

FROM DIGITAL LEARNING TO ARTIFICIAL INTELLIGENCE. THEORETICAL OBSERVATIONS FOR A MORE INCLUSIVE ITALIAN SCHOOL SYSTEM

DALLA DIDATTICA DIGITALE ALL'INTELLIGENZA ARTIFICIALE PER UNA SCUOLA PIU' INCLUSIVA. RIFLESSIONI TEORICHE



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ABSTRACT

The present effort is an in-depth analysis of inclusion in Italian schools in the light of the digital learning opportunities and the new AI prospects, with a view to understanding how radical innovations can contribute to adequately face special educational needs and inequality and discrimination issues. One crucial aspect of educational research in the past few years has been inclusivity at school, as the conceptual UDL paradigm suggested. In order to establish a proactive educational process, a reconsideration and redesigning of the learning environment and a reconfiguration of classroom contexts and settings are indeed the top priorities of the moment. The combination of digital learning and intelligence at school will contribute to the creation of inclusive teaching-learning routes in line with the pupils' various learning styles.

Il contributo approfondisce il tema dell'inclusione alla luce delle opportunità offerte nel contesto educativo dalla didattica digitale e, oggi, dall'Intelligenza Artificiale, per comprendere come innovazioni radicali possano concorrere ad affrontare bisogni educativi speciali e situazioni di disuguaglianza o marginalità. Uno degli aspetti fondamentali della ricerca educativa degli ultimi anni è rappresentato, infatti, dal tema di una scuola inclusiva, così come suggerito dal paradigma concettuale dell'Universal Design for Learning. La priorità è dunque ripensare e riprogettare gli ambienti di apprendimento e riconfigurare i contesti ed i setting d'aula al fine di realizzare un processo di apprendimento proattivo. Contestualmente, l'utilizzo di didattiche digitali, rafforzate dall'uso dell'intelligenza artificiale, produrrà percorsi di insegnamento-apprendimento inclusivi, allineati con gli stili d'apprendimento degli alunni.

KEYWORDS

Italian school, Inclusion, Digital Education, Artificial Intelligence, Universal Design for Learning.
Scuola italiana, inclusione, didattica digitale, intelligenza artificiale, Universal Design for Learning.

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Introduction

The developments of digital innovation in the educational field are manifold, as are the prospects to explore regarding the risks as well as the potential that new technologies entail in pedagogical and didactic practices.

One of the fundamental issues in educational research in recent years is represented by the theme of inclusive education (Ianes & Canevaro, 2016; Canevaro & Ianes, 2023), as suggested by the pedagogical paradigm of Universal Design for Learning (UDL), capable of ensuring the development of each student's peculiarities and potential by offering adequate and effective responses to all (CAST 2011; 2018).

Alongside this model of schooling, which implies calibrating education to the specific characteristics of each individual, including the category of Special Educational Needs, there is a growing reflection on the real possibility of inclusion through a didactics that takes into account the digital and Artificial Intelligence, to understand how these technologies could impact the future prospects of students (Rivoltella, 2020).

In particular, the acquisition of digital skills can represent a resource capable of promoting high-quality inclusion in school, favoring the emergence of increasingly innovative, inclusive, and engaging educational environments that can seamlessly combine educational needs and technological innovation.

Moreover, the evolution of Artificial Intelligence could, for students with disabilities, make inclusion a decisive and crucial opportunity for the realization of their life projects, promoting the development of autonomy (Fabiano, 2023).

The new dimension of the educational process centered on the blend of educational action and digital action is highlighted by the constant development of computer and multimedia technologies in which virtual reality can reproduce sensations and emotions, making it possible – even for those with Special Education Needs – to face new experiences and compensate for their deficits by drawing on personal resources in a divergent way (Aiello, 2016).

In a world where the real and virtual are now integrated, an evaluation of the opportunities and challenges offered in the school context by the use of technological resources that simulate human capabilities becomes all the more appropriate, potentially opening new scenarios to ensure the participation and involvement of every student as the protagonist of their growth process

1. Digital Didactics in Italian Inclusive School

Although the Italian school system represents one of the most mature educational systems for embracing a sensitive approach to diversity, inclusion remains an extremely challenging model to achieve since it implies the ability of a context to be prepared and predisposed to welcome everyone, including people with Special Educational Needs, regardless of whether they are present within it or not.

