for communication support across devices.

The selection of an AAC app depends on an individual's needs, preferences and specific requirements. The professionals involved — for example, teachers, speech and language therapists, occupational therapists — must explore and assess the various options to find the most suitable solution for each individual, taking into account their participation needs and tasks to be performed.

Assistiva's laboratory is equipped with various hardware, including different types of mice, keyboards, switches, touchscreens, tablets and computers. The centre provides a variety of recorded voice communicators, accessible furniture, inclined surfaces and wheelchairs with customizable postural adjustments. It also offers orthoses — to facilitate typing, painting, writing and using scissors — and various school supplies. The centre's collection of school supplies includes printed and laminated resources for AAC and materials that can enhance the accessibility of pedagogical tasks.

Teachers' ICT, AT and AI competencies and skills development

The centre has a core staff of six. Four actively use AT; the other two use simpler and more basic resources. All six employees incorporate ICT into their daily professional practice. However, levels of enthusiasm for using ICT vary among the students, families (caregivers) and other professionals. While the centre's team is proactive and enthusiastic about incorporating technology into its teaching practices and strategies, they recognize that some adults might be more reluctant than enthusiastic. The varied responses stem from differences in the levels of familiarity, comfort and previous interaction with ICT tools. To date, Assistiva has had no experience with AI. The centre's main emphasis is on the use of AT, with very limited use of augmented reality (AR) or AI.

ICT are part of daily life at Assistiva. They are used for learning, finding ideas and resources and understanding how the team can better serve persons with disabilities (through assessments and follow-up of AT implementation). The specialists teach students to use tools such as Word/Google Docs and PowerPoint/Google Presentations, which have accessibility tools included in them, to create digital notebooks and organize their assignments and presentations.

Digital teaching and learning materials (including games, applications, e-books, OER, websites, educational portals, videos, etc.) and ways of integrating ICT, AT and AI into the curriculum

The Assistiva staff received specific training on the use of AT and related topics during the past academic year. The centre remains proactive in seeking out and participating in relevant training opportunities, including conferences, courses and workshops, both within Brazil and internationally. This ongoing commitment to professional development ensures that the team remain well informed about the latest advancements in EdTech, allowing them to provide high-quality and up-to-date support for persons with disabilities.

The centre obtains digital content from a variety of platforms and resources, which reflects its commitment to providing diverse and accessible materials. Some of its key sources are ARASAAC, HelpKidzLearn, Monarch Reader (formerly Tar Heel Reader) and YouTube (for educational or other relevant videos). The staff are also familiar with other educational apps, such as the iPad applications ANTON and TinyTap.

The centre actively participates in content development, as there is not a significant amount of official content available from the government.

It creates in-house materials and adapts useful resources that staff find online to meet the specific needs of particular learners and fulfil the centre's goals of using and integrating AT.

Facilitators and challenges

Assistiva staff see multidisciplinary collaboration among diverse professionals, including educators, healthcare providers and AT specialists, as a major facilitator of the successful integration of ICT and AT. An inclusion-/participation-driven mindset that embraces a philosophy of recognizing the potential of every individual, irrespective of abilities, creates a conducive environment for the adoption of ICT and AT.

Ongoing training programmes targeted at educators and stakeholders ensure a continuous understanding of ICT and AT tools and their application in inclusive education, while tailoring ICT and AT solutions to the specific needs and abilities of students promotes a more personalized and effective learning experience.

Clear and supportive policies at both the institutional and governmental level encourage the systematic integration of ICT and AT into educational settings. Adhering to and promoting accessibility standards ensures that digital content and technologies are designed to cater to the needs of a diverse range of learners.

The centre places special emphasis on raising awareness of the benefits of ICT and AT in inclusive education among educators, parents (caregivers) and policy-makers to foster a positive attitude towards their implementation.

The major challenge experienced by the centre is guaranteeing adequate financial support for the procurement and maintenance of ICT and AT tools to sustain their implementation in educational institutions.

Partnering with technology providers and industry experts facilitates access to cutting-edge ICT and AT solutions and keeps educational institutions abreast of technological advancements. Continuous research into the impact of ICT and AT in inclusive education helps the centre refine how these tools are used in practice and sustain their effectiveness in supporting diverse learners.

The team often encounter language issues when they are selecting and using digital content, as much of it is available only in English. To address this challenge, Assistiva's experts adopt the following strategies:

- Using improved translation tools: These tools facilitate access to information and materials by providing good translations that the team can revise to make content accessible to users or other staff who are not proficient in English.

- Sharing translated materials: Once the material has been translated, the team share it with the participating community. This allows a wide range of people to benefit from the translated content.

- Employing online platforms: Some staff members have Instagram profiles and are dedicated to sharing relevant information about AT, educational inclusion and other pertinent topics — for example, *@alternativainclusiva*, *@fonomichelleborges* and *@to.daianne*. Their active participation on social media contributes to the dissemination of useful content and the promotion of awareness of issues related to disabilities and best practices in the field of inclusive education. It allows the centre's specialists to exchange knowledge and experiences with a broader community that is interested in the specified themes.

Case study

Assistiva operates on multiple fronts, providing direct assistance to persons with disabilities seeking AT-based solutions and offering consulting and training to professionals in the health and education fields. One of the centre's best practices is sharing the process of AT implementation; this strategy emphasizes the importance of multidisciplinary teamwork, which is a crucial but often challenging aspect

of the implementation process because of insufficient knowledge and proper training. Many professionals still operate within a deficit-oriented perspective that is deeply grounded in the medical and clinical models of disability.

The team is guided by the following overarching principles:

- Everyone, without exception, can learn.

- Acceptance and belonging are crucial for all.

- Presume there is potential and always adopt the least dangerous assumption.

- Inclusion is beneficial for everyone, not only persons with a disability.

Assistiva's AT implementation workflow comprises six steps:

1. Initial contact.

2. Pre-assessment.

3. Scheduling an initial meeting.

4. Initial assessment meeting to experiment with resources, interact with the student and their family or caregiver and provide initial guidance to all the families or caregivers and professionals involved.

5. Assessment report that includes the student's observed skills, recommended resources and strategies.

6. Implementation and follow-up involving family (caregiver) and professional empowerment, monitoring results and making adjustments in accordance with emerging needs in new contexts and activities in the student's daily life.

Assistiva's team conducts the whole assessment process. After the assessment, some, but not all, families or caregivers may want some support with the implementation process. Alternatively, they may follow up with their school team for this type of support. Some school teams reach out to Assistiva during or after this six-step process. At this point, the centre's team may meet with the school to help them understand the student's abilities, their potential ability to use AT successfully and how to seamlessly integrate AT into the student's school routine for maximum benefit to their ongoing academic development.

One of the references that the team uses during the assessment processes is the SETT framework by Joy Zabala. SETT stands for Student, Environment, Tasks and Tools. Taking the task(s) the student has to perform as the starting point, school teams use the SETT framework to help them consider the student's characteristics and abilities, assess the environment for barriers and accessibility facilitators, and identify which tools could be used for each target task.

Assistiva's approach has proven effective in supporting an inclusive educational environment and empowering not only persons with disabilities but also families (caregivers) and professionals to thrive.

Finally, it is essential to emphasize that the collaboration of all parties (i.e. family, caregivers, healthcare professionals and the school team) is intricately linked to the success of any effort to realize the right to education and promote academic development. This collaboration

fosters the development of a culture of inclusivity and commitment that leads to broader educational growth.

The centre used the process described above for a student named Alice Rosa, whose mother is active on Instagram. When Alice Rosa was first introduced to Assistiva in 2020, her ability to communicate was very restricted. She improved her communication skills through access to computers, online books and stories and other relevant digital content. The centre guided her family on how to better support their daughter's literacy development, and Alice made significant progress between 2020 and 2022. She not only became capable of communicating her needs effectively but also achieved consistent conventional literacy. Now Alice keeps up with her peers and attends a mainstream school (and enjoys it very much). Her story serves as a compelling example of how successful Assistiva's approach in combination with family (caregiver) engagement can be. Alice's condition presents many challenges, and she requires a high level of support. Assistiva worked with Alice, her family and her school team online (during the follow-up phase), and her teachers attended the centre's courses and developed an awareness of the characteristics of effective inclusive education and the skills required to support it.

The Hong Kong Special Administrative Region (HKSAR) of the People's Republic of China

Bridge AI

About the organization

Bridge Academy is a Hong Kong Special Administrative Region (HKSAR) Education Development Bureau approved institute. It has been providing early intervention and individualized programmes for children with learning difficulties since 2014. Bridge AI, an affiliated company of Bridge Academy, uses AI, big data and video and audio communication systems to enhance educational experiences and support the development of children who have SEN. The team is committed to serving children aged 18 months and older with tailored programmes in English, Cantonese or Mandarin.

Bridge Academy and Bridge AI currently provide services for more than 500 male and female students aged 2–8. Most of the children have had a definite or possible diagnosis of ASD, ADHD, global developmental delay, language difficulties/delays or behavioural issues.

Bridge AI uses an integrated intelligent intervention learning system (3i-learning system) that can be tailored to meet the individual needs of students with SEN in all their therapy and training sessions. The AI system generates Individualized Training Plans (ITPs) based on students' performances and scores from previous sessions, systematically stores and analyzes students' learning performances and progress, tracks and analyzes students' emotional state and captures environmental data (e.g. temperature, light intensity, volume of therapist's voice and CO_2 intensity) during training sessions. The 3i-learning system not only provides ITPs for students who have SEN but also helps therapists and teachers prepare more effectively for interactions with the students and helps supervisors closely monitor students' progress systematically and efficiently.

The organization's primary services include one-on-one Applied Behavioural Analysis (ABA) training, observation and screening for children with SEN, social group training, training and support groups for parents (caregivers), and training for teachers and other professionals on-site, including a practicum programme for early childhood education trainee teachers.

Bridge AI's beneficiaries are students with SEN and their parents (caregivers), teachers and other professionals (e.g. speech therapists, occupational therapists, physiotherapists, social workers, educational psychologists). Its staff include thirty behavioural therapists.

Bridge AI is sponsored by the Partnership Research Programme (PRP) of the Innovation and Technology Fund of the Government of HKSAR.

ICT, AT and AI in education and rehabilitation

The centre applies technology in several ways. For example:

- Personalized support for students with SEN: The use of technology, including the 3i-learning system, is designed to provide individualized support for students with SEN. By tailoring therapy and training

sessions to meet individual needs, Bridge AI aims to address each student's unique challenges and learning requirements, thus ensuring equitable access to education.

- Proactive intervention and emotional well-being: By using emotion analytic technology, Bridge AI aims to detect and analyze students' emotional state. The objective is to identify potential emotional breakdowns in advance and intervene proactively. This approach helps maintain a positive and inclusive learning environment, ensuring that students' emotional well-being is supported, regardless of their individual needs.

- Efficient and effective teaching: The integration of technology in the form of the 3i-learning system aims to increase therapists' and teachers' efficiency and effectiveness. The objective is to streamline the teaching process by generating ITPs, analyzing learning performances and systematically tracking progress. Educators can then cater more effectively and appropriately to the diverse needs of students with SEN, thus ensuring equitable access to high-quality education.

- Systematic monitoring and progress tracking: The application of monitoring and progress

tracking technology enables supervisors to closely monitor students' progress in a systematic and efficient manner. By capturing and analyzing data related to learning performances, emotional state and environmental factors, therapists and teachers can gain insights into students' development and make informed decisions about interventions and support. This systematic monitoring enhances equity by ensuring that students' progress is closely tracked, regardless of their individual circumstances.

Overall, the objectives of technology use at Bridge AI align with promoting equity and inclusion by providing personalized support, addressing emotional well-being, increasing teaching efficiency and enabling systematic monitoring of students' progress. By leveraging technology, the aim is to create an inclusive educational environment in which all students, including those with SEN, have equal opportunities to thrive and succeed.

