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Assessing the Impact of AI in Schools to Promote Inclusion

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Abstract: It is the duty of educational institutions to help students with disabilities overcome difficulties in participating in classroom activities. Assistive technologies based on Artificial Intelligence (AI) offer essential support for ensuring inclusive and equitable learning environments, finally giving substance to the institutions' policy project for young people. This article identifies AI-based tools and technologies for inclusive education. It also explores the factors necessary for developing learning plans using AI to enable personalized learning. This study was conducted during the 2024-25 school year in a lower secondary school and involved 178 students (divided into a control and experimental group) and 45 teachers. A system model that includes engagement and adaptive learning components is proposed. Bloom's Taxonomy (revised: RBT) was used to continuously monitor student development. AI-based tools and technologies for inclusive education were defined, and key factors for organizing personalized learning plans were identified. The findings highlight that AI-based inclusive education has the potential to enhance the educational experiences of students with disabilities, creating an equitable and inclusive learning environment

Keywords: teaching-learning; Artificial Intelligence; inclusion.

1. Introduction

The cultural journey designed to guide European political institutions toward an inclusive school project officially began with the commitment expressed in the Salamanca Declaration (UNESCO, 1994). At that World Conference on Education and Special Needs, representatives of 92 governments and 25 international organizations, meeting in Spain from June 7 to 10, 1994, affirmed their commitment to education for every young person, not only with respect to standard educational needs but especially for children, youth, and adults with «special educational needs».

At that meeting in Spain, political action gave rise to the Action Plan for Education and Special Educational Needs, to favor each child as capable of unique

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characteristics, interests, predispositions, and learning needs. The time had come for educational systems and curricula to be designed to consider the variety of characteristics and needs of everyone.

The educational premises thus guided political and educational action, favoring a child-centered pedagogical system capable of combating discriminatory behavior, creating welcoming communities, and building an inclusive society.

«Schools should welcome all students regardless of their physical, intellectual, social, linguistic, or other conditions. This should include students with disabilities, as well as exceptionally gifted students, street children and working children, children from nomadic populations or distant immigrants, children from linguistic, ethnic, or cultural minorities, and children from other disadvantaged and marginalized areas or groups» (Salamanca Declaration, UNESCO, 1994, 6).

It was no longer a question of considering diversity as a way of being worthy of dignity and ethical consideration, but of a robust intervention plan to enhance and make the contribution of each child socially beneficial, considering a complex reality that can no longer be managed according to predictable and, therefore, pre-packaged operational models.

Bringing diversified intelligence meant enabling solutions to the unpredictable problems that entering the new millennium could represent.

The concept of "special needs" was added to that of "inclusive education" in the Luxembourg Charter (1996) - A School for All, which specified that:

«Inclusive education requires flexible education systems that respond to the diverse and often complex needs of individual students» (p. 4).

It is important to note that the efforts made by the business community are well-known. The educational design of the European Round Table of Industrialists – ERT (Gargiulo, 2012) was officially translated into a European policy framework during the so-called Bologna Process of June 29, 1999, a series of ministerial meetings and agreements between European countries to ensure the comparability of educational standards and the quality of higher education qualifications. The Joint Declaration, signed by twenty-five European education ministers in Bologna, followed the suggestions on higher education introduced by the Lisbon Convention and the impetus provided by the Sorbonne Declaration:

«We are moving into a period of major changes in education and work conditions, toward a diversification of professional career paths, with lifelong education and training becoming a clear obligation. We owe our students, and our society at large, a higher education system that offers them the best opportunities to seek and find their own fields of excellence. An open European area for higher education brings with it a wealth of positive prospects, naturally respecting our

diversity, but it also requires continued efforts to remove barriers and develop a framework for teaching and learning that enhances mobility and ever closer cooperation» (Sorbonne, 25-05-1998).

The inclusion process was driven by political propositions of a social and ethical nature, but also by a socially beneficial return, including economics. As underlined in the Lisbon Memorandum of 2000, education and training for all citizens represents the first step because «the ability to find and keep a job, consequently, constitutes an essential dimension of active citizenship, but is also the decisive premise for achieving full employment, for improving Europe's competitiveness and ensuring its prosperity in the "new economy"» (p.6).

2. Artificial Intelligence and Inclusion

The use of Artificial Intelligence supports the commitments to enhancing diversity and inclusion. The availability of more accessible, inclusive, and personalized cultural initiatives in education is redefining the way we respond to specific needs and provide support and knowledge to everyone, as it can personalize educational processes more meaningfully and effectively, adapting to the specific needs of each student.

Artificial Intelligence is redefining the paradigms of educational personalization, emerging as a tool capable of adaptively reconfiguring the teaching-learning process toward true, differentiated and universally designed inclusiveness.