The possibility of accommodating students with their specificities, their potential, and their educational needs, including special ones, depends mainly on the need to rethink the school environment and the curriculum from a universal perspective that overturns the concept of disability and focuses on curricular design from an inclusive point of view (Sgambelluri, 2020).

Often, we forget that each student is profoundly different from the others, giving everyone the same explanation, the same tools, the same learning methods, without considering that each person's specificities should be enhanced while maintaining the diversity of educational processes (D'Alonzo & Monauni, 2021).

The consequence of a progressive focus on creating adequate environments for study and participation in school and social life is currently represented by the application in school practices of the ICF bio-psycho-social model (WHO, 2001; 2007; 2017), an approach that recognizes diversity as a possible condition of every human being and represents the cultural innovation of recent decades in the effort to build a model of inclusive schooling.

The ICF (International Classification of Functioning, Disability, and Health) is considered an "ecological" approach (Ianes et al., 2021) and is a classification that aims to promote the inclusion of people with disabilities by designing learning environments that can determine specific opportunities for integration and welcome for everyone. Based on this principle, "human functioning" reconsiders the conception of the person with special educational needs, looking at disability as the result of the relationship between the subject's health condition and the social environment in which they live.

In this perspective, an aspect that can enrich the issue of inclusion, with particular reference to the inclusion of students with disabilities, is surely represented by the role of digital didactics and reflections on the learning modes of people with special educational needs even in a context, such as that of the future school, increasingly based on the use of technological resources and applications of Artificial Intelligence.

The new knowledge supporting an educational approach focused on the use of digital tools today can intertwine with the theoretical framework underlying inclusion and the concept of *capability* (Nussbaum & Sen, 1993), a term that

represents the most pedagogically significant expression of the concept of unexpressed potential, inherent in each person in their diversity (Fabiano, 2022). If it is true that "...differences are normal, they are the biodiversity that enriches ecosystems where learning and relationships occur..." (Canevaro & lanes, 2023, p. 10), an inclusive school requires teaching that considers a constant dialogue between individualization and personalization and, at the same time, seeks to enhance the contribution of all those tools that can help meet the new needs of teaching, related to the need to address the specific educational needs of each student.

Indeed, within the school environment, digital didactics enhance learning facilitation processes, allowing barriers to accessibility for people with disabilities to be broken down or limited through greater customization of paths, as well as stimulating participation, curiosity, and creativity, thereby bringing to light capacities of learners that were previously submerged.

Studies on digital didactics (Ferri & Moriggi, 2018; Rivoltella & Rossi, 2019; Sibilio, 2020) in recent decades have highlighted the rise of a new didactic paradigm that could help us better understand the contribution of inclusive digital didactics to the educational process of individuals with disabilities.

The learning of a student with special educational needs is primarily an expression of a difficult self-perception of one's identity and the relationship with others, but, especially AI, could specifically favor the recognition of one's body identity and the distinction between real and virtual as a fundamental measure to make one's learning tailored to oneself and others (Fabiano, 2023).

The school, a place of possibilities, imagination, and creativity, cannot be a mere spectator of the great digital revolution, especially when its primary goal, as in the case of disabilities, is social inclusion. It is now clear that the cornerstone of adult integration is certainly their insertion in the social context. Thus, it is essential, for the development of digital technologies, to think more and more about their accessibility, as they can intervene significantly to promote inclusion not only in educational contexts but also in social and work contexts.

The educational dimension centered on the connection between learning and digital evolution can definitely represent added value to better understand the characteristics of individuals with disabilities and, above all, guarantee the involvement of each subject with a primary role in their own growth process.

The use of new technologies can also be a valuable support for teachers to facilitate learning and integration processes, highlighting how the resources of the digital world, in addition to the immediate practical impact on the learning of students with special educational needs, can be important tools for the

construction of more complex pathways of education and inclusion. The latter, in fact, cannot be only conceived within the school classroom but should aim for a broader vision of education to define a more personalized life project that is responsive to the needs of the individual, allowing them to improve the quality of their life, develop all their potential, and lead a life under conditions of equal opportunities compared to others.

2. Digital Didactics in the Perspective of Universal Design for Learning

An approach that can effectively support the implementation of digital didactics is Universal Design for Learning (UDL), considered a possible model for the construction of a fully inclusive curriculum in Italian schools.