IT infrastructure (internet connectivity, main types of hardware and software)

Bridge AI uses fibre internet broadband in its office building and 5G wireless internet for services it provides to other NGOs and in parents' (caregivers') homes. The rooms at Bridge AI have standard computers, tablets, smart wristbands and environmental sensors, all of which are used daily.

Bridge AI developed, and uses, its own 3i-learning system and emotion analysis system. Both systems use Bridge AI's own software and hardware technology.

The 3i-learning system, smart wristband to detect emotion and environmental sensor are the main ICT, AT and AI used at Bridge AI. Overall, the 3i-learning system not only benefits students with SEN by providing them with individualized support but also streamlines the workflow for therapists, teachers and supervisors. By making session preparation more efficient and enabling the systematic monitoring of students' progress, the system empowers these professionals to deliver high-quality interventions and closely track students' development. The monitoring technology uses AI to help create ITPs based on students' performances and progress from previous sessions.

Teachers' ICT, AT and AI competencies and skills development

- **in relation to the educators of the centre**

All in-house therapists at Bridge AI undergo a two-week training session that includes training in therapeutic skills and understanding and using the centre's systems.

Volunteers and other professionals can undertake forty-two hours' training to become a Chartered Special Needs Tutor (CSNT) and use the 3i-system to train students with SEN through local NGOs with support and supervision from Bridge AI.

There has been a notable increase in teachers' and professionals' receptiveness to AI and its integration into their everyday teaching practices. The availability of increased funding and resources has also provided start-ups with valuable opportunities to further enhance their systems and develop more up-to-date solutions.

Teachers are enthusiastic about using ICT and AI. They are very motivated and very confident using it.

- **in relation to the educators of mainstream schools/universities**

Bridge AI provides professional training for teachers and other professionals on-site through its practicum programme for early childhood education teacher training.

Digital teaching and learning materials (including games, applications, e-books, OER, websites, educational portals, videos, etc.) and ways of integrating ICT, AT and AI into the curriculum

Every aspect of Bridge AI's teaching and learning activities is supported by ICT, AT and AI, especially teaching styles, learning activities, skills development, communication and networking. Some of these aspects are discussed in more detail below:

- Individualized training and activities: The ability of the 3i-learning system to provide individualized training tasks and activities based on students' strengths, weaknesses and learning progress is highly beneficial. This personalized approach helps maximize students' progress by targeting specific areas for improvement and tailoring the learning experience to reflect and meet their unique needs.

- Teacher support and professional development: The AI system's recommendations for teachers regarding students' learning objectives and planning can be valuable for their professional growth. By analyzing data and providing insights, the system helps teachers gain a deeper understanding of students' learning needs and adjust

their teaching strategies accordingly. This feedback loop supports ongoing professional development and enhances the effectiveness of teaching practices.

- Video playback and data analysis: The recording of sessions and inclusion of alerts and tags enables teachers to review videos and analyze data for further reflection. This allows them to assess their therapeutic skills, clinical judgement and professional development. By observing their teaching methods and interactions with students, teachers can identify areas of improvement and make informed adjustments to their practices.

- Effective communication and collaboration: Teachers and parents (caregivers) can leave comments or feedback in the learning system. This feature promotes effective communication and information exchange. It enhances collaboration between teachers

and parents (caregivers), allowing them to share insights, discuss student progress and provide valuable input for ongoing support and intervention.

Facilitators and challenges

Several facilitators and challenges have been identified:

- Accessible infrastructure: Ensuring that educational institutions have the necessary ICT infrastructure, including reliable internet connectivity, devices and AT, is crucial. This infrastructure should be accessible and compatible with a range of assistive devices and software to support the needs of students who have disabilities.

- Professional development: Comprehensive professional development programmes for educators are essential. Teachers should receive training on how to effectively integrate ICT, AT and AI in inclusive classrooms,

adapt instructional strategies and support the diverse needs of students. Ongoing professional development helps teachers build their confidence and competence in using technology for inclusive education.

- Policy and funding support: Supportive policies and adequate funding at both the institutional and governmental level are crucial for promoting the use of ICT, AT and AI in inclusive education. Policies should address accessibility, procurement of AT and the integration of technology in inclusive classrooms. When they have adequate funding, institutions can acquire the necessary technologies and provide ongoing support and maintenance.

- UDL: Implementing UDL principles guides the development and use of ICT, AT and AI tools in inclusive education. UDL promotes the creation of flexible learning environments that accommodate diverse learning styles, abilities and preferences. Technology should be designed with multiple means of representation, engagement and expression to cater to individual learners' needs.

- Collaboration and partnerships: Collaboration among stakeholders, including teachers, students, families (caregivers) and technology developers, is crucial. Partnerships with technology providers, disability organizations and research institutions foster the development of inclusive technologies, promote knowledge exchange and ensure the alignment of technology with the needs of students who have disabilities.

- Research and evidence-based practices: Conducting research and evaluation studies on the use of ICT, AT and AI in inclusive education helps identify best practices, measure outcomes and inform decision-making. Evidence-based practices provide a foundation for the effective implementation and continuous improvement of technology integration in inclusive classrooms.

Impact of ICT, AT and AI integration in inclusive education/special needs education

ICT, AT and AI can provide accessibility features and tools that cater to diverse learning needs. For students who have disabilities or SEN, AT such as screen readers, speech-to-text software and adaptive devices can help level the educational playing field by enabling them to access educational content and participate in classroom activities. This in turn ensures that all students, regardless of their abilities, have equal opportunities to engage in quality education.

The use of ICT, AT and AI allows for personalized learning experiences. Adaptive learning platforms and intelligent tutoring systems can analyze student performance data and provide tailored instructional materials and feedback. This individualized approach addresses students' unique strengths, weaknesses and learning styles and promotes inclusive education by accommodating diverse needs and maximizing each student's potential.

ICT facilitates collaboration and communication among students, teachers and parents (caregivers). Online platforms, video-conferencing tools and digital communication channels enable inclusive participation and engagement, regardless of geographical or physical barriers. This enhanced access fosters a sense of belonging, encourages peer interaction and promotes inclusive classroom environments in which diverse perspectives are valued and respected.

ICT, AT and AI expand access to a wide range of educational resources. Online libraries, digital textbooks and educational apps can provide a wealth of information and learning materials, ensuring that students, regardless of their location or socio-economic background, have access to quality educational content. This reduces the disparity in resource availability and promotes equity in education.

AI-powered analytics and data systems can provide insights into student progress, learning patterns and areas in need of improvement. Educators can leverage this information to make data-driven decisions and implement targeted interventions, thus ensuring that no student is left behind. This data-driven approach enhances equity by identifying and addressing learning gaps promptly and effectively.

The integration of ICT, AT and AI in inclusive education necessitates ongoing teacher professional development. Training programmes and workshops can equip teachers with the skills and knowledge they need to use these technologies effectively. When teachers' digital literacy and pedagogical practices improve, inclusive education can be better supported, leading to improved equity and quality in the classroom.

Case study

In 2019, Bridge AI used a combination of modern technology and local human resources to make accessible and affordable behavioural therapy available to more families (caregivers) with children who have SEN. It trains parents, caregivers and other interested individuals to be CSNTs. CSNTs conduct behavioural therapy sessions with the aid of the 3i-learning system, developed by Bridge AI to be used with

modern technologies such as AI and Internet of Things (IoT) to help CSNTs conduct a high-quality behavioural therapy session. The 3i-learning system received support from the Hong Kong Applied Science and Technology Research Institute (ASTRI), an organization founded by the HKSAR government in 2000 to enhance the competitiveness of Hong Kong through applied research. Bridge AI's continuing partnership with ASTRI has allowed it to act on comments and suggestions from users to improve the 3i-learning system and integrate AI and IoT technologies into it.

The 3i-learning system is a distance-learning system to help parents (caregivers) and teachers conduct ABA therapy with children who have SEN at home and school. The system contains more than 10,000 learning tasks to meet the needs of children who have SEN and generates ITPs for parents' (caregivers') and teachers' reference. The tasks focus on a variety of areas, including communication, social skills, fine and gross motor skills, academic skills and development, behavioural development and self-help skills. All the learning tasks come with a detailed description and video demonstration, so parents (caregivers) and teachers have the best guidance possible in how to use them. The 3i-learning system also tracks the performance of each child on every single learning task. Bridge AI uses the data collected in the system to monitor the children's learning progress, thus ensuring the quality and progress of therapy.

In 2022 and 2023, Bridge AI trained teachers and staff from multiple special schools and NGOs to become CSNTs. The behavioural therapy sessions conducted by the CSNTs have had remarkable results for students who have SEN. For example, in the case of Caritas Resurrection Schools (CRS) and Rotary Club of Hong Kong Island West Hong Chi Morning Hope School,

87 per cent and 83 per cent, respectively, of the students who attended behavioural therapy sessions have demonstrated significant learning progress. To date, more than 500 students with SEN have attended behavioural therapy sessions conducted through the 3i-learning system, with an encouraging majority (over 80 per cent) of them achieving significant learning results through mastering the training tasks.

Bridge AI has won multiple prizes over the past few years. Its latest achievement was winning a Silver Award at Geneva Inventions 2024 in the Teaching Methods and Materials category. It was also the HK Final Champion, the winner of the Timely Impact Award and the winner of the Youth Co:Lab HKSAR Award at the Hong Kong Social Enterprise Challenge 2021–22. In addition, the centre won JUMPSTARTER IdeaPOP! 2021 and the Community Outreach Silver Award Trophy, awarded by eLearning Forum Asia. Bridge AI is humbled and honoured that its work has been recognized in this way, and these awards will help the team try even harder to extend their impact on the community. The organization has been invited to talk about its work on numerous local and international forums, including the eLearning Forum Asia and IEEE Learning with MOOCs 2020. Its work has also been covered by various media outlets, and the team hopes the publicity will help them reach more families (caregivers) who could benefit from the 3i-learning system.

Beit Issie Shapiro (BIS)

Beit Issie Shapiro
Changing the lives of people with disabilities
On the Willie & Celia Trump Campus

About the organization

Beit Issie Shapiro (BIS) is an Israeli organization that offers state-of-the-art therapies and services for persons with disabilities. It focuses on driving social change through service development, changes in societal attitudes and knowledge-sharing, both nationally and internationally. Its mission is to secure the rights of persons with disabilities and improve their quality of life.

Beit Issie Shapiro is the leading developer and provider of innovative therapies and state-of-the-art services for children and adults across the entire range of disabilities in Israel. Over half a million people benefit from its work every year.

The organization promotes social change through a three-pronged approach: developing and providing cutting-edge services, changing attitudes in society and advocating for better legislation, and sharing knowledge throughout Israel, as well as internationally, through research, consultations and training. Beit Issie Shapiro has four decades of expertise in scaling up its impactful solutions, which are developed, researched and validated on-site. The organization has therefore been able to promote systemic change in the quality of life of persons with disabilities both in Israel and internationally. BIS staff work with all sectors in Israel — Jewish, Arab and others.

The centre's vision is that every person with a disability will enjoy full and equal rights, and will be included and active in community life. Its mission is to pioneer Israeli innovation to secure the full rights of persons with disabilities and improve their quality of life.

Beit Issie Shapiro has had Special Consultative Status with the United Nations Economic and Social Council (ECOSOC) since 2012. It is a leading organization in the field of disabilities in Israel, providing a variety of services to several Israeli and global populations. Its educational programmes are just one of the services it provides. It also has a training institute for professionals and families (caregivers) throughout Israel and the world; provides direct services such as hydrotherapy, dental services and emotional therapies to the community; and has a technology development centre and a research and policy departments.

BIS is funded through government and private sources and provides special education for male and female students with disabilities who live in the cities closest to its facility in Ra'anana and its Sindian Center in Kalansua. It makes a direct impact by providing services such as occupational therapy, psychological therapy, speech therapy, hydrotherapy, dental services and emotional therapies to families (caregivers) from around the country. Indirectly, the work at Beit Issie Shapiro impacts children and adults with disabilities and their families (caregivers) across the country and throughout the world via its training programmes and resource-sharing.