First, AI enables personalization based on individual prerequisites. Through machine learning algorithms and predictive analysis of learning data (learning analytics), intelligent systems can map everyone's prerequisite knowledge graph —that is, what that individual knows— in real time. At the same time, the individual's learning gaps can be identified to offer optimal conceptual sequences and more effective consolidation trajectories for that specific cognitive profile.

This approach goes beyond the traditional linear and uniform curriculum progression, replacing it with dynamic scaffolding that adapts to each student's Vygotskian Zone of Proximal Development.

In this way, the AI does not simply "offer content," but constructs coherent and hierarchically sensible preparatory pathways. This reduces the risk of frustration with the outcome and/or content, and reduces the risk of dropping out, which often affects students with learning delays or atypical profiles.

Second, generative and multimodal AI technologies (Large Language Models, advanced speech recognition systems, facial expression and digital behavior analysis) enable students to recognize and respond contextually to the different special

educational needs, prevalent cognitive styles (visual, auditory, kinesthetic, logical-mathematical, etc.), and metacognitive preferences of each young person.

This capability is enabled by the student's dynamic multimodal profile, continuously updated by AI, which integrates explicit data (responses to tasks, processing times, representational modality choices) and implicit data (attention patterns, engagement levels deduced from interactions, semantic analysis of the texts produced).

The result is a reactive and proactive learning environment, capable of modulating language complexity, information density, presentation pace, feedback modalities, and even narrative scenarios or conceptual metaphors depending on the subject (Pagliara, Bonavolontà & Mura, 2024).

We could say that AI is like a teacher who offers students content that is sequentially logical, cognitively necessary, and appealing based on their enjoyment.

This is the crucial aspect: creating an accessible environment for all learning.

AI concretely implements the principles of Universal Design for Learning (UDL) (CAST, 2018), offering multiple opportunities for engagement, multiple representation strategies, and multiple tools for action and expression.

AI achieves effective universal accessibility (Meyer, Rose & Gordon, 2015) thanks to advanced text-to-speech tools, expressive speech synthesis, automatic vocabulary simplification, contextual translation into sign language or facilitative symbols, generation of interactive concept maps, adaptive simulations, and adaptive interfaces: all of this forms an ecosystem that breaks down architectural, sensorial, linguistic, and cognitive barriers.

AI also recognizes and values what each student brings with them, without even realizing it: a distinct way of being made up of diverse prior experiences, unique abilities, motivational preferences, and specific challenges.

This recognition is not merely technical knowledge, but possesses profound anthropological and ethical value: theoretically, AI represents valorization and induces the unleashing of everyone's potential and talents, promoting both social inclusion and productivity.

3. AI and Diversity

As emphasized by the World Health Organization in the International Classification of Functioning, Disability and Health (ICF) (WHO, 2001; updated 2013 edition for children), disability cannot be reduced to an intrinsic and inalienable deficit, but is the result of social interaction, health conditions, and environmental factors.

Therefore, if AI were calibrated with pedagogical wisdom, it could act as an enabling environmental factor, modifying the context to reduce barriers to participation and enhance residual and potential capabilities (Nussbaum, 2011; Sen, 1999).

Finally, attention to individual specificities represents an act of ontological recognition and educational justice. It is in line with the UN Convention on the Rights of Persons with Disabilities (2006), particularly Articles 24 (Education) and 9 (Accessibility), which require states to ensure an inclusive education system at all levels, valuing cultural, linguistic, and gender identity and preventing discrimination. Personalization through AI, when guided by the ethics of care and the capabilities paradigm (Capability Approach), defines development and well-being not based on income, but on the real opportunities (capabilities) and achievements (functionings) of individuals (Nussbaum, 2011; Sen, 1999).

It should foster the ability to choose how to enhance one's life, not only professionally; education ceases to be a mere technical optimization to become a practice of valorizing human uniqueness and socially transforming the educational experience (Biesta, 2013; Pagliara, Bonavolontà & Mura, 2024).

In short, the thoughtful and critical adoption of AI in teaching not only increases efficiency but also heralds the possibility of an inclusive digital humanism in which technology, rather than standardizing—as Chaplin did in the film Modern Times—amplifies the uniqueness of each learning path, creating an education that is certainly transformative, modular, and flexible (Zurru, 2022), but, above all, personalized and equitable.

4. AI User Experience

Starting from the assumption that students with disabilities may encounter difficulties participating in classroom activities, the use of AI-based assistive technologies was motivated, as they can provide essential support and ensure inclusive and equitable learning environments.

The starting point was several key principles in managing AI:

1. Transparency: algorithms must be understandable and accessible, so that machine decisions can be verified. This approach not only strengthens user trust but also allows programmers to identify and correct any hidden biases in systems.

