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Artificial Intelligence: Technological Advances In An Inclusivity-Oriented Italian School System

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Abstract: The present effort sets out to theoretically analyze the prospective use and relevance of AI within Italy's innovative learning contexts and environments, with particular reference to the schools' need to design a national inclusive curriculum. In this view, technological tools and devices are not only facilitators, but also educational strategies, cognitive processes, curricular competences and soft skills through which each pupil can determine and assert himself/herself (Cottini, 2016; Deci, Ryan, 1985; Wehmeyer et al., 2003). This theoretical study specifically focuses on the feasible educational options that technology, and AI in particular, can provide all pupils with. Considering the variegated opportunities Italian schooling can give learners today, we will also evaluate to what extent education-oriented technology and AI tend to encourage them to tread creative and immersive routes and activate cognitive and meta-cognitive processes capable of matching individual needs with collective needs.

Keywords: Artificial Intelligence; Digital Learning; Inclusion; Universal Design for Learning

1. Introduction

The modernization of the Italian school system, which has now become an evident top priority for the Government, has recently enjoyed the well-oriented actions and improvements of PNRR (the National Recovery and Resilience Plan). The strategies adopted have simultaneously been developed through the following two macro-areas: a) the purchase of tools and instruments suitable for innovative teaching and learning and b) the specific training of teachers who would later use these tools and instruments and adopt methods, models and practices oriented towards effective and efficient learning (Aiello et al., 2016). The great emphasis placed on innovation has determined the Italian education system's need to clearly and quickly define the intentions, attitudes and behaviors that would most likely foster this innovation nationwide. A huge gap between the pupils' learning styles and the teachers' ability to keep track of them has given a strong impulse for this great change. Thus, digital

learning is a sustainable and effective practice, a route to tread in order to intercept the pupils' educational specificities and skills (Ferri, 2011).

However, digital skills and innovative tools alone will not be enough to fully sustain the change, and the redesigning and renovation of methodological structures and learning practices to be used at class must be sustained by a deep change in the teacher's mindset; innovation, and the change in practical behavior and mental attitudes in schools can develop only if those in charge have been made aware of the huge change they will have to experience at class (Lazzari, 2017).

The acquisition of a cross-subject idea of inclusivity, the internalization of some sort of strategic and methodological thinking which is bound to trigger and improve the teaching/learning process is certainly one fundamental step towards a complete renewal of the Italian education system.

The aforesaid scenario also envisages the prospective development of AI-driven and AI-regulated digital education routes. AI has already made its way through various fields of knowledge and social life, such as medicine, economics, political propaganda, and has lately triggered a serious pedagogic discussion (Panciroli & Rivoltella, 2023). While notion-transfer processes could already be based upon simple web searching or questions addressed to any household devices out there, a series of software developers have, in their turn, enabled us to the design plots and networks between and among various fields of knowledge, thus fostering the creation some sort of digital cross-subject-based and cross-subject-oriented education. Alongside software like Chat GPT, a lot of web apps have recently introduced, within the development of the item being built, an AI-driven function starting from simple command line user instructions. What is more, alongside the typical AI machines described above, which learn through a transversal detection of all the big data available, deep learning machines are apparently much more effective and efficient.

These machines can make neural links which, in their turn, can produce an analysis of the pupil's emotions, attitudes and inclinations to create adaptive educational processes and individualized strategies for an inclusive and eco-systemic education in line with his/her own specificities.

2. Using Technology in Italian Schools

Technology consists of tools which are potentially effective in transforming teaching/learning processes. Their final adaptability and flexibility derive just from their way of storing content, which is more dynamic and modifiable than was the case with traditional processes in the past.

Within the framework of "Scuola 4.0" and together with PNRR, the Italian Education Ministry has invested a lot of resources on the transition from traditional classes to innovative learning environments and on the creation of lab activities for future digital professions. It also tried to promote a training scheme for all school personnel.

According to the "Scuola 4.0" plan, "…the physical "classroom" learning environment will have to be designed and integrated with the digital learning environment, so that the transformation will also provide a versatile learning platform that could enact several educational scenarios, ranging from *e-learning* to VR (which reproduces the physical classroom environment)…" (MIUR, 2022, p. 26).

Moreover, within the context of learning spaces, the use of adequate teaching/learning methods entails a considerable amount of educational designing which

features the dynamic use of technology to foster more efficient learning and greater formative success.

For all intents and purposes, still through the "Scuola 4.0" plan, PNRR has designed digital education training schemes for teachers; it is strategically useful for each and every school or educational institution of any sort to guarantee specific training routes and experience-exchange contexts for all teachers, thus fostering their feedback and self-reflection on new methodology and encouraging their participation in international stages and meetings.

Moreover, educational technology-based changes enable us to create learning environments where the pupil can undergo a formative process where he is an active subject down his/her route towards knowledge and, in his/her turn, the teacher, through VR, augmented patterns, 3D building, real-world simulation, *digital storytelling*, digital maps, interactive presentations, *coding*, robotics, *gamification*, can activate some sort of erotics of knowledge (Recalcati, 2014) that can represent itself as an unconsciously active anthropic process in a natural and emotionally-fulfilled form of becoming.

This is the most suitable scenario for L. Cottini's proposal (2019) regarding the implementation of technology in the following three specific educational macro-areas:

– *assistive-compensative macro-area* – (table1) it includes Assistive Technologies (AT), i.e. all technological supports necessary for people with special needs and compensative devices. Assistive Technologies accompany the special needs student whenever he has to fulfil a personal need, which means always (so they are permanent), whereas compensative devices are used momentarily and can be of help for the whole class. Assistive technologies feature flexible personalization and improve accessibility;

Assistive-Compensative Functions	
1. Presentation-Oriented Options	• Select and identify high-accessibility digital educational material. • Digitize paper texts and prepare the transcription of audio, video and graphic resources. • Simplify digital texts by changing the layout, inserting symbols, applying masks and other similar instruments. • Record audio-notes for interactive explanations, image descriptions, graphic supports… • Add texts and language translations in digital video-clips by means of video-editing software. • Design alternative iconographic systems by means of image-editing software.
2. Organization-Oriented Options	• Set IWB and mobile device accessibility. • Look for alternative educational solutions in the processing and elaboration of data and answers.

	• Integrate compensative resources in ART (Augmented Reality Technology). • Prepare instruments to foster the expression of personal opinions and monitor feedback requests at class.
3. Processing- and Elaboration-Oriented