The two centres have a total of 114 students: 40 are in elementary school (aged 6–12), 19 are in kindergarten (aged 4–6) and 55 are

in an early-intervention centre (aged 6 months – 3 years). Beit Issie Shapiro works with children who have a broad spectrum of disabilities and conditions, including developmental delays, mild to moderate intellectual disabilities and complex motor disabilities — for example, cerebral palsy, autism, Rett syndrome, Down syndrome, metabolic disorders and a range of rare syndromes.

ICT, AT and AI in education and rehabilitation

In general, technology is used to support the professional development of teachers and ensure that students benefit from innovative technologies used for educational purposes. At the family (caregiver) counselling centre, the specialists use Zoom and other online meeting tools for online counselling sessions. iPads are normally used for special education and child development sessions. Staff at the technology-based rehabilitation unit use games to develop the children's physical strength and body movements.

ICT are used regularly at almost all BIS service units. In addition, the organization has participated in some international projects that integrated ICT into special education programmes.

In BIS educational programmes, BIS staff use technology to help the students participate

as fully as possible in their daily lives. The children use personal devices to communicate with staff and other children. At the pedagogical level, technology is used to provide an accessible learning environment, convey information and give students a way to express what they know. It is also used to promote engagement in play and leisure activities.

Beit Issie Shapiro integrates ICT on an ongoing basis. Technology development and implementation are funded through philanthropic sources.

The direct beneficiaries of BIS's technology initiatives are the students and staff in their educational programmes, children (aged 6 months – 12 years) with complex disabilities, special education teachers, speech therapists, occupational therapists and educational assistants. In addition, BIS provides training through its technology centre and learning institute in the use of technology to promote participation and inclusion among a variety of professionals throughout the world.

To facilitate the adequate implementation of technology at its school, BIS has stakeholders at several levels. The technology centre is staffed by two occupational therapists and two speech therapists. They are responsible for the implementation of technology in the organization and work on technology development, connecting

with partners in high-tech industries and understanding the needs on the ground. In each of their three educational programmes there is a technical team, comprising a special education teacher, an occupational therapist and a speech therapist. These professionals are all responsible for the implementation of technology to promote students' participation in the educational environment from a multidisciplinary perspective. They are in close communication with the technology centre. At an individual level, the stakeholders are the educational and therapeutic staff in each classroom who are trained by the technical teams to implement the specific technology that each child needs.

IT infrastructure (internet connectivity, main types of hardware and software)

A fibre optic internet connection, paid for by the centre, and wireless internet access (via a LAN) are available in all classrooms. Teachers working at BIS have the equipment they need to support students who have SEN. Every teacher has a laptop.

Every classroom has an interactive touchscreen, a computer, two iPads and communication and learning software. Whatever the teacher displays on the interactive touchscreen or iPad can also be seen on the students' devices. The devices are connected to each another through the school's Wi-Fi network. The initiative is funded through philanthropy, but the state provides students with their own personal devices. Beit Issie Shapiro also purchases subscriptions to relevant and appropriate websites to support the creation of customized learning activities, and has purchased other assistive and supportive devices to improve customizations to meet each student's needs. The integration of ICT and AT is an integral part of the regular school day. Staff are in the process of exploring AI tools

and how they can be used in special education, particularly to enhance student motivation in academic learning activities.

Teachers' ICT, AT and AI competencies and skills development

- **in relation to the educators of the centre**

Teachers are very enthusiastic about using ICT and AI and have high levels of motivation. They are very confident about using ICT and AT in inclusive education. Almost all the teachers and specialists actively use ICT every day in their work and in communication with students and their parents (caregivers).

Beit Issie Shapiro hosts international and national seminars and conferences under the auspices of the Trump International Institute for Continuing Education in Developmental Disabilities. These events are a unique opportunity for academic, medical and community professionals, researchers, policy-makers, service providers and persons with disabilities and their family members (caregivers) to meet with colleagues and other families (caregivers) from around the world and learn about the latest knowledge, research and practices in the field.

BIS prides itself on being on the cutting edge of treatment and services for persons with disabilities. In order to develop and maintain high professional standards, it constantly develops and tests new methodologies and approaches to provide the best services and maintain best practices.

- **in relation to the educators of mainstream schools/universities**

In 1993, the Research and Evaluation Department was established with the objective of developing model programmes that have relevance to the field of education for persons with disabilities

טכנולוגיה ואפליקציות עבור אנשים עם מוגבלויות

as a whole. The role of this department is especially important as Beit Issie Shapiro provides continuing education opportunities in this field. Managed by Dr Dana Roth, the department engages in research conducted by professionals both within the organization and from outside it, and in cooperation with academic institutions in Israel and other countries. The research findings are presented at national and international conferences and published in national and international professional journals.

Digital teaching and learning materials (including games, applications, e-books, OER, websites, educational portals, videos, etc.) and ways of integrating ICT, AT and AI into the curriculum

BIS teachers use a variety of digital content including communication software, educational websites, open-platform websites that allow the creation of customized learning activities, websites that provide adaptive educational and leisure games and educational, communication and play apps. Digital content is funded through philanthropic sources. Some resources are purchased via a one-time licence fee, some are website subscriptions, some are apps that are purchased and some are resources that BIS has developed — for example, IssieBoard, IssieDice, IssieDocs and IssieSign.

When choosing content, the teachers consider a number of factors. If the content will be used by staff, they consider the price, availability of the content across various devices and customizabili-

ty of the content. If the content will be used by students, they consider the price, age-appropriateness, design (visual presentation, customizability, how intuitive it is to use) and whether it meets the need for which it is intended.

The technology centre staff and technology team of each programme decide together what kind of technology should be used in the classrooms. Students receive communication devices from the state based on professional assessments and recommendations. BIS staff then choose technology for the school or classrooms based on what tools have been identified as best for pedagogical purposes and integrate well with what the students are using. The technology centre staff and tech teams include occupational therapists who are trained to consider ergonomics as part of the implementation process.

The technology centre has a blog in which it promotes recommended apps and posts about how to use the apps that BIS staff have developed and integrate them into the learning environment. The staff regularly hold training sessions for professionals to teach them how to use digital content in the learning environment.

Facilitators and challenges

Combined funding from government and private sources is seen as a facilitator to enable and support the centre's ongoing and emerging activities.

However, language is a challenge, as most resources are in English. For this reason, BIS staff look for open-platform apps and websites that allow the centre to create its own useful content. They also use apps in English and translate for students, if and when necessary.

Impact of ICT, AT and AI integration in inclusive education/special needs education

The use of technology in education contributes to easier, faster, more effective and enduring learning among students and improves job satisfaction for teachers.

Teachers are motivated by the technology because it offers many more options than typical traditional teaching methods and offers multiple benefits simultaneously. In addition, it is interactive and can be personalized. Some important benefits of technology-based sessions are that they provide feedback/reports to both the therapist and the person who is receiving the therapy. Repetitive boring exercises become easy and fun with technology, and the duration and speed of games can be adjusted according to each person's needs.

Furthermore, virtual reality (VR) applications can create an artificial environment that reflects real-world situations and experiences. This feature allows children with disabilities to experience the real world in safety.

Case study

One of BIS's focus areas is providing support and educational services for students who have SEN. The teachers support the students' reading and writing progress by using a variety of techniques and tools, including various AT. One particularly popular tool that teachers use is a symbol-based speech-generating communication software called GRID3 (also GRID for iPad), typically used by children who are non-speaking. Instead of using the app only to create communication boards, the teachers are also using it to create accessible texts, so that students can press the symbols and hear the text. The student sees the symbol and the written word as they hear it, strengthening comprehension and whole-word recognition. The teachers use unique templates with the same app to create expressive activities.

Using these unique tools and methods, children develop their understanding of how written text is presented on a page, learning that text goes from right to left (Hebrew), and top to bottom. This understanding will allow them to participate in reading comprehension activities independently and also to participate in expressive activities. Sentence-building templates that allow students to choose words from pre-determined categories strengthen students' directionality (to read and write in a continuous line from start to finish) and teach standard sentence structures — that is, how to write a sentence using a variety of parts of speech including adjectives, prepositions and conjunctions. Such technologies allow students to participate in classroom reading and writing activities and acquire complementary skills.

Information and Training Centre for Persons with Disabilities, Digital Innovation Academy

About the organization

The Digital Innovation Academy, an information and training resource centre for persons with disabilities, began its work on 22 October 2015. The centre was created with the support of the International Telecommunication Union (ITU) within the framework of the regional initiative 'Providing Access to Telecommunication/ICT Services for Persons with Disabilities'.

The centre's main goal is to ensure that persons with disabilities are fully integrated into all areas of university activities and have unhindered access to the services they need.

The centre operates at a national level, with a mandate to oversee educational and training programmes related to ICT accessibility; design and deliver courses, workshops and educational resources that cater to individuals with disabilities; and ensure that their facilities and curricula are appropriately adapted to be inclusive and accessible.

The centre puts a premium on developing collaborations with local educational institutions, disability advocacy groups and other relevant organizations to enhance the impact of its work; engaging with other international organizations, governments and NGOs to create a support network and promote global inclusivity in ICT services; and facilitating international collaboration and knowledge exchange. Its focused commitments also comprise providing expertise and establishing global standards and best practices in ensuring access to telecommunications/ICT services for persons with disabilities.

The Digital Innovation Academy was created to educate learners with disabilities and SEN separately from students in the mainstream education setting. However, the pedagogical staff opted to merge the classes and make them inclusive.

The centre's primary beneficiaries are male and female children and adolescents who have limited mobility or hearing impairments. In total, since 2015, more than 160 children with disabilities have been trained on the centre's premises with the support of its staff. The centre employs five specialists: four teachers and one IT assistant.

The academy is a private non-profit organization. Financial support comes from various sources, including funds earned from training sessions, funding to support research projects, donations and loans. The centre also attracts funding from the local private sector.

ICT, AT and AI in education and rehabilitation

The Digital Innovation Academy's goals for using technology to achieve equity and inclusion are multifaceted, encompassing the provision of accessible and inclusive educational resources that meet a variety of learning needs and the use of AT to create a welcoming environment for people with different abilities.

Technology is used to facilitate skill development and training for people with different backgrounds and capacities. These training

strategies include online courses, virtual learning environments and adaptive software designed to enhance learning and empower students to enter a variety of careers. The use of virtual collaboration platforms and communication tools enables communication with a wider audience, no matter how remote their location, thus creating an inclusive learning environment that transcends physical boundaries.

The centre's space and classrooms are organized specifically to facilitate the integration of ICT, AT and AI.

IT infrastructure (internet connectivity, main types of hardware and software)

The centre uses a fibre optic internet connection. The information and training centre has sixteen workstations equipped with standard and specialized ICT tools, adapted in accordance with the needs of various categories of users:

- Six workstations for users who have visual disabilities (three for students who are blind and three for students who have impaired vision). The workstations are designed specifically for people with visual impairments and use technology to improve visibility and accommodate varying levels of visual acuity.

- Six workstations for users who have disorders of the musculoskeletal system (two for users who have muscular atrophy and myopathy, two for users who have hand-based hyperkinetic movement disorders and two for users who have no upper limbs).

- Two workstations for users with hearing impairments.

- Two workstations for users with speech impairments.

Teachers' ICT, AT and AI competencies and skills development

- **in relation to the educators of the centre**

The Digital Innovation Academy strives to provide reliable daily support to teaching staff to help them introduce innovative and experimental tools and approaches into their teaching practice. It provides training sessions on using ICT, AT and AI in inclusive education at least once every two years, ensuring a continuous focus on professional development.

About 60 per cent of the centre's teachers use advanced ICT and AI or VR/AR for educational purposes. The teachers received specialist training in the use of ICT, AT and AI to teach students who have disabilities and SEN during the previous school year. The training was carried out within the framework of the 'Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)' initiative.

