



TECHNOLOGICALLY ADVANCED INCLUSIVE ENVIRONMENTS FOR FRAILTY SUBJECTS

Fabio Orecchioⁱ

PhD in Economics and Law,
University of Enna "Kore",
Italy

Abstract:

The contribution addresses the problem of the use of educational technologies for inclusive purposes at school in the Italian context. Inclusive education is implemented in different ways in different contexts and varies with national policies and priorities, which in turn are influenced by a whole range of social, cultural, historical and political issues. Technologies have considerable potential that helps teachers to support pupils with disabilities and inclusion processes at school. The opportunity for interaction, collaboration and mediation offered by assistive technologies benefits the fragile student, but also the entire class, which can be supported in some learning processes through the adoption of specific devices. The article also emphasizes the use of ICT facilitators for pupils with special needs with the aim of implementing the principles of equality, diversity and inclusive education.

Keywords: students with disabilities; inclusive education; assistive technologies

1. Introduction

During the pandemic, while distance learning (DL) and integrated digital teaching (IDT) have been placed at the heart of the teaching-learning processes, the proper use of the information and communication technologies (ICTs) by teachers and students, but also by the entire school community, becomes an imperative of contemporary culture. The proper use of digital devices, within educational contexts and classes, manifests as a priority, especially if the issue is at the heart of the promotion of school inclusion in an attempt to facilitate the learning of pupils with special educational needs. The proper use of the digital school register, the different educational platforms capable of adapting to every need, the several applications, etc. remain at the heart of the design of the lessons. However, the continuing problem is how to “think” about using technologies to calibrate interventions “tailored” to the needs of each student in the class and, together with that,

ⁱ Correspondence: email forecchio@alice.it

about how to integrate them to produce engaging and participative lessons focused on the needs of students.

It is clear that in the design of any fundamental learning environment, barriers to participation have to be removed, increasing the “facilitating” elements, through a precise organization of the factors that guide the life in the classroom and the learner’s actions. In order to consider a teaching environment as “inclusive,” it is essential that every activity is accessible and usable to all students and that the students contribute to their full use too.

From this point of view, ICTs are versatile resources, thanks also to well-structured educational software, which can help to build meaningful and shared learning, providing good opportunities for all students, even for those with special educational needs, especially in achieving specific curricular objectives.

While it is true that ICTs can be seen as a support to the teacher’s action, it is also true that they represent and mediate the relationship with pupils, stimulating different sensory channels and language codes which help ensure learning starting from an appropriate design.

From this point of view, integrated educational support through technology is often indispensable to enhance teaching-learning processes in a school context, and also to ensure the full participation of pupils with disabilities. In fact, ICT plays a central role in assuring an inclusive education for each and every student, an education which is perhaps different, especially from the methodological, participative and constructive point of view, whose main aim is to help students achieve the necessary acquisitions at the highest level while respecting and valuing (cultural, ethnic, socio-economic, etc.) differences within the class group.

However, in 2021, in Italy several statistical sources pointed out that the percentage of students with disabilities was of 23%, that is about 70.000 students not attending lessons, with an even higher peak, topping to about 29%, in Southern Italy due to causes of a different order. Such a situation reflected the organizational and design implications which must be considered in such frameworks. It is precisely in this direction that the new regional ordinances are aimed at when focusing on the possibility, for pupils with special educational needs, to follow the didactic activities in person. Suffice it to mention the Ministerial Note No. 388 of 17 March 2020 concerning health emergency by a New Coronavirus. First operating indications for distance learning activities recall the need, mentioning distance teaching too, to provide for the use of compensatory and dispensation instruments such as the use of speech synthesis software, which could transform reading tasks into listening tasks, digital books or vocabularies, concept maps. Article 43 of the following Ministerial Note No. 662 of 12 March 2021 concerning the Prime ministerial decree of 2 March 2021 – pupils with special educational needs and pupils with disabilities – clarifies that, if distance activities are arranged, school attendance is possible *“to carry out on-site activities where the use of laboratories is necessary or for the purpose of maintaining an educational relationship that achieves an effective school inclusion of pupils with disabilities and with special educational needs”*. The focus was on the

on-site/distance ratio, which was important to give fragile students a dignified right to study.