In the early '90s, Universal Design for Learning was addressed in the pedagogical field by CAST (Center for Applied Special Technology), which defined it as an innovative approach to didactic design founded on the idea that diversity characterizes the norm in knowledge processes and that this diversity must be met, from the outset, with a flexible didactic offering (CAST, 2011; 2018).

Universal Design for Learning hence helps develop didactic strategies capable of coping with student variability, based on flexibility and personalization in objectives, methods, materials, and evaluation system to meet the needs of each student. It is a mode of design and management of didactic practice attentive to the different learning possibilities and conditions that can arise in various contexts, with the main objective of creating products and educational environments accessible to all.

The paradigm of Universal Design for Learning sets forth "...a set of principles for the design and development of paths that propose equal learning opportunities to all individuals [...] not a one-size-fits-all solution [...] but the use of flexible approaches that can be personalized and adaptable for the individual needs of each student..."(Savia, 2016, p.23).

This pedagogical paradigm acting on the forms of production, communication, and fruition of contents prompts a rethinking of teaching to render it suitable for each person in the most extensive measure possible, without the need for adaptations or specialized designs", following the model of Universal Design encouraged by the UN Convention on the Rights of Persons with Disabilities in the design of environments, products, programs, and services (ONU, 2006).

As is also suggested by the user-centered (Norman, 2005; Benyon, 2010) design model and the methodology of Universal Design applied to the complexity of

educational contexts (Rose & Meyer, 2002), one must explore the real needs of users to design appropriate learning environments. Specifically, it is necessary to investigate the uses and perceptions of technologies for education and identify, from both direct and indirect users, the characteristics that digital tools must have to be functional to inclusive didactics.

The CAST (2011) has established three foundational assumptions underlying UDL (CAST, 2018) as an inclusive, flexible, and fair educational journey through which to ensure all students the possibility of reaching remarkable learning standards by offering a variety of different tools for representing information, action and expression of knowledge, as well as engagement and motivation.

The *first* principle corresponds to the why of learning: a practical example related to this principle is the explicit acquisition of control strategies through which one can autonomously regulate their behavior or self-regulate during moments of deadlock or difficulty in an activity or project that is already underway.

The *second* principle concerns the what of learning: an example of this principle is the use of digital books with expansions where the written content is associated with a file characterized by auditory and visual information activated by students.

The *third* principle is the how of learning: a practical example related to this principle can be associated with the autonomous decision of the student to present their research orally rather than in writing, iconically rather than in video format.

From the didactic application of these principles, it emerges that the goal of the Universal Design for Learning paradigm is to support educators in developing inclusive curricula that ensure all students equal opportunities for learning.

3. The Development of Digital Didactics through Artificial Intelligence for the Design of Inclusive Contexts

The recent advent of artificial intelligence (AI) has revolutionized numerous sectors, including education. The use of AI in schools offers the opportunity to personalize learning by adapting it to the specific needs of students and promoting an inclusive educational environment (Fabiano,2022) it also offers various potentials to enhance the learning experience. Through data analysis, AI can identify the strengths and weaknesses of each student, allowing teachers to adapt lessons more effectively. Furthermore, AI-based tutoring systems can provide personalized support to students, offering explanations and additional resources when needed. AI can also facilitate student assessment, using algorithms to assess their progress more accurately and objectively.

The integration of artificial intelligence into schools has seen significant developments, with particular attention to the fields of machine learning and deep learning (Panciroli & Rivoltella, 2023). Machine learning, a branch of AI that develops algorithms capable of learning from data, has allowed the creation of systems capable of analyzing large amounts of information to identify patterns and trends in student learning. For example, machine learning algorithms are used to personalize each student's learning path by adapting educational materials and activities to their specific needs.

On the other hand, deep learning, a more advanced branch of machine learning based on deep artificial neural networks, has opened up new possibilities in the analysis of complex educational data. These neural networks can automatically extract relevant features from data, allowing for more accurate and sophisticated results in student assessment and predictions of their future performance. Additionally, deep learning has led to significant advancements in the automatic generation of educational content, such as the production of texts, images, and educational videos.