- **in relation to the educators of mainstream schools/universities**

The Digital Innovation Academy is developing recommendations for teaching children who have disabilities and organizes relevant training courses for teachers. It has provided training for teachers of children with SEN twice since 2020, and trained twenty teachers for children with disabilities.

Digital teaching and learning materials (including games, applications, e-books, OER, websites, educational portals, videos, etc.) and ways of integrating ICT, AT and AI into the curriculum

The Digital Innovation Academy develops its own content and uses resources that are freely available on the internet. Selecting digital content is a rigorous process based on a set of selection criteria to ensure that the content aligns with the centre's educational and inclusion goals.

The centre uses the following resources:

- Open access online resources, including educational websites, virtual libraries and interactive simulations that provide additional learning materials.

- Digital versions of textbooks, literature and other written materials that can be accessed on electronic devices.

- Open educational resources (OER).

- Multimedia presentations.

- Online tools for administering tests, quizzes and assessments.

- Zoom for distance learning.

- Mobile devices for accessing educational materials.

The centre frequently organizes collaborative projects that enable students to work with their peers, participate in virtual discussions and participate in group work using digital collaboration tools outside of the physical classroom.

The centre prioritizes accessibility across devices. For this reason, it chooses AT that will make digital content and resources accessible across devices, allowing students to seamlessly continue their learning outside the centre.

Facilitators and challenges

The Digital Innovation Academy's objectives of using technology to promote equity and inclusion are multifaceted. Primarily, it aims to provide accessible and inclusive educational resources that leverage technology to accommodate diverse learning needs. By incorporating AT, the team strives to create an environment in which individuals with different abilities can engage fully in the learning process.

Moreover, it uses technology to facilitate skill development and professional training for students with diverse backgrounds and abilities. This training draws on online courses, virtual learning environments and adaptive software designed to enhance learning experiences and empower students to pursue various professions.

In alignment with the principles of equity and inclusion, the centre leverages technology not only to address existing barriers but also to foster a supportive community. Virtual collaboration platforms and communication tools enable the team to connect with a broader audience, including students in remote locations, thus fostering an inclusive learning environment that transcends physical boundaries.

Ultimately, the centre's technology objectives are grounded in a commitment to provide equal opportunities, promote accessibility and foster an inclusive educational experience for all individuals, regardless of their abilities or backgrounds.

The centre's robust technological infrastructure, which includes high-speed internet, accessible devices and AT, ensures equitable access for all students. Furthermore, the integration of adaptive technologies and AI tools that can personalize learning experiences makes it possible to provide tailored content and support based on individual student needs. Collaboration with parents, caregivers and other stakeholders ensures a holistic and supportive approach to inclusive education that extends beyond the classroom.

The primary challenge arises from the absence of government support, both financially and in terms of infrastructure. The centre lacks funding for teacher training and the adoption of new technologies, making it difficult to keep pace

with emerging trends and effectively integrate new technologies into the children's learning experiences. The lack of financial support also means that recruiting new teachers and staff to work with students is not feasible.

A related challenge is that learners with disabilities or SEN are not always able to commute to the centre, leading their parents (caregivers) and guardians to request transportation services. However, a lack of funding means this option is not feasible.

Overall, there is a noticeable lack of financial support, and teachers primarily work for the benefit of the children, driven by their own enthusiasm.

Impact of ICT, AT and AI integration in inclusive education/special needs education

ICT is used both inside and outside the Digital Innovation Academy and its classrooms to create a comprehensive and inclusive learning environment. The centre leverages ICT strategically to uphold the principle of equal opportunities for all students. ICT helps break down traditional barriers and ensure that every student, regardless of abilities, has access to a quality education.

The use of ICT, AT and AI in inclusive education has been associated with psychological benefits, including increased student engagement, improved self-esteem, enhanced motivation and a sense of empowerment among learners with diverse abilities.

The centre prioritizes data privacy. The staff adhere to stringent data protection policies and practices to ensure confidentiality and protect sensitive information about the students.

The integration of technology at the centre has brought about notable changes in interactions among various stakeholders, and has helped break down traditional barriers, thus ensuring that every student, regardless of abilities, has access to a quality education.

The organization of the centre's workstations reflects the team's commitment to inclusivity, ensuring that individuals with diverse abilities can access educational resources and participate fully in the learning experience. The arrangement takes into account specific needs related to visual, motor and auditory impairments to provide a supportive and adaptive environment. Additionally, the centre continuously explores and integrates new technologies, including AI, to further enhance the accessibility and effectiveness of its educational programmes.

Case study

The Digital Innovation Academy has achieved notable outcomes, particularly in promoting inclusion and addressing the specific needs of both male and female learners with disabilities. Several alumni have successfully secured employment and enrolled in college as a result of the centre's efforts.

In June 2019, the centre actively participated in the LG Electronics Global IT Challenge for Youth with Disabilities (GITC). Four participants from the centre not only successfully advanced to the finals of the competition, which took place in November 2019 in Korea, but also won prizes. This success not only reflects the participants' individual achievements but also highlights the centre's meaningful provision of inclusive educational opportunities that fostered the talents of male and female learners with disabilities. In addition, three of the centre's students with disabilities participated in the International IT Competition for Students with SEN in South Korea.

Rodney House Specialist Support School

About the organization

Rodney House Specialist Support School is a welcoming community that helps all children reach their full potential and aims to provide a safe, caring environment in which all achievements are valued and celebrated. It provides school places for male and female children with an Education, Health and Care (EHC) plan that includes a Specialist Support designation. It also provides a citywide outreach service that supports early-years children and their families (caregivers), and offers training and assistance to daycare providers and school nursery teams. The school is a generic special education school that provides education for children aged 4–11 who have ASD, profound and multiple learning difficulties and severe learning difficulties. The places are commissioned by local authorities.

The school's vision is to create and maintain a safe learning environment in which all children and adults feel safe, secure and valued and know they will be listened to and taken seriously. Rodney House is committed to embodying the principles outlined in *Working Together to Safeguard Children 2021* and implements policies, practices and procedures that safeguard the emotional and physical well-being of children, youth and staff.

Children at the centre receive expert support through speech and language therapy, occupational therapy, music therapy, play therapy and sports. The learners also participate in activities related to the development of life skills (e.g. the ability to log in and use a computer, type on a computer, use the internet safely, use switches for communication aids) and digital photography.

The school has eight classes and can accommodate a total of forty children. Each class has one teacher and two assistants. The centre has a seven-member senior leadership team, comprising one head teacher, one deputy head teacher, two assistant head teachers, one teacher, one Rodney House Outreach Service Early Years (RHOSEY) manager and one business manager. It also has a school council that works to help the children recognize their rights of empowerment and ability to make a change, develop confidence and assertiveness, take responsibility, make their voice heard and learn about democracy.

The Foundation is funded by fixed governmental financial support and individual donations.

ICT, AT and AI in education and rehabilitation

In general, the aim of using technology is to support the students' development and ensure that they benefit from innovative technologies for educational purposes.

IT infrastructure (internet connectivity, main types of hardware and software)

The school uses a fibre optic internet connection, which it pays for itself. Wireless internet access is available in all classrooms through a LAN.

The staff have a range of technical equipment, including iPads and computers. Every teacher has a laptop.

The school's IT team provides technical support and maintenance services. The classrooms are equipped with interactive whiteboards in each class and there is a designated room where the staff and children can use the QTrobot.
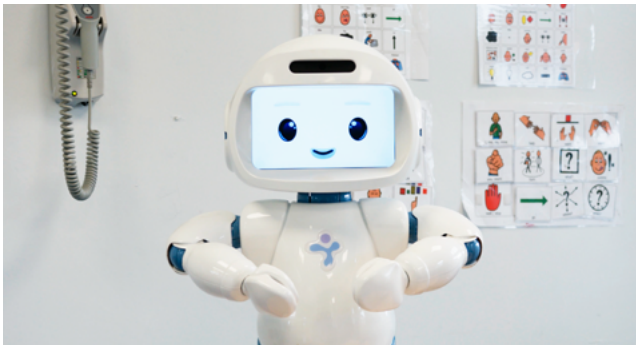
Rodney House staff use a variety of inclusive hardware and software, including AAC devices, switches, various apps, HelpKidzLearn, BBOTS and QTrobots.

Teachers' ICT, AT and AI competencies and skills development

Teachers are mostly neutral about the use of ICT and AI. While they are somewhat confident about using technological solutions, they do not show particular enthusiasm for them and use them more as simply part of their daily routine. Nonetheless, guidelines on remote teaching are in place for teachers.

Digital teaching and learning materials (including games, applications, e-books, OER, websites, educational portals, videos, etc.) and ways of integrating ICT, AT and AI into the curriculum

Rodney House teachers have access to Microsoft and Google products. They use content from educational websites and portals, entertainment applications, YouTube, TikTok, etc., that

is considered secure, rewarding and beneficial for pupils.

Teaching, learning and skill development activities are integrated into the current curriculum. All specialists at the school use technology to create instructional videos for students who are not in school, play the recorded videos, conduct live lessons, organize virtual consultations for parents (caregivers) and staff, deliver the school curriculum and support the students' health, well-being and motivation.

Facilitators and challenges

The centre did not identify any current facilitators, but highlighted the following challenges:

- Financial issues.

- Insufficient internet connection and/or digital devices.

- Inadequate competency in the use of ICT and AI among teachers.

- Limited accessibility of digital tools and platforms/low level of adaptation.

- Shortage of accessible digital learning materials.

- Lack of technical and administrative support at the centre.

- Lack of networking and experience exchange among teachers.

Impact of ICT, AT and AI integration in inclusive education/special needs education

The use of technology in education contributes to easier, faster, more effective and enduring learning among students and improves job satisfaction for teachers.
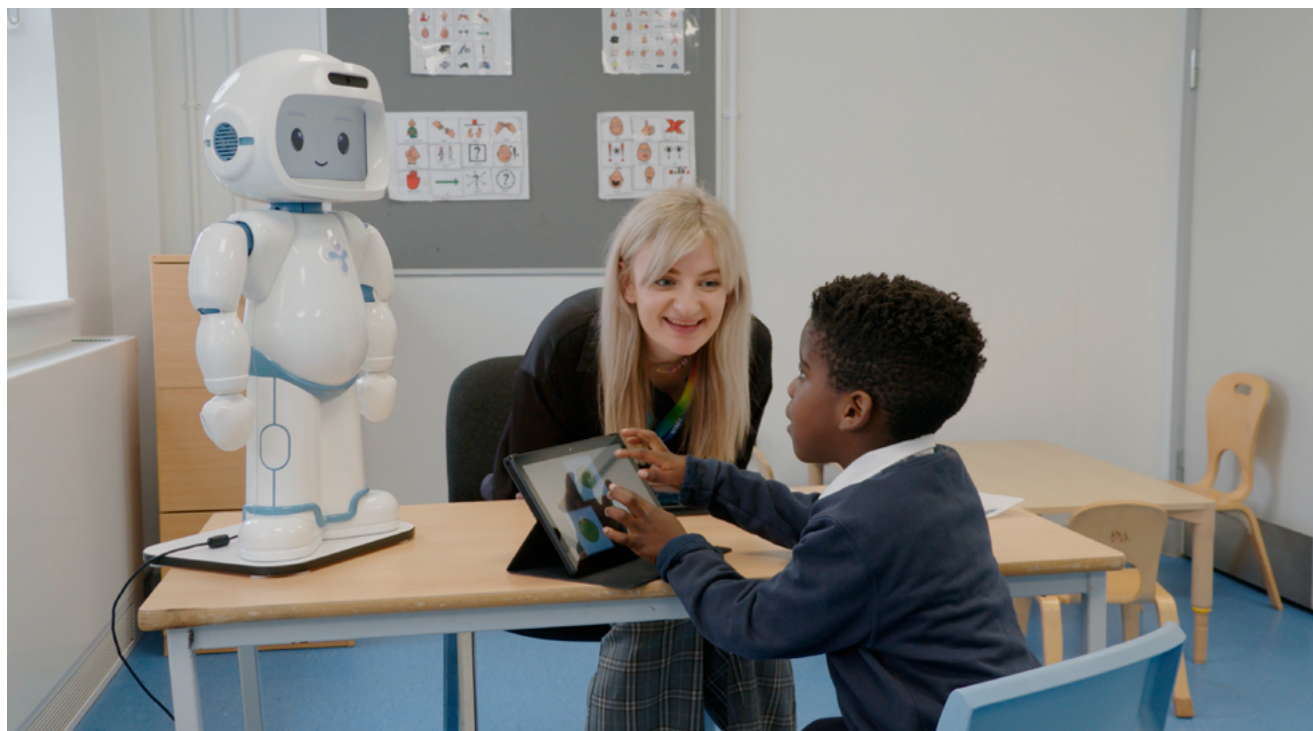
Teachers are motivated by the technology because it offers many more options than typical traditional teaching methods and offers multiple benefits simultaneously. In addition, it is interactive and can be personalized. Some important advantages of technology-based learning sessions are that they provide feedback and reports to both the therapist and the person who is receiving the therapy. Repetitive, boring exercises become easy and fun with technology, and the duration and speed of the games can be adjusted according to each person's needs.