The idea behind this proposal is to create the conditions for inclusion projects, but the issue is probably more complex because if at school there are only pupils with special educational needs, there is a real risk of denying some fundamental principles of inclusion and even recreating those special classes that are now clearly at odds with the Law. If pupils with disabilities go to school and the others stay at home for DL activities, there is no inclusion, and, on the contrary, there is a separation between them. The point is that the request for pupils with disabilities to go to school was made by families, and that is perfectly understandable: it is difficult to work with children with disabilities through DL, and the families themselves have difficulties in managing the situation. Moreover, it is true that, even in normal conditions, there are many pupils with disabilities attending their lessons outside their classrooms. This epidemic is only causing contradictions to explode, or even bringing to light the lack of serious inclusion policies, a situation which has been going on for 20 years now.

Piemonte	86.2
Valle d'Aosta	51.6
Lombardia	79.9
Bolzano-Bozen	95.1
Trento	49.4
Veneto	81.4
Friuli-Venezia Giulia	83.0
Liguria	74.1
Emilia-Romagna	79.8
Toscana	81.3
Umbria	86.4
Marche	87.5
Lazio	73.4
Abruzzo	76.8
Molise	66.4
Campania	70.5
Puglia	79.1
Basilicata	84.1
Calabria	78.3
Sicilia	73.4
Sardegna	81.1
Italy	78.1

Figure 1: Percentage by Region (Source: Istat, 2021)

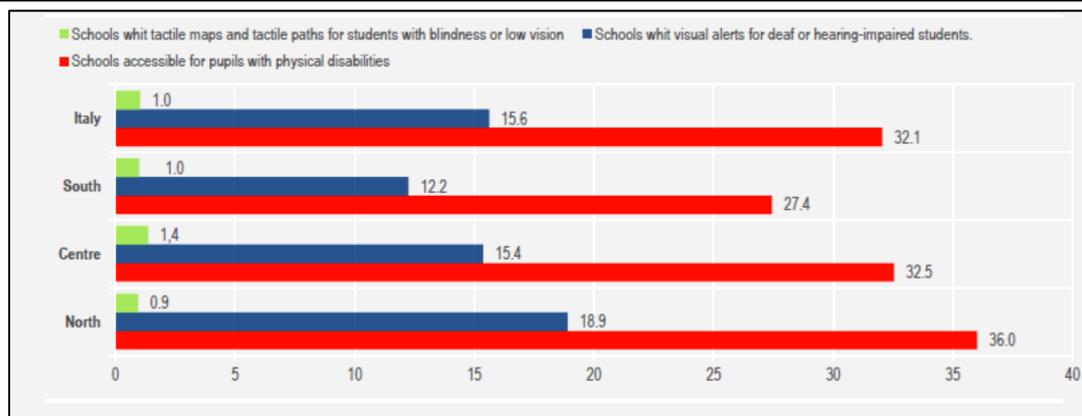


Figure 2: Percentage by Area (Source: Istat, 2021)

2. Technology, inclusion and protection

Being powerful allies of inclusion ICTs have become indispensable at school to support students and teachers, as well as assistive technology devices, including adaptive or alternative input devices, speech synthesis and recognition devices, and specialized software, which can facilitate the inclusion of students with disabilities by making feasible previously difficult or impossible tasks. Teachers can take advantage of software which enables rapid recording and reporting. As these technologies continue to evolve, the potential benefits of educating students in inclusive environments will expand dramatically.

While the potential positive effect of technology on inclusive education is considerable, achieving that potential requires the user's knowledge as well as careful planning and policy-making at both the classroom and school system levels. The important issues that need to be addressed include topics of a different order, including legal issues, etc.