In summary, the application of machine learning and deep learning in schools is radically transforming how teachers and students interact with educational content, opening up new opportunities for more personalized, effective, and engaging learning.

A crucial aspect of using AI in schools is its ability to promote the inclusion of students with disabilities. Thanks to personalized learning, AI can adapt educational materials and activities to meet the specific needs of students with disabilities or special educational needs. For example, AI-based learning systems can provide visual or auditory support for students with learning difficulties, thereby improving their access to the curriculum.

However, the adoption of AI in the educational context also raises various ethical and practical challenges. One concern is the privacy and security of students' personal data, as AI collects and analyzes a vast amount of information about students. Furthermore, there is a risk of exacerbating existing inequalities, as students with limited access to technology may be disadvantaged compared to their more privileged peers. It is essential to address these challenges to ensure the responsible and equitable use of AI in schools (Rivoltella, 2020).

To mitigate the challenges associated with the use of AI in schools, it is necessary to adopt responsible and inclusive approaches. This includes transparency in the use of AI and the protection of student privacy through robust data management policies. It is also important to ensure fair access to technology, providing resources and support to students from disadvantaged socioeconomic

backgrounds. Moreover, it is essential to involve teachers in the design and implementation of AI-based solutions, ensuring that these are tailored to the specific needs of their classes and students.

Among the various applications that can be implemented through a digitally-oriented didactics, a fundamental role is played by the possibility of customizing learning environments by adapting educational materials and activities to the specific needs of each student and by the possibility of developing artificial tutoring that constantly guides the student by providing additional resources tailored to their requests. Furthermore, other possible uses of AI with useful implications for improving the teaching/learning process can be identified with predictive analysis, enabling the identification of learning patterns and the prediction of students' future performances, allowing teachers to intervene proactively (Baker & Siemens, 2014). Additionally, teachers could use AI to generate new educational materials, such as structured tests, lessons, and audio-video materials in line with the student's learning style.

Finally, another area of development thanks to the use of AI is represented by the design and creation of new high-performance learning environments (Castoldi, 2020) through the use of digital technologies, a sort of Didactics for Digital Learning Environments, *Digital DADA*, in which artificial intelligence would serve a dual function, guiding the creation and modulation of the environment and, at the same time, serving as a facilitating tool for both teachers and students in the production and improvement of internal dynamics within the teaching/learning context.

Conclusions

The synergy between inclusion, digital didactics, UDL, and artificial intelligence is revolutionizing educational practices. Through technology and the use of digital didactics, we can personalize learning for each student, ensuring an inclusive and accessible environment for all.

The UDL approach offers a flexible framework for adapting educational materials, while artificial intelligence can analyze data to identify the specific needs of students and offer personalized support. This combination opens doors to a more equitable and engaging educational future for all.

It is essential, for the development of digital technologies (Lazzari, 2017) to think not only about usability but increasingly about their accessibility (Rivoltella, 2020), as they can intervene significantly to promote greater inclusion not only in educational contexts but also in social and work contexts.

The perspectives offered by the use of AI can broaden the impact on the cognitive and metacognitive processes of students and teachers (Alam, 2022); they can also have an important function in the analysis of future prospects of a student, suggesting points of reflection to all stakeholders regarding the different orientation and care pathways in an inclusive perspective.

In conclusion, it is of great importance to ensure that people with disabilities can participate in technological innovation processes, including through the training of teachers prepared from a didactic, pedagogical, and sociological standpoint, as it is evident that the connection between teaching action, digital action, and AI evolution could determine the construction of a new paradigm to achieve a truly inclusive school. Ultimately, the synergistic integration of inclusion, digital didactics, UDL, and artificial intelligence in educational practices not only offers unprecedented opportunities to personalize student learning but also demonstrates the potential to reduce disparities in education, potentially improving current disparities and early dropout rates, addressing the phenomenon of NEET (Mussida & Sciulli, 2018).

Evidence from practices already in place in various educational realities and contexts has highlighted that an approach based on UDL supported by artificial intelligence can significantly improve the accessibility and effectiveness of teaching, enabling educators to meet the diverse needs of students. This approach not only promotes equality of educational opportunities but can also improve academic results and student well-being, better preparing them to face the challenges of the modern world. The ongoing research and implementation of these methodologies represent a significant step towards a more inclusive, fair, and effective educational system for all students.

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