Furthermore, VR applications can create an artificial environment that reflects real-world situations and experiences. This feature allows children with disabilities to experience the real world in safety.

Case study

At Rodney House, staff have been actively using QTrobots in their daily activities and special educational, psychological and communication practices. The team encourages and facilitates various engaging exercises for students who have barriers to learning and interaction.

Rodney House School is attended by children with many different needs and abilities; many of them have barriers to learning and several experience demand avoidances. Therefore, it can be difficult to achieve academic learning unless teachers have something to draw the children in and engage them in class.

After the COVID-19 pandemic, the school team recognized that there was a need to challenge and push the students a little bit more. The teachers now take the children for weekly one-on-one sessions and for group sessions to give them more support as required. Much of the staff's work involves helping not only with the

children's cognitive development and learning, but also with the development of their attention, listening skills and communication skills.

Many of the centre's students find it difficult to communicate. QTrobot has excellent games that promote both expressive and receptive language.

Students who find social communication difficult might use a little communication to request something. And after interacting with QTrobot, two out of three children in one particular class now come into the classroom and say 'Hello' and 'Goodbye'.

Unpredictability can make children very nervous. For example, sometimes adults might look different than they did the day before because their hair is different, or they might smell different. For very sensory children at Rodney House, interacting with QTrobot helps them feel much calmer and improves their overall readiness to learn. They know what to expect from the robot; there are no surprises. This in turn helps the teachers gain precious trust between themselves and the children.

It is critical to highlight that at Rodney House the robot brings humans together. It is never just technology and the child. It is always the teacher, the child and the tech toy to bolster trust, interest, enthusiasm and positive attitudes towards learning and communication. The school's team believes it is crucial that the robot does not replace the role of the teacher. The latter works

alongside the robot, and the robot may even refer to the teacher as its colleague or assistant.

One of the school's big success stories emerged from the Tiger class, which comprises children with more extensive abilities. A boy in that class struggles with regulating and controlling his emotions, especially anger. He has been practising his deep breathing with QTrobot for some time, and now when he feels angry, he says, 'I want to work with the robot.'

When the robot symbol is shown as the children enter the classroom, their faces light up and they rush in. These children are normally difficult to engage in structured learning, but teachers have seen their attention span extend noticeably after they begin to work with the QTrobot. Within as little as six weeks, children might progress from staying in the classroom for only a few minutes to as long as fifteen minutes, which represents significant progress.

QTrobot is very user-friendly, easily operated by both teachers and teaching assistants. A ten-minute initial briefing is enough to learn how to use it safely and meaningfully. Teachers at Rodney House explained that QTrobot is quite intuitive to use and that not much can go wrong. They see it as a fantastic tool to have in the teacher toolkit, especially for educators who work with children with SEN and need to be creative. Every child is an individual, and QTrobot can be used in many ways to inspire them and support their readiness to learn.

Mada — Assistive Technology Center

About the organization

Mada — Assistive Technology Center, Qatar, is a private institution founded in 2010 to promote digital inclusion and build a technology-based community that meets the needs of persons with functional limitations, which it defines as persons with disabilities and seniors, in Qatar.

The centre uses strategic partnerships to enable the education sector to provide inclusive education, the community sector to become more inclusive, and the employment sector to enhance employment, professional development and entrepreneurship opportunities for persons with disabilities.

Mada is not an educational institute. However, students and teachers from various age groups and with various disabilities benefit from its services (not all the teachers who benefit from its services have disabilities).

To perform its role as an ICT accessibility strategic enabler, Mada offers its partners access to various services and programmes, including the following:

- Mada builds the capabilities and capacities of a diverse audience, including educators, digital accessibility specialists, web developers, special education professionals and others. It does this through specialized training programmes that are meticulously designed and implemented in alignment with international best practices and standards. These initiatives aim to enhance the quality of services provided to persons with disabilities

and seniors, fostering greater inclusivity and accessibility across various sectors.

- Mada is dedicated to enabling persons with disabilities to increase their independence by using AT. It offers a range of AT services, including AT assessments, provision of AT and training in using AT.

- Mada provides digital accessibility consulting services and accreditation for websites and digital platforms in accordance with international standards to support the right of persons with disabilities and seniors to access information independently.

- Mada works with various partners and innovators to develop an ecosystem that supports the use and development of innovative technological solutions that promote digital access for persons with disabilities and seniors.

- Mada researches developments in AT and ICT accessibility that foster innovation through Mada Edge, its research core unit. This research is aimed at promoting the advancement and dissemination of global, regional and local industry-specific best

practices. Mada also develops publications with a focus on ICT accessibility, assistive products and solutions, and the creation of inclusive, accessible environments.

Mada runs promotion campaigns to raise awareness of the impact of ICT and ICT accessibility and stimulate community action through dedicated workshops, public outreach initiatives, focus groups, innovation days, advocacy, etc. It also raises awareness among persons with disabilities about how ICT can improve their economic and social inclusion.

The centre advocates for national sectorial policies and strategies that foster the widespread availability of accessible ICT and for national public policies to introduce digital accessibility services.

Mada is dedicated to serving male and female persons with disabilities of all ages, teachers, professionals and strategic partners.

It receives funding from both government and private sources.

ICT, AT and AI in education and rehabilitation

Since its founding, Mada has been addressing the needs of persons with disabilities through AT and ICT in a variety of ways.

Mada Academy

Mada Academy works to promote open and inclusive education opportunities. It offers innovative and inclusive training programmes and materials designed in accordance with competency frameworks in the targeted fields, especially ICT accessibility, AT and open and inclusive digital education.

The Academy's training rooms are accessible and equipped with ICT and AT devices to facilitate the use and integration of technology in training practices. Reasonable accommodation is provided for trainees as required. Its central training and capacity-building hub is the Mada Academy portal.

Mada Academy aims to contribute to improving capabilities and enhancing digital inclusion throughout society through purposeful and inclusive training and capacity-building for all.

MadaLab

MadaLab, the centre's state-of-the-art laboratory, is equipped with cutting-edge AT and accessible solutions for improving digital access for persons with disabilities in the Arabic-speaking region and beyond. It serves as an innovation hub for innovators, solution providers, users and ICT and AT experts.

The lab is designed to be at the forefront of the creation of new accessibility solutions for Qatar and the Arabic-speaking region. The vision is to create an open, accessible and inclusive environment in which to access, explore, envision and develop demonstrable

outcomes in areas focused on emerging digital accessibility and AT. Leveraging the growing research and innovation ecosystem in the State of Qatar, the MadaLab will act as an intermediary for the government, researchers, innovators and technology industry by presenting them with challenges identified by the community.

ساعدتني في البيت على اللعب والكتابة

The MadaLab consists of various zones which are classified as follows:

- Accessible reception area.

- Artificial intelligence: Robotic zone.

- Innovation zone.

- Community and culture zone.

- Inclusive education zone.

- Digital accessibility zone.

- AT room.

- Sensory room.

- Mada studio.

- Mada FabLab.

The Mada FabLab is certified by the Fab Foundation and is the world's first accessible digital manufacturing space in which to support, enhance and accelerate the transformation of ideas into innovations that improve digital accessibility and technological solutions in Arabic.

Teachers' ICT, AT and AI competencies and skills development

- **in relation to the educators of mainstream schools/universities**

Mada Academy is a training hub that aims to empower people and institutions and improve lives through engaging and inspiring training and capacity-building for all. It works to promote open and inclusive digital education opportunities, and provides quality, accessible online and blended training courses and face-to-face training workshops on a wide range of cutting-edge topics, with a focus on digital accessibility, AT and inclusive education.

Topics covered in the training include, but are not limited to, the following:

- Disability and AT.

- ICT accessibility.

- AI for accessible and inclusive education.

- Accessible customer service.

- Accessible OER.

- UDL.

- Best practices for accessible social media.

- Windows and iOS accessibility for literacy.

- AAC in the classroom: evaluation and best practices.

- Security and privacy versus ICT accessibility.

- Using the TextHelp Read&Write program.

- Introduction to environmental accessibility.

Digital teaching and learning materials (including games, applications, e-books, OER, websites, educational portals, videos, etc.) and ways of integrating ICT, AT and AI into the curriculum

Mada Academy uses AI and VR/AR mainly with students who have hearing-related disabilities. It is developing a new way of learning using avatar technology through its JUMLA Sign Language projects.

Mada generally develops its own content, mostly as OER, but it also collaborates with universities to create and curate specific content. The centre advocates for open and freely accessible digital content. The Mada OER Hub contains collections of accessible OER, curated by Mada and its partners, that align with the Mada ICT Accessibility and Inclusive Design Competency framework (ICT-AID). The community of inclusive education and ICT accessibility experts, advocates, educators and learners can explore the accessible open content and connect with others to improve their collective inclusive practices.

Mada Academy offers a wide selection of technology-enhanced learning activities, delivered within various training modalities. Their topics include online instructor-led training, webinars

or virtual training, open online self-paced training and blended training. ICT and AT are used in these training sessions.

The centre has released multiple reports on best practices in the field of inclusive education to raise awareness of the importance of inclusive education among stakeholders and the community. These reports have covered a variety of topics and include, for example, 'Education for All Guide', 'Guide to Support High Functioning and Gifted Children with Autism in Education' and 'Educational Best Practices for Deaf Students'. The reports are available in Arabic and English on the Resources page of MADA's ICT Accessibility Policy Portal.

Facilitators and challenges

The centre notes the following facilitators:

- Mada policy frameworks and strategy.

- Mada ICT accessibility and AT competency frameworks.

- Training and capability-building.

- Mada platforms (online learning, OER Hub, etc.) and Mada specialized portals.

- Mada AT stations.

- Collaborations and partnerships at national and international levels through strategic partnership agreements.

It also notes the following challenges:

- Financial restraints on the integration of ICT in education.

- Digital accessibility and copyright laws.

- Unavailability of digital content in Arabic. The centre provides financial support for the localization and translation of existing content into Arabic.

- Lack of awareness and capacity.

- No national policies for inclusive education or inclusive ICT in education or AI in education.

- No ethical guidelines for technology use.

Impact of ICT, AT and AI integration in inclusive education/special needs education

ICT, AI and AT play a vital role in ensuring diversity, equity and inclusion in education. They help to overcome barriers and help persons with disabilities not only to fulfil their potential through access to learning opportunities but also to participate fully in society and live independently.

All parties involved must collaborate to further promote the effective use of ICT, AI and AT in education. Mada stresses the importance and value of supporting the professional development of employees and trainers in the field of ICT, AT and AI integration in inclusive education; preparing policies and best practices on ICT, AT and AI integration in inclusive education; fostering the development of digital content and OER relating to ICT, AT and AI; and launching dedicated online courses in collaboration with partners in the fields of ICT, AT and AI integration in inclusive education.