The interest in the use of inclusive technologies for inclusive purposes is therefore marked by a large number of national and international measures and declarations, such as the Salamanca Declaration (1994), signed by 92 countries which agreed on the Core principles for promoting inclusive education (UNESCO, 1994). Or the Report on using Information and Communication Technologies (ICTs) in Education for Persons with Disabilities, which encourages to an increased knowledge of disability assistive technologies, to the need for more funding aimed at developing accessible educational technologies for all, to the involvement of people with disabilities in the regulatory framework, to a substantial investment in teachers' training and in supporting schools to introduce digital instruments. 2003 was the European Year of the Disabled and the White Book on Disability Technologies: An inclusive society was presented in Italy. The publication was the fruit of the work of the Interdepartmental Commission on the development and use of information technologies for the weak and it collects what had been done, but also suggested what still needed to be done for the benefit of people with disabilities. The book contained a number of proposals, including a commitment to activate programs aimed at making the physical environment accessible, granting access

to information and to the world of communication, to increase intelligent and adaptive systems for independence and assistance.

Also in 2004, Law No. 4 Provisions to facilitate disabled people's access to information technology was passed, representing an important piece of legislation for digital democracy and the reduction of the digital divide. Among the various provisions aimed at protecting and granting disabled persons the right to gain access to technology and information in order to overcome forms of social exclusion, there is the one introducing the obligation to grant access to educational and training material in educational contexts at all levels, which also encourages the promotion of training courses in the field of assistive technologies. From a legal point of view, as early as 1998, Bryant and Seay provided a comprehensive summary of the provisions of the law and its implications for people with learning disabilities. This is given by the fact that although ICTs have opened up new worlds of information to students and teachers, they also created various problems for schools and school systems. Maguire (1999) noted several legal risks posed by technology, including possible privacy and open meeting law violations, as well as harassment. For example, students and teachers who regularly create and publish Web pages using computer systems from the school can unknowingly publish private and individual information. Similarly, e-mail exchanges between members of a school group can be a violation of open meeting laws. Indeed, the only indeed way a school system has to avoid such legal issues is a comprehensive and strictly enforced policy for users of school equipment, including the exclusion of the school's liability for the use of its equipment and network.

3. Educational technologies, research and inclusion

Literature on educational technology presents a remarkable conglomeration of several research focuses of recent decades, primarily aimed at examining the effectiveness of integrating hardware devices, such as computers and interactive whiteboards, as well as software into classroom practice. From this point of view, some studies focus on the impact of emerging technologies (such as social media) on learning, and others study the applications of learning theories in developing technology-based learning environments. There is a growing number of research into the use of assistive technologies by students with disabilities, which shows that strategies to remove barriers and/or facilitate success are still lacking, but that that strand of research which strengthens their self-determination and self-management capabilities suggests that although students may have access to resources, the latter are not always adequate or effective (Getzel, 2008; Seale et al. 2015). Furthermore, these studies point out that students with disabilities have a complex relationship with assistive technologies and need support for both relatively simple issues and more complex technologies.

A significant body of research reveals many potentialities for various digital technologies which may be applied to educational settings. However, we would like to summarize this corpus starting from Passey's (2014) considerations on the role of technology-enhanced learning, which provides several implications for extending

research into the use of educational technologies for inclusive purposes. First, Passey's development of a multi-faceted framework demonstrates an alternative and more inclusive way to analyze, examine, and possibly evaluate digital technologies. He notes that too often not enough attention is paid to the specific nature of learning contexts and that the multiple taxonomies associated with key learning factors are excessively simplified. In addition, many educational technologies are examined through actions focused on a single goal with too many hyper-generalized implications for other contexts. Consequently, as digital technologies cannot be interpreted as a panacea for any type of learning challenge, Passey warns that their use should aim to point out the potential of each type of technology, taking into account the specific learning needs and contexts. Pier Cesare Rivoltella (2015; 2019) goes in the same direction when he says that prudence in the use of ICT has to do with balance and awareness, moderation and the sense of limit, with the ability to see far and not only solve everything in the immediate. Whereas therefore, in the years leading up to the digital age, there were few and not enough instruments to allow customization so it was the user who had to adapt to the medium, we are now witnessing a change in the human-device relationship where it is the latter which is adapted to the needs of the former, who increasingly becomes a producer too. In his *Inclusive Technology Enhanced Learning*, Passey (2014) deepens existing research and identifies eight types of digital educational technologies based on how they are used for student learning, that is specific resources and software for specific contents, curriculum-focused software, etc. Then he focuses on these eight types of educational technologies through three perspectives: The first one involves how each type of digital technology is used to develop the student's various skills using a framework which includes multiple skills coming from five learning constructs (i.e., megacognitive, metacognitive, socio-cognitive, social and societal). The second perspective investigates how each type of technology supports twelve distinct groups of students, some of whom face different types of challenges, including cognitive, physical, emotional and geographic. The third one looks at how six types of mediators (i.e. teachers, teaching assistants, parents and guardians, support agents, online advisors and tutors) use various forms of interaction in practice in conjunction with digital technologies. Passey's analyses (2014) basically reveal the contributions and inadequacies of each type of digital technology. According to a view he shares with many scholars, there is hardly any technology able to support all kinds of learning. For instance, an analysis of his shows that a student-centered software at the curriculum level has the strength to guide students in developing cognitive skills but does not have the ability to engage students in social interactions. His analyses of the educational technologies he identified in existing literature highlight the importance of understanding the strengths and weaknesses of each type of technology and the need to select it on the basis of certain learning contexts for inclusive use.