2. Accountability: who should be held accountable for the errors made by an algorithm? Establishing a clear chain of accountability is essential to avoid gray areas that risk leaving sensitive issues unresolved, especially when AI decisions have a direct impact on people's lives.

3. Justice: algorithms must be designed to avoid discrimination and inequality, using representative and bias-free data. Systems must be trained without bias, as the

risk is that existing social injustices will be consolidated and amplified; it is necessary to ensure that benefits are distributed equitably.

AI-based tools and technologies for inclusive education were subsequently identified in relation to the factors necessary for developing personalized learning plans using the digital environment to enable a type of learning suited to the needs explored.

This study was conducted during the 2024-25 school year in a lower secondary school and involved 178 students (divided into a control and experimental group) and 45 teachers.

A system model was proposed that includes engagement and adaptive learning components.

Measurable, objective data, as well as qualitative elements, were used to measure the process; the evaluation aimed not only at aspects related to cognitive progress but also at assessing engagement and the perception of a sense of inclusion.

To this end, Bloom's Taxonomy (revised: RBT) was used to continuously monitor student development. AI-based tools and technologies for inclusive education were defined, and key factors for organizing personalized learning plans were identified.

Questionnaires based on the Likert scale (Marradi & Gasperoni, 2002) and standardized tests (based on RBT) were developed and calibrated based on the frequent interviews and observations.

1	Strongly disagree
2	Slightly disagree
3	Neither agree nor disagree
4	Somewhat agree
5	Completely agree

Section 1	**Relationship and respect**
	I feel respected by my classmates
	Teachers treat all students equally
	I can express my opinions in class without fear of being judged
Section 2	**Partecipation and involvement**
	I have the same opportunities to participate in school activities as others
	I feel encouraged to participate in class discussions
	Activities are organized so that everyone can contribute
Section 3	**Support and well-being**
	f I have difficulties, I know who to turn to at school
	Teachers are committed to helping those with different needs
	I feel safe and welcomed in school
Section 4	**Diversity and valuation**
	Cultural, linguistic, and personal differences are valued at school
	I learn new things thanks to the experiences and stories of my classmates
	School rules respect everyone's needs

Tab. 1-2, *Likert scale questionnaire for inclusion and answers.*

Cognitive ability		Learning Activities	Assessment Tests
1	**Remember**	Recall previously acquired facts and data	True or False, Fill-in-the-blank, Multiple Choice
2	**Understand**	Understand facts and ideas by organizing, comparing, translating, and interpreting them	Comprehension Tests: Multiple Choice
3	**Apply**	Solve problems related to one context using knowledge acquired in another context	Transfer Tests: Project, Research
4	**Analyze**	Examine information by identifying causes, making inferences, and finding supporting evidence	Logical Thinking Tests, Case Studies
5	**Evaluete**	Express judgment and defend your opinion based on a set of criteria	Critical Thinking Tests, Peer Assessment
6	**Create**	Create something original: combine information in a different way or propose alternative solutions to a problem	Prototype Creation, Original Presentation

Tab.3, *Revised Bloom's Taxonomy - RBT (Anderson e Krathwohl, 2001) hierarchical levels of learning*

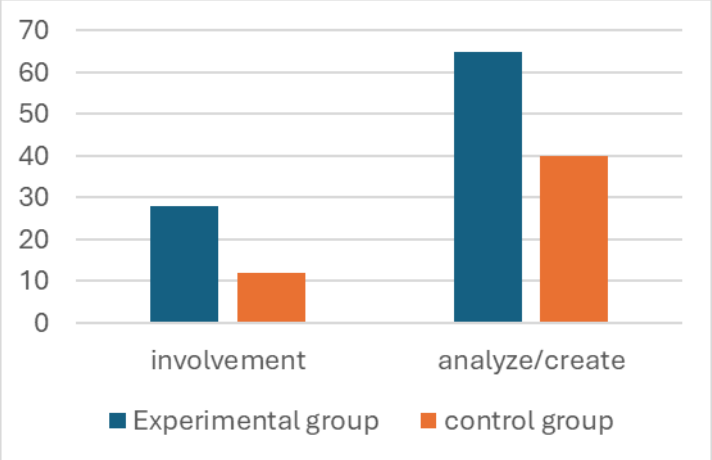
5. Statistical Data Analysis

The 178 students were divided into two groups, as homogeneous as possible and of equal size, one of which received traditional teaching, accompanied by teachers less inclined to introduce AI tools.

The data collected (Viganò, R., 1999). Quantitative Methods in Educational Research. Italy: Life and Thought) were analyzed according to the parameter offered by the Student's t-test with related samples to compare groups (JMP Statistical Discovery, n.d.).

Analysis of Variance with the multiple variables procedure was also considered (Vardanega, n.d.).