Case studies

Mobile accessibility

Mobile accessibility refers to making mobile applications more accessible to persons with disabilities and seniors.

Mada's services act as a step-by-step guide for the organizations it is working with — ministries, education institutions, etc. — on how to ensure that their mobile applications comply with international standards for mobile accessibility — W3C and WCAG 2.1, A and AA — and are accessible to persons with disabilities and seniors. In addition, accessibility enhancements in mobile applications would greatly improve their usability among users who do not have disabilities or are not seniors.

Mada's mobile application accreditation is granted to an organization once it has successfully completed the manual usability assessment.

Mada ICT-AID competency framework

The Mada ICT-AID competency framework describes all the ICT accessibility competencies and capabilities that are needed to use and develop accessible products, contents and services.

The framework features six domains that are broken down into the competencies required to use, evaluate and improve digital accessibility in compliance with accessibility standards and best practices. It can be used to help professional education services, universities and individuals determine the competencies required to address ICT accessibility and foster the integration of ICT into curricula and training programmes. It can be also adapted for use in different learning contexts and modes, and used to develop, describe and publish ICT-AID–aligned resources in courseware repositories.

Users of the OER Commons digital library and collaboration platform can use the [ICT-AID framework](#) to index, align and search OER, improving ease of access and retrieval of these resources.

Mada ICT-AID–aligned OER HUB

Recognizing the pivotal role of OER in providing effective access to learning opportunities for all, Mada joined the growing worldwide OER movement and pledged to promote the accessibility of OER and harness the power of inclusive ICTs so that educational resources are accessible for all. As part of its commitment, it launched the [Mada ICT-AID Competency Framework OER Hub](#), designed to be a global knowledge hub featuring freely accessible resources that can be used to help close the training and knowledge gap in ICT accessibility.

The Hub contains collections of accessible OER that are aligned with the Mada ICT-AID competency framework. These resources are curated and managed by Mada and its partners, through a variety of tools available on the Hub.

The community of ICT accessibility professionals, experts, advocates, educators and learners can discover, create and share accessible quality open content and connect with others to expand their capabilities and improve inclusive practices.

The Hub is meant to be a centralized and searchable repository of ICT-AID–aligned educational and training materials to help the community in Qatar and beyond locate and access appropriate OER related to ICT accessibility. In that vein, the Mada ICT-AID competency framework is featured as a standard tool available to users of the [OER Commons](#) digital library and collaboration platform. It can be used to index and describe ICT-AID–aligned OER to improve the ease of access and retrieval of these resources.

Türkiye Spastik Çocuklar Vakfı (TSCV) (Cerebral Palsy Türkiye)

About the organization

The purpose of Türkiye Spastik Çocuklar Vakfı (TSCV) is to provide diagnoses, treatment, rehabilitation and training for children and adults with cerebral palsy and to provide activities that will train them for a vocation and help them integrate into society.

TSCV is striving to become an international reference institution with a financially sustainable structure and to serve individuals with cerebral palsy throughout their life.

The foundation has two schools, two rehabilitation units and a family (caregiver) counselling centre. The family (caregiver) counselling centre has no age limits on who can access its services. Every month, it welcomes approximately 205 visitors who have cerebral palsy, ASD, Down syndrome, genetic disorders, metabolic disorders, developmental delays, ADHD, speech and language disorders, spina bifida or other conditions.

Metin Sabancı Rehabilitation Centre currently has 212 clients — ranging from newborns to 30-year-olds — who have cerebral palsy. Hıfzı Özcan Rehabilitation Centre has 192 clients — aged between 12 months and 18 years — most of whom have cerebral palsy, intellectual disabilities or ASD. There are seventy-six students aged 3–15 at Metin Sabancı Schools; most of them have intellectual disabilities.

TSCV provides the following services to male and female children and adults with cerebral palsy and their families (caregivers) at all its locations:

- Providing medical consultations, treatment, rehabilitation and training.

- Training persons with disabilities for a vocation so that they can meet their own needs and participate in society.

- Raising public awareness of cerebral palsy.

- Raising academic awareness of cerebral palsy to increase the number of academic studies conducted on the topic.

- Monitoring international studies closely and taking the lead in implementing the findings in Türkiye.

- Encouraging teachers, therapists, instructors and experts to study cerebral palsy and conduct research.

- Enacting legislation regarding cerebral palsy to improve the rehabilitation and health services provided across the country.

- Carrying out early intervention and development monitoring studies with experts and families (caregivers).

- Establishing private and public collaborations and partnerships to achieve all the points listed above and to create and implement projects to increase the quality of life for individuals with cerebral palsy.

TSCV receives purpose-specific funds from private donors, as well as donations from individuals and social responsibility donations from companies. It applies for and receives grants from national and international organizations.

ICT, AT and AI in education and rehabilitation

In general, technology is used to support the professional development of teachers and ensure that students benefit from innovative technologies for educational purposes. At the family (caregiver) counselling centre, the specialists use Zoom and other online meeting tools to conduct online counselling sessions. iPads are usually used for special education and child development sessions. At the technology-based rehabilitation unit, staff use games to develop the children's physical strength and body movements.

ICT is used regularly at almost all TSCV service units. In addition, some international projects on ICT integration into education for children with SEN have been implemented. These projects included the following:

- 'CP Care' (vocational training of caregivers of individuals with cerebral palsy in accordance with the European credentialling system).

- 'BENvob' (building bridges for inclusive education).

- 'IDA' ('Inclusive Digital Academy').

- 'MedVet' (programme for medical practitioners supporting parents (caregivers) of babies who have disabilities and complex needs).

- 'VETforEI' ('Vocational Training for Physiotherapists about Family Centred and Play Based Approaches in Early Childhood Intervention').

- 'BOOST' (programme to improve the capacity of the distance education programme at Metin Sabancı Special Education Schools).

- iPad use in schools with students who have SEN (the Apple Türkiye office initiated this project in collaboration with schools; by the end of the project, students could use iPads using special methods).

- 'AI-Based Personalized and Adaptive Education Platform for Children with Cerebral Palsy Project' (project to develop an AI-based personalized and adaptive learning platform for children with cerebral palsy).

- Techno-therapy sessions through LindeGas/CAF America grants (using gaming consoles in physical rehabilitation sessions to gamify the rehabilitation experience).

IT infrastructure (internet connectivity, main types of hardware and software)

The centre has a fibre optic internet connection, which it pays for itself, and all classrooms have LAN wireless internet access.

The staff have technical equipment such as iPads, computers and laptops. Every teacher has a laptop. Teachers working at Metin Sabancı Special Education Schools and other units have iPads and use Apple applications to support students who have SEN. Technical support and maintenance services are provided by the foundation's IT team. The classrooms are equipped with Microsoft Xboxes, Sony PlayStations, VR glasses, projectors and mechanical horses and SPACE therapy systems. The centre's collection of inclusive software includes more than fifty interactive games, programs and tools to support the development of the skills required for life and learning — for example, a farm animal jigsaw puzzle, body parts puzzle, eye-movement training programs. The strategies for educating students are based on an active learning approach and reflect individual learning needs.

Teachers' ICT, AT and AI competencies and skills development

- **in relation to the educators of the centre**

Teachers are mostly neutral about the use of ICT and AI. While they are somewhat confident about using technological tools and innovative solutions, they do not show particular enthusiasm for them and tend to treat them as simply part of their daily routine. An online assessment and evaluation system platform is used to monitor the students studying at the Metin Sabancı Special Education Schools. All teachers receive training in how to use this portal.

Digital teaching and learning materials (including games, applications, e-books, OER, websites, educational portals, videos, etc.) and ways of integrating ICT, AT and AI into the curriculum

Teachers at TSCV have access to Microsoft and Google products, as well as software products developed in Türkiye in the national language (including those developed by the foundation). TSCV staff sometimes use websites and educational portals of universities and other NGOs (e.g. Gelişimsel Destek Programı [GEDEP], Tohum Otizm portal, YouTube).

The Metin Sabancı Special Education Schools use educational videos prepared within the scope of the BOOST project and the digital content of the GEDEX application of the Ministry of National Education General Directorate of Special Education.

Teaching, learning and skill development activities are integrated into the curriculum.

Facilitators and challenges

The centre considers financial issues to be the main challenge to the integration of ICT in education. The state covers the cost of up to eight hours' rehabilitation for children with disabilities a month. This is usually not enough, and most parents (caregivers) cannot afford individual education and rehabilitation sessions.

Impact of ICT, AT and AI integration in inclusive education/special needs education

The use of technology in education contributes to faster, easier and more effective and enduring learning among students and improves teachers' job satisfaction. Teachers are motivated by the technology because it offers multiple benefits simultaneously and more options than traditional teaching methods, and it is also interactive and personalized. An important advantage of technology-based sessions is that they provide feedback and reports to both the therapist and the person who is receiving the therapy. In addition, repetitive, and potentially boring, exercises become easy and fun with technology, and the duration and speed of the games can be adjusted according to the player's ability.

Furthermore, VR applications can be used to create artificial or augmented environments that reflect real-world situations and experiences. This feature allows children with disabilities to experience the real world safely and securely.
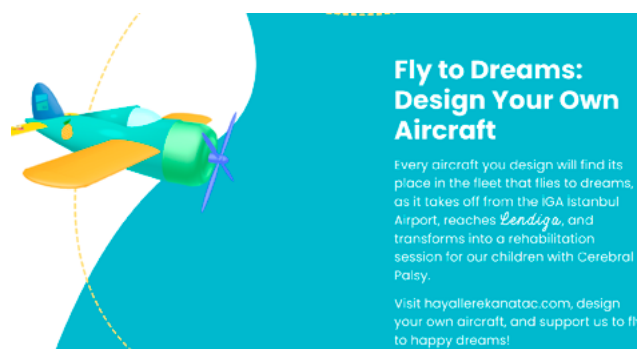
Case study

In 2022, in close cooperation with the Hıfzı Özcan Rehabilitation Centre and with the support of Ford Otosan, TSCV opened a technology-based rehabilitation (technotherapy) unit to support the mental and physical development of children. In the unit, children are generally offered therapy sessions through games. One aim of the therapy is to have the children

increase their mobility. Pertinent information about a student is recorded on the computer before the sessions so that their progress can be evaluated. Evaluations and information collected during the game are automatically saved to the computer using the Becure BalanceSystem. They can then be downloaded as a report and presented to the student's family (caregivers). In the unit, two physiotherapists and one occupational therapist actively use the systems.

TSCV works to provide the special education and rehabilitation support that persons with disabilities need throughout their lives. The administrators obtain funding through national

and international projects and provide free special education and rehabilitation support to children who are eligible to participate. For example, the 'Hayallere Kanat Aç' ('Wings to Dreams') project was carried out in cooperation with İstanbul Grand Airport. Participants in the project played SmartPose, which is a game used in technology-based rehabilitation, in a designated area of the airport. They could also go onto a website created specifically for the project to design aeroplanes to take children to an imaginary island called Lendiga.

Fly to Dreams: Design Your Own Aircraft

Every aircraft you design will find its place in the fleet that flies to dreams, as it takes off from the IGA Istanbul Airport, reaches *Lendiga*, and transforms into a rehabilitation session for our children with Cerebral Palsy.

Visit hayallerekanatac.com, design your own aircraft, and support us to fly to happy dreams!

Each aeroplane translated into a rehabilitation session for a child. Fifty children received 400 technology-supported rehabilitation sessions between them as a result of the project.