This leads us to say that, as far as technologies and applications are concerned, the different kinds of disabilities must be taken into account. When it comes to supporting for visually disabled students, the facilitation tools share a significant transformation, that is the shift from sheets of paper to electronic paper. Such a change becomes

multimodal, meaning that the tools can be accessed and used in different ways, using different senses to capture information (such as, for example, the spreadsheet can be enlarged, listened to through speech synthesis), be used with Braille reading, etc.) through devices (a software turning reading text into audio files), the Braille display (a device which, when connected to a computer, converts the text on the video to the Braille code), the screen reader (a device that describes the screen content using the Braille display or speech synthesis), the Braille printer. So even visually impaired people will be able to customize the device by changing the computer configuration and using tools such as magnifiers, scanners, optical character recognition systems, audiobooks, e-book readers, or video magnifiers. Different programs and applications support both disciplinary and non-disciplinary learning (for instance, the Linear Access to Mathematics for Braille Device and Audio-synthesis (LAMBDA) program is a computer mathematics writing system which is based on the use of both a Braille display and a speech synthesizer through the Braille Music Editor 2 (BME2) software. Such an instrument allows a blind musician to write musical scores by himself and then check and print them in Braille. The same is true for technologies and applications for hearing impaired students. Facilitation tools share the transposition of an audio track into a visual signal; there are now many software and applications to support teachers and students in their teaching and learning activities; Voice software, for example, are subtitling programs born from the experience of the European Commission's "Voice Project" that aim to expand and improve the communication opportunities of the deaf, and include VoiceMeeting (a live subtitling system), VoiceTranscribe (a Live or delayed transcription) and VoiceReader (a software allowing you to re-read and re-listen to the text generated by the operator's voice to correct any errors). Just a microphone connected to a personal computer or digital audio recorder turns your voice into subtitles. Of great use is the DIZLIS, a bilingual dictionary (Italian to Italian Sign Language (ISL) and ISL to Italian), which allows the sign to be searched starting from a word and vice versa.

4. The perspective of inclusive technologies and Universal Design for All

This interpretative outlook represents a framework for a customized use of inclusive technologies with a view to training based on the Universal Design for Learning emerging in the field of facility accessibility and soon imported into the educational environment from a civil right law which prohibits any discrimination based on disability, that is the Americans with Disabilities Act of 1990. The Universal Design for Learning (UDL) introduces a pedagogical approach to education that focuses on three broad lines of action. These range from the enhancement of diversity to inclusive education and a critical and conscious use of ICTs, to the idea that digital technologies may enable an easier and more effective customization of the students' curricula. It is clear that underlying this idea are the principles that must guide the design of inclusive learning environments, methodologies and technologies, and that implies the fairness, flexibility and ease of use of materials that must be as intuitive and usable as possible by

all students, so to introduce acting strategies inspired by mistake tolerance, systematic use of feedback, etc.