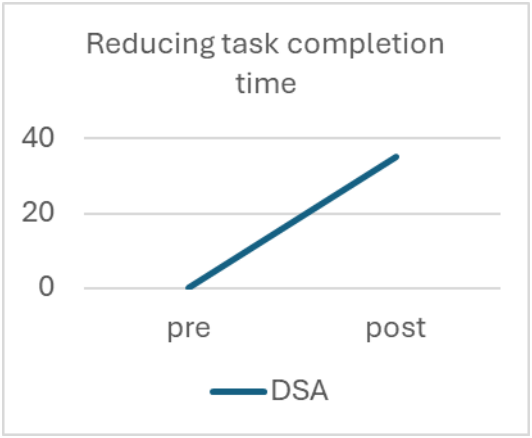
The software used was SPSS (Statistical Package for the Social Sciences) (Kent State University Libraries, n.d.).



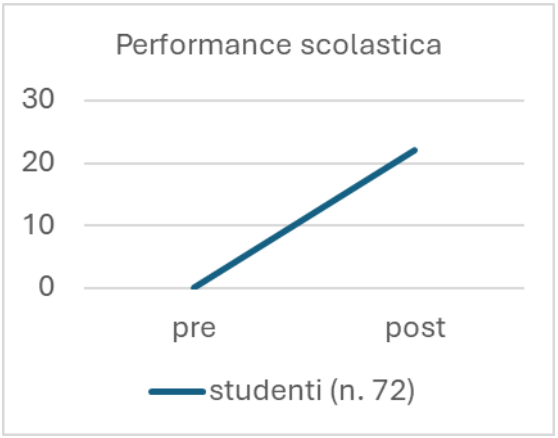
Tab. 5, *positive impact of AI on inclusion.*

Table 5 summarizes the results obtained in relation to the feeling of inclusion, primarily in terms of willingness and/or feeling of involvement. Furthermore, it measured how their perception of renewed academic engagement, their willingness to analyze/create, and their performance (RBT) had improved.

The group that received methodological and teaching innovations implemented with AI perceived themselves more engaged and achieved better results than the control group. The difference between the two groups was primarily observed in terms of acceptance in the classroom and sharing projects and school life with classmates. The average score achieved increased from a mean of 3.2 in the pre-test to a mean of 4.1 on a scale of 5 in the post-test.



Tab. 6, *work completion times.*



Tab. 7, *school performance*

An unequivocally significant and objective result is the reduction in students' time to complete schoolwork compared to the control group (Table 6).

The improvement in academic performance among young people supported by AI is also unequivocal, as it is based on quantitative evidence (Table 7).

6. Key Factors Emerged

The first consideration that emerges highlights that work with AI must be personalized for each student to enable them to achieve positive results for everyone; training in the use of digital tools is also necessary for students and, above all, teachers.

In this regard, we observe the paradox of different feelings among students and teachers, which could not be objectively defined and should be defined in another study.

At the end of the process, the young people declared themselves enthusiastic ("I feel part of the class"), motivated by academic improvement and with a consequent reduction in frustration caused by some underperformance.

Conversely, although teachers volunteered to join the pilot group (60% of teachers declared themselves "very confident" in the project), their workload increased as they had to support students individually and grapple with new learning and assessment processes.

Another aspect, to be considered a limitation, is the necessary implementation of the costs of AI-based teaching; teachers trained for AI teaching, higher-performance hardware, and paid software represent an initial cost to transfer traditional teaching to new methodological platforms —before digital ones! Finally, it would be necessary to measure how young people's dependence on internet connectivity is increasing and what feedback mechanisms might lead to further exposure to the digital environment they already rely on extensively.

7. Conclusions

Artificial intelligence has demonstrated significant potential for promoting inclusive education and improving the learning experience; benefits in personalized teaching are emerging, as are risks that must be assessed in terms of critical thinking and privacy. Certainly, without knowledge and use of IA, the gap in educational inequality between schools with adequate implementation and teaching staff and disadvantaged schools will widen (Sgambelluri, Iacono, & De Domenico, 2024; Melo-López, Basantes-Andrade, Gudiño-Mejía, & Hernández-Martínez, 2025).

In conclusion:

• with personalized tools and models, it becomes possible to support students with disabilities;

• the personalization of teaching strategies and the flexibility of curricula offers a more equitable, supportive, and welcoming experience of school;

• AI promotes a more inclusive school system, but requires ethical and research insights, especially regarding the hyperconnectivity young people are being exposed to;

At the same time, universal accessibility policies must be developed to prevent the widening of the gap between schools, not only in terms of cognitive performance, but also because the use of AI can inspire acceptance among young people who feel welcomed by the school system.

One area worth exploring is the intrinsic motivation of young people, who are increasing their engagement and attention span thanks to artificial intelligence.

However, we are aware that the improvements may have been conditioned by the influence that AI has on students and the novelty that comes with it, only temporarily capturing their interest.

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