United Kingdom

Outcomes First Group

About the organization

Outcomes First Group is the leading provider of specialist education in the United Kingdom. It gives neurodivergent male and female children and young people access to a high-quality education that caters to their specific needs, abilities and aspirations. It aims to help students overcome barriers, develop, flourish and achieve their personal goals. Outcomes First offers a uniquely blended clinical and academic approach, and all its settings include outdoor education and technology as standard. It has three brands: Acorn Education, which focuses on students with social, emotional and mental health needs (SEMH); Options Autism, which is dedicated to serving children and young people with autism spectrum condition (ASC); and Momenta Connect, which helps young people overcome barriers and engage with education. The key beneficiaries are children and young people who have SEMH or ASC and a wide range of complex needs.

Outcomes First Group has a central office, with finance, HR, quality and commercial departments to support the schools. It also has advisory and quality boards that keep the group updated on research and development.

Outcomes First works closely with local authorities and trusts to make sure every placement serves the best interests of the children and young people and helps them achieve the best possible outcomes.

ICT/AT/AI in education and rehabilitation

The schools use technology to engage and prepare students for their next stage of development. This is particularly critical for students who find it difficult to communicate. A suite of QTrobots, one in each of the Options Autism schools, is used to help children practise having conversations, for speech and language interventions and in games to support communication. ICT are used in therapeutic speech interventions in places where recruiting therapists has been difficult.

All the schools have immersive classrooms. These classrooms offer an immersive experience through the use of VR. The room enhances the lessons, enabling children to be 'in' a different country, 'under' the sea or 'inside' a flower. Many students find transitions stressful, so 360 cameras are used to film them as they practise going to a work experience placement, a concert, the dentist or the hairdresser — so they can be 'in' the space with no people/no noise, some people/some movement, building up to being able to go for a haircut or whatever their next step is. They can use the videos to help them continue to practise. This tactic has enriched and expanded the range of options available to the children — for example, one child was able to go abroad to visit family after practising being in the airport and on an aeroplane well before the event and learning resilience and coping strategies.

IT infrastructure (internet connectivity, main types of hardware and software)

At time of writing, Outcomes First was on course to meet its target of implementing immersive classrooms in all schools by September 2024.

From the hardware perspective, QTrobot — an expressive little humanoid designed and developed by LuxAI, a spinoff from SnT/University of Luxembourg, as a tool for therapists and educators — plays a key role in the schools' daily activities. As of August 2024, the schools had a total of twenty-two QTrobots.

We introduced QT Robot as a pilot to some of our schools.

QTrobot is an innovative assistive tool, designed to enhance learning and support the development of socially empowering life skills for autistic children.

The schools have iPads for students, interactive whiteboards, laptops for each member of staff, VR headsets, QTrobots (as noted above), wearable tech (watches and vests) and 360 cameras.

Software includes immersion software, photo and music editing suites, e-sports, a wide range of apps, including some for AAC and evidence for learning, and SOLAR for tracking performance.

Teachers' ICT competencies and skills development

- **in relation to the educators of the centre**

Employees are creative, excited and enthusiastic about finding new ways to use the software and hardware to improve children's lives. The pedagogy lead for technology oversees the use and quality of provision and internal IT support for the Group.

Teachers are enthusiastic about ICT and AI — both of which are great motivators — and use their school's immersion room and QTrobots for teaching activities.

Teachers undergo special training in the use of ICT in education. Many take on-site courses between webinars and online courses to improve and enhance their skills. Some also do additional training in how to use AI to create phonic books, when deemed beneficial for the children. Some employees provide training to their colleagues in photography, music, using drones, using wearables, etc. Those who teach using e-sports receive additional training sessions throughout the year.

- **in relation to the educators of mainstream schools/universities**

Teachers can also participate in online Teams sessions on skills development in English, maths, science, etc., each term. In the Teams sessions, staff share best practices and celebrate wins from other schools within the network. They describe how parents (caregivers) have been involved, discuss upcoming opportunities, trips and events, and offer specific options for training — for example, a drone group or phonics book party — that employees can join remotely and explore together. The pedagogy leads also visit schools to work with colleagues on specific projects or tasks face-to-face. Each school has at least one visit per year.

Digital teaching and learning materials (including games, applications, e-books, OER, websites, educational portals, videos, etc.) and ways of integrating ICT into the curriculum

Outcomes First has software licences for specific packages — for example, White Rose maths resources, Evidence for Learning tracking

software — apps for educational games such as Times Table Rockstars, testing services such as Accelerated Reader and immersion software called Immersive Studio.

Teachers, teaching assistants and sometimes clinical staff use AI to create early-reader phonics books for older pupils, so that they have age- and stage-appropriate books about things they are interested in to help them learn to read. The teachers can generate these books quickly in accordance with Systematic Synthetic Phonics (SSP), analytic or whole-word phonic approaches using AI. The books have helped children with ASC in particular learn how to read quickly and with high engagement.
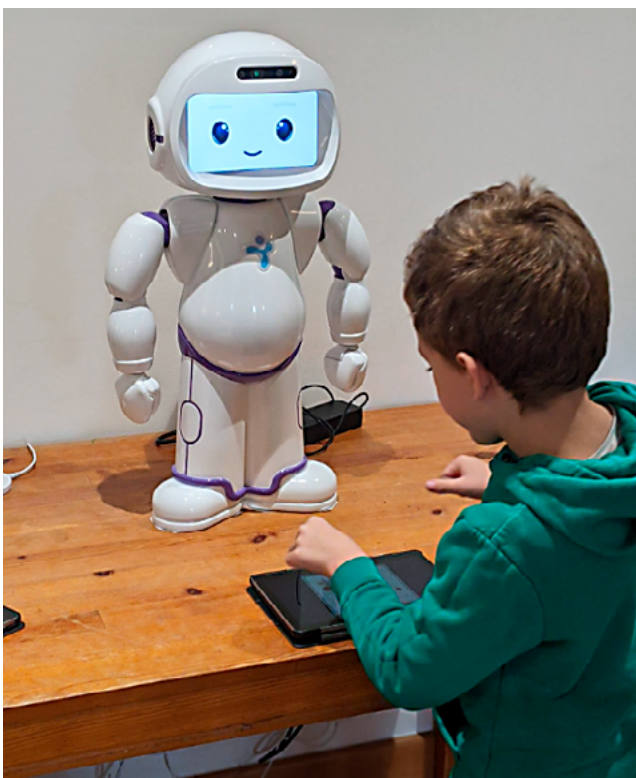
Students develop skills by practising and refining their fine and gross motor skills — from popping bubbles in the immersive classroom to handwriting with the QTrobot. QTrobot prepares the children for interacting with society by running through social story scripts about, for example, shopping and interacting with

others. The students use photo and music editing suites to be creative and use Minecraft to solve problems in 3D. In addition, when QTrobot asks them a question — for example, 'How was your weekend?' — to help them practise their social skills, the children record their answers as video or audio so they can go back and refine and improve their responses.

Children who have missed school can watch events recorded by staff on a 360 camera.

Facilitators and challenges

The Outcomes First advisory board, led by Professor Barry Carpenter, from Oxford University, and Dr Francesca Happe, from King's College, London, uses the very latest research alongside accepted practices to evaluate and create bespoke preferred supplier packages for the schools.

Technical support is available any working day from the in-house IT support service and pedagogy lead. Methodological support is provided by the pedagogy leads via Teams — they all meet virtually each term — and is informed by the clinical team. Administrative assistance is provided by central services.

Outcomes First runs its own in-house CPD and has its own learning and talent team.

Excellent hardware and software bolster success and benefit students. The organization has group-level licences for software and, where possible, uses packages that enable educators to generate and store their own content. iPads have helped learners who have less mobility, particularly because of their voice control functionality. The ability to record responses as video and audio has also improved some of the children's ability to respond to learning.

The children who attend Outcomes First schools often experience challenges relating to speech and language, handwriting or feeling comfortable in social settings. They use technology to practise being in certain settings (e.g. visiting a barbershop), practise their social skills (e.g. having conversations through the robot) or, if they are struggling to read and write, record an audio or video response to exam questions. (The latter has the added bonus of removing the need for a scribe in the exam room and, consequently, removes the risk of the scribe's (mis)interpreting or mishearing a question.) The children therefore need to be able to use IT to move to their next learning stage.

Employees consider it a priority to provide the children with the widest range of opportunities possible, including an extended range of ways to communicate. The immersive rooms and QTrobots do this automatically, and push staff to ask, accept and develop (the neurodiversity strategy) how they can use the technology and how the children can express what they have learned. Staff ask children what they have learned, and how they want to show them they have understood. If a student does not want to write or type their response, staff facilitate their ability to respond in a way that better meets their needs, such as recording a response by talking with the robot. Staff develop speech programs with open-ended response patterns so that the children can articulate their understanding.

Some children pick up a new skill or piece of knowledge quickly and want to move on rapidly. Others may need several repetitions of a lesson, for example, before the new learning is embedded. The managers' priority is to share best practices across the Group and enable staff to move forward at the speed the children need. The teachers should not be duplicating lessons learned, but rather challenging themselves to maintain the momentum of innovation. When selecting and using digital content, the two main challenges are security — that is, making sure the content is appropriate for pupils who are high risk — and ensuring there is an option to adapt content created with the mainstream (larger) market in mind. The big advantage of using QTrobot is that the robot never gets bored and never deviates from the pattern, letting the child build their memory and learning by doing as many repetitions as they need.

Impact of ICT/AT/AI integration in inclusive education/special needs education

The integration of technology has been life-changing for some of the Outcomes First students, who can now access sporting events, concerts, travel and experiences that were previously out of their reach. Technology has enabled the children to explore the curriculum in a way that best matches their interests and needs and at the speed and depth they require, rather than being forced to follow traditional academic methodology. The Outcomes First team uses AI to create early-reader age- and stage-appropriate phonics books for older pupils, so that they have books about things they are interested in to help them learn to read. Teachers can quickly generate books based on SSP, analytic or whole-word phonic approaches using AI. These books have helped children with ASC learn to read quickly and with high engagement.

Case studies

Immersive classrooms

The teachers use immersive technology in the schools to expand the children's opportunities. Some of the children struggle to cope

in high-sensory environments such as hospitals, concerts and sporting events because they are not in control of the noise, movement or actions. For some, this can be a barrier to engaging with certain aspects of life. The Outcomes First team uses immersive classrooms to help students decide how to manage their own resilience and prepare for the unknown. One child had never been able to visit relatives because he could not cope with the airport environment.

The specialists filmed the airport multiple times: first, with a small number of people in it, and then with gradually more and more people, eventually filming during the busiest times. Teachers practised his route with him through the various queues, and reflected on how his emotions and responses could be managed if different situations occurred. They were able to practise in a low-stress environment until the boy was able to visit the airport in real life, and eventually managed to leave the country. The teachers also use this approach to enable children to get a haircut in their local barbershop or go to their local

dentist. They film the actual settings and actual people involved to build resilience and confidence. For children who decide they do not want to attend a sporting event in person, for example, someone wearing a 360 camera can be sent in their place so the child can experience in real time watching a match and participating in a way that works for them, whether that means muting the sound or having fewer people around. One child saw their brother win a wrestling match in this way. They sat 'next to' their mother in the arena and simultaneously felt safe sitting with their family in the immersive classroom. Life-changing experiences such as these drive teachers to find more ways of supporting children who, for reasons beyond their control, are unable to participate in certain aspects of life without the creativity and support of IT.

QTrobot

The use of QTrobot has been invaluable given the current shortage of speech and language therapists in the United Kingdom. In some areas, few therapists are available. Teachers in those areas have been able to program QTrobot with the help of a qualified therapist, who then visits periodically to check on progress and help children take their next steps. The children receive high-quality support in terms of repetition — QTrobot will repeat something 1,000 times if required — and pronunciation, with the same level of enthusiasm and celebration each time. By using QTrobot, the specialists have been able to reach more children and help them make better progress using their bespoke programs than they would have done by using non-qualified assistants or doing shorter or less frequent therapy visits. Teachers have seen improvements in engagement and progress and are now seeing older students program games and events for the younger ones. QTrobots have engaged students of all levels and are proving beneficial for all involved.