Human factors or ergonomics are important considerations when selecting and using technologies (King, 1999), which include, but are not limited to, the ease of use of a device, the learning curve required for a student to become an expert user, the appearance of the device and any possible danger to the user or bystanders. Human factors become particularly important in inclusive contexts where intrusive or strange-looking devices may cause discomfort to a student with disabilities and/or reluctant to use the equipment. A device that is noisy or requires constant attention from the teacher is obviously undesirable.

This is because the main idea is to allow pupils with special educational needs to learn, making them independent and participative in the tasks. Personal computers, tablets, digital books, media, and the web become tools for self-paced, personalized search and internalized learning.

5. Conclusion

The terms "inclusive education" and "inclusiveness" are variously defined, although the underlying meaning, namely that inclusive education is supported as a means of removing barriers, improving outcomes, and removing discrimination (Lindsay, 2003, Lindsay & Thompson, 1997), cannot be considered sufficient to transform the ability-to-disability relationship (Singal, 2008; Slee, 2009). Educational technologies used for inclusive purposes have sometimes been blamed in educational environments, but it should not be forgotten that, while no factor can mitigate the disadvantage of all students with disabilities, technologies are a potential tool for improving inclusion. Any technology that extends the range of learning experiences offered to students in favour of a possible wider impact on inclusiveness can only be appreciated from the educational point of view (alternative interfaces such as screen readers, display tools, reading, recording, planning and organization and communication tools, etc.). Assistive technologies provide greater access to learning activities, support individual study success, and enable supporting activities for their ability to challenge trite speech about "skills".

The values of inclusion must find a solid translation into the educational choices, starting with the adaptation of the environment, which doesn't benefit only a single student but many of them, relying on tools of a different order, such as multi-sensory devices ensuring greater accessibility to information and strengthening autonomy. The lack of clarity and guidance as to which assistive technologies are required and/or necessary for students with disabilities or how they can use the resources available to them seems to be shared. However, ICTs are powerful mediating processes in the student-teacher relationship, when the notion of deficit gives way to the enhancement of strengths through a flexible, integrated and context-adapted didactic intervention. Relevant examples are referred to in the case of robotic technologies. Therefore, it is a matter of replacing the "compensatory" logic with the "inclusive" logic, which works on

the context and class group, in order to consider the individual as a whole. Inclusive education through technology allows for the rethinking of education processes without discrimination, focusing on those favorable educational conditions which facilitate the learning of each pupil and make the classroom an environment for the promotion of each pupil's characteristics.

Conflict of Interest Statement

The author declares no conflicts of interest.

About the Author

Fabio Orecchio holds PhD in Economics and Law, University of Enna "Kore"; he deals with problems related to disability, social inclusion and the conditions related to the recognition of fragility to define to develop prevention models in the educational field, also with reference to the dimension of legal protection. ORCID <https://orcid.org/0000-0002-3219-6031>.

References

- Battenberg, J., & Merbler, J. B. (1990). Touch screen versus keyboard: a comparison of task performance of young children. *Journal of Special Education Technology*, 10(1), 24-28.
- Braaten, S. (1998). *Behavioral objective sequence*. Champaign, IL: Research Press.
- Braaten, S., & Merbler, J. B. (1998). *Behavioral objective sequence reports*. Champaign, IL: Research Press.
- Bryant, B. R., & Seay, P. C. (1998). The technology-related assistance to individuals with disabilities act: relevance to individuals with learning disabilities and their advocates. *Journal of Learning Disabilities*, 31(1), 4-15.
- Bryant, P. B., & Bryant, B. R. (1998). Using assistive technology adaptations to include students with learning disabilities in cooperative learning activities. *Journal of Learning Disabilities*, 31(1), 41-54.
- Getzel, E. (2008). Addressing the persistence and retention of students with disabilities in higher education: incorporating key strategies and supports on campus. *Exceptionality*, 16(4), 207-219. doi: 10.1080/09362830802412216
- Kincaid, C. (1999). Alternative keyboards. *Exceptional Parent*, 29(2), 34-37.
- King, T. W. (1999). *Assistive technology: essential human factors*. Allyn and Bacon: Boston.
- Lewis, R. B. (1998). Assistive technology and learning disabilities: Today's realities and tomorrow's promises. *Journal of Learning Disabilities*, 31(1), 16-26.
- Lindsay, G. & Thompson, D. (1997). Values and special education. In G. Lindsay & D. Thompson (Eds.) *Values into practice in special education* (pp. 2-14). London: David Fulton Publishers.
- Lindsay, G. (2003). Inclusive education: a critical perspective. *British Journal of Special Education*, 30(1), 3 -12. doi: 10.1111/1467-8527.00275