Specialized Information Technology Training Centre for Hearing-Impaired Children

About the organization

The Specialized Information Technology Training Centre for Hearing-Impaired Children was organized by IT Park Uzbekistan, the IT Academy and the ITU. Each partner had an area of accountability:

- IT Park Uzbekistan: organizing infrastructure for training (rooms, equipment).

- IT Academy: organizing the educational process.

- ITU: providing expert assistance in conducting trainings and organizing sign language translation of the 'One Million Uzbek Coders' course.

Established in October 2021 in Tashkent, the centre was a national pilot centre. The first students were children under 16 years of age who had hearing impairments. Teachers who worked in specialized boarding schools and knew how to interact and work with this particular learner group were invited to be part of the initiative. They received relevant advanced training. To make learning easier for children, the centre has specialized equipment that can be adjusted to meet the needs of each child. The classrooms are also equipped with laptops and touchscreens.

Students are trained in graphic design (using Photoshop and CorelDRAW), computer literacy and web technologies in two stages through courses on Microsoft Office, the Scratch programming language, HTML and CSS.

Throughout the entire educational process, students are accompanied by mentors who are leading specialists in the field of IT and help them assimilate the knowledge they acquire more effectively. In addition, students can access the 'One Million Uzbek Coders' courses designed with sign language translation to enhance understanding for children whose hearing is impaired.

The initiative had a positive influence on all the students who participated; they acquired additional skills and a different social circle and improved their abilities.

The centre's primary beneficiaries are male and female children under 16 with auditory impairments. However, it can help all students by providing them with additional skills and a different environment in which to communicate and develop.

The centre receives funding from both the government and private sources.

ICT, AT and AI in education and rehabilitation

To make learning easier for the children, specialized equipment is provided and adjusted

to meet the needs of each child. The classes are also equipped with laptops and touchscreens. To give the children extra motivation, the rooms are decorated with paintings with inscriptions in sign language.

IT infrastructure (internet connectivity, main types of hardware and software)

The centre has two classrooms. Each classroom is 48 square metres and is designed for eight students and one teacher. The classrooms are equipped with technology that allows each student to adjust their headphones according to their level of hearing loss, and all the students can hear the teacher. Each teacher was trained in how to operate the equipment and adjust the sound. When children adjust the headphones according to their needs, they do not hear any interference, which improves their learning experience. The classrooms are also equipped with a laptop for each student and the teacher. In addition, interactive touchscreens allow the teachers to give visual demonstrations of the material being taught.

A wireless internet connection is provided by IT Park, and the centre's IT administrator resolves all IT-related issues.

Teachers' ICT, AT and AI competencies and skills development

Teachers use ICT and AI with strong enthusiasm and a high level of motivation. The centre's staff includes three teachers, and all three feel confident about using ICT and AT in inclusive education. The centre also has five specialists.

The teachers' primary objective is to organize classes with appropriate support (sign language interpretation, recording, editing) to encourage students' active learning and acquisition of new skills. The results of the first course prompted a demand for more courses and the continuation of the inclusive initiative.

The centre aims to improve its training programmes to enhance their quality. All teachers use advanced ICT and AI or VR/AR for teaching and self-development. The teachers were trained in the use of the specialized equipment, and also completed advanced training in the field of ICT.

Digital teaching and learning materials (including games, applications, e-books, OER, websites, educational portals, videos, etc.) and ways of integrating ICT, AT and AI into the curriculum

Teachers at the centre were trained in the use of the specialized equipment and underwent advanced training in the field of ICT. Administrative and organizational support was provided every day.

The content of the courses is selected according to the needs of students. The centre uses specialist equipment for persons whose hearing is impaired and content and video courses it developed itself.

Facilitators and challenges

The main facilitator of the centre's activities is IT Park Uzbekistan. Children who have disabilities must have the same access to knowledge as everyone else. IT Park Uzbekistan therefore created all the necessary conditions for learners with disabilities to work independently on both projects and their personal development. This opportunity gave them a solid understanding of standard IT applications.

Impact of ICT, AT and AI integration in inclusive education/special needs education

Students are trained in graphic design (using Photoshop and CorelDRAW), computer literacy and web technologies in two stages through courses on Microsoft Office, the Scratch programming language, HTML and CSS. The in-house training programme was developed by the centre's team.

The centre's digital content includes software, learning materials, OER, websites, educational portals and videos. Students are assessed before they begin their courses and tested after they complete them.

Case study

IT Park, IT Academy and the ITU Regional Office for CIS established a technology training centre for children who have hearing impairments. The centre has two specialized speech/audio classes. The goal of the project is to raise the level of education and interest in IT among children who have hearing impairments. Each classroom is designed for eight students and one teacher. The centre uses specialist equipment that allows students to adjust their headphones in accordance with their level of hearing loss, and all students can hear the teacher. All teachers received training on operating the equipment and adjusting the sound settings. When the children customize their headphones to suit their individual needs, they experience minimal interference, thereby enhancing their overall learning experience. Additionally, each classroom is equipped with a laptop for both the teacher and each

student, along with two interactive touch-screens that allow the teacher to give visual demonstrations of the instructional material.

Currently, the centre teaches two courses, computer literacy and web technologies and graphic design, for which dedicated learning materials have been developed. Three groups of students have been successfully trained (two groups on computer literacy and web technologies and one group on graphic design).

The centre employs three ICT teachers who have knowledge of sign languages and organized two specialized speech/audio classes.

II

CORE INSIGHTS

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KEY CONCLUSIONS

The information gathered from the Global Survey and presented in the previous section uses the experiences of twenty-one resource centres to illustrate how ICT and AT products have positively influenced the inclusion in education of students who have disabilities. It also identifies facilitators and challenges relating to the provision and use of AT and ICT products.

This section contains a comprehensive overview of that information and serves as an evidence-based assessment of the critical factors that affect the provision and implementation of ICT, AI and AT products in educational settings.

Challenges

- **Funding and resource allocation:** One of the most significant challenges faced by RCs is securing adequate funding to buy the necessary technologies. The costs of cutting-edge AT and ICT products can be prohibitive, hindering centres from accessing and providing these essential tools.

- **Lack of expertise:** Despite the growing importance of technology in supporting persons with disabilities, educators, healthcare providers and family members (caregivers) frequently lack the requisite knowledge and expertise to implement and leverage the tools effectively. This knowledge gap can impede the effective integration of technology in educational processes.

- **Inadequate teacher training:** To advance beyond general awareness, education professionals require comprehensive training in inclusive educational practices and the application of AT and ICT. This training should encompass not only the technical aspects of operating devices but also adequate pedagogical strategies aimed at fostering an inclusive learning environment.

Facilitators

- **Collaborative networks:** Successful RCs benefit from strong collaboration among a diverse array of stakeholders, including educational institutions, healthcare professionals, NGOs and the families (caregivers) of students with disabilities or SEN. These partnerships foster a multidisciplinary approach that enhances the effectiveness of technological interventions.

- **Professional development:** Continuous training and professional development for staff and educators on the latest AT and ICT advancements are crucial facilitators of beneficial technology integration. These types of programmes equip professionals with the knowledge and skills needed to effectively implement and use these technologies, thereby maximizing their impact on learners with disabilities.

- **Inclusive educational frameworks:** The adoption of inclusive educational frameworks, such as the UDL, and Personalized Education Plans (PEPs) plays a significant role in facilitating the integration of technology in education for students with disabilities. These approaches ensure that educational content is accessible to all learners, regardless of their abilities.

Impact

- **Enhanced educational and social participation:** The integration of AT and ICT products substantially improves the educational experiences and social engagement of students with disabilities. Tools such as AAC devices, specialized software and adaptive hardware effectively dismantle communication barriers, facilitate learning and promote greater independence.

- **Promotion of inclusivity:** Ensuring the availability and accessibility of relevant and appropriate technologies is crucial for fostering inclusivity within mainstream educational settings. When RCs are equipped with tools tailored to meet a diverse range of needs, they can ensure that students with disabilities can enjoy full and equitable participation in education alongside their peers.

- **Empowerment and quality of life:** The provision of appropriate relevant technologies — selected through a student-centred assessment approach — empowers learners with disabilities, enhancing their autonomy and self-reliance. This empowerment has a profound impact on their quality of life, paving the way for new opportunities for personal growth, academic advancement and career opportunities.

Conclusion

The integration of ICT, AT and AI within educational and rehabilitation RCs underscores the transformative potential and enduring challenges inherent in supporting learners, especially children, who have disabilities and SEN. These centres, exemplified by their commitment to facilitating equitable quality education, play a pivotal role in bridging the accessibility gap through meticulous assessments and the deployment of both low-tech and high-tech solutions tailored to the unique requirements of every learner.

The case studies presented in this report highlight the profound role that AAC technologies, such as eye-gaze systems and specialized communication software, play in enhancing the educational engagement and social participation of students with severe disabilities. The adoption of frameworks such as the UDL and SETT further reinforces the necessity of using personalized educational strategies, ensuring that every student's learning environment is adaptable to their specific needs.

The path towards genuinely inclusive education is fraught with both significant advantages and notable challenges. Key challenges include financial constraints that limit access to the required technologies, a widespread lack of expertise among educators and therapists, and the ongoing need for continuous professional development. Addressing these issues requires a multifaceted approach: increased funding, enhanced training programmes for professionals and the establishment of national standards for the provision and use of AT and ICT products in educational settings.

Despite the challenges, the unwavering dedication of RCs, their staff and collaborating partners illustrates a commendable pursuit of an inclusive and equitable educational future. By fostering a collaborative ecosystem that involves families (caregivers), educators and technology experts, these centres ensure that students who have disabilities not only receive the support they need but also thrive in mainstream educational environments.

As we highlight the advancements and persistent impediments faced by dedicated RCs and education systems throughout the world, it becomes evident that the way forward lies in harnessing the full potential of technological innovations while maintaining a steadfast commitment to providing personalized, fully inclusive education. Through ongoing research, collaboration and advocacy, RCs can continue to break down barriers, enabling all learners to achieve their full potential and participate fully in society. The centres' dedication to inclusive education serves as both a beacon of hope and a call to action for all stakeholders committed to creating an equitable learning landscape for persons with disabilities and SEN.

III

SHOWCASING DEDICATION AND INNOVATION IN INCLUSIVE EDUCATION: CARE, CAPACITY, CONCERN AND COMMITMENT

1	Access to Communication and Technology Unit (ACTU), Aġenzija Sapport, Malta
2	Asociación en Defensa del Infante Neurológico (AEDIN), Argentina
3	ASSIST – Assistive Technologies Foundation, Bulgaria
4	Assistiva Tecnologia e Educação, Brazil
5	Assistive Technology, Disability and Inclusive Education Multi-Disciplinary Research Unit (MRU), Cyprus
6	Beit Issie Shapiro (BIS), Israel
7	Bridge AI, The Hong Kong Special Administrative Region (HKSAR) of the People's Republic of China
8	Centre on Inclusive Technology & Education Systems (CITES), United States of America
9	Centro de Desarrollo de Tecnologías de Inclusión (CEDETi), Chile
10	Information and Training Centre for Persons with Disabilities, Digital Innovation Academy, The Kyrgyz Republic
11	Kara + BJANA Vision Skills Lab, India
12	Mada – Assistive Technology Center, Qatar
13	Outcomes First Group, United Kingdom
14	Regional Centre for Assistive Technology, Italy
15	Regional Centre for Support of the Inclusive Education Process in the Targovishte Province, Bulgaria
16	Resursni centar Milan Petrović, Novi Sad, Serbia
17	Rodney House Specialist Support School, United Kingdom
18	Specialized Information Technology Training Centre for Hearing-Impaired Children, Uzbekistan
19	Territorial Support Centre for Disabilities through Technologies (CTS Bologna), Bologna, Italy
20	Türkiye Spastik Çocuklar Vakfı (TSCV)/Cerebral Palsy Türkiye, Türkiye
21	Young Power in Social Action (YPSA), Bangladesh