- MacArthur, C. A. (1996). Using technology to enhance the writing processes of students with learning disabilities. *Journal of Learning Disabilities*, 29(4), 344-354.
- MacArthur, C. A., Graham, S., & Swartz, S. (1991). Knowledge of revision and revising behavior among learning disabled students. *Learning Disability Quarterly*, 14, 61-73.
- MacArthur, C. A., Graham, S., & Swartz, S. (1993). Integrating word processing and strategy instruction into a process approach to writing. *School Psychology Review*, 22, 671-681.
- Maguire, B. D. (1999, March). Legal potholes on the information superhighway. Paper presented at the 1999 Principals' Joint Technology Leadership Seminar, Minneapolis.
- Male, M. (1994). *Technology for inclusion: Meeting the special needs of all students*. Allyn and Bacon: Needham Heights, MA.
- Merbler, J. B. (1990). Advanced logo: Teachers and artificial intelligence. *American Annals of the Deaf*, 135(5), 379-383.
- Murdaca, A. M., Fabio, R. A., & Capri, T. (2018). The use of new technologies to improve attention in neurodevelopmental disabilities: new educational scenarios for the enhancement of differences. *International Journal of Digital Literacy and Digital Competence*, 9(4), 46–57. <https://doi.org/10.4018/IJDLDC.2018100104>.
- Passey, D. (2014). *Inclusive technology enhanced learning overcoming cognitive, physical, emotional, and geographic challenges*. London: Routledge.
- Rivoltella, P. C. (2015). *Le virtù del digitale. Per un'etica dei media*. Brescia: Editrice Morcelliana s.r.l.
- Rivoltella, P. C. (2019). *Media education. Idea, metodo, ricerca*. Milano: Mondadori.
- Seale, J., J. Georgeson, C. Mamas, & Swain, J. (2015). Not the Right Kind of 'Digital Capital'? An Examination of the Complex Relationship between Disabled Students, Their Technologies and Higher Education Institutions. *Computers & Education*, 82, 118-128. doi: 10.1016/j.compedu.2014.11.007.
- Singal, N. (2008). Working towards inclusion: reflections from the classroom. *Teaching and Teacher Education*, 24, 1516 -1529. doi: 10.1016/j.tate.2008.01.008.
- Slee, R. (2009). Travelling with our eyes open: models, mantras and analysis in new times. In M. Alur & V. Timmons (Eds.), *Inclusive Education Across Cultures: Crossing Boundaries, Sharing Ideas* (pp. 93-109). New Delhi: Sage.
- UNESCO (1994). *The Salamanca Statement and framework for action on special needs education*. Paris: UNESCO.

Creative Commons licensing terms

Authors will retain the copyright of their published articles agreeing that a Creative Commons Attribution 4.0 International License (CC BY 4.0) terms will be applied to their work. Under the terms of this license, no permission is required from the author(s) or publisher for members of the community to copy, distribute, transmit or adapt the article content, providing a proper, prominent and unambiguous attribution to the authors in a manner that makes clear that the materials are being reused under permission of a Creative Commons License. Views, opinions and conclusions expressed in this research article are views, opinions and conclusions of the author(s). Open Access Publishing Group and European Journal of Special Education Research shall not be responsible or answerable for any loss, damage or liability caused in relation to/arising out of conflict of interests, copyright violations and inappropriate or inaccurate use of any kind content related or integrated on the research work. All the published works are meeting the Open Access Publishing requirements and can be freely accessed, shared, modified, distributed and used in educational, commercial and non-commercial purposes under a [Creative Commons Attribution 4.0 International License \(CC BY 4.0\)](https://creativecommons.org/licenses/by/4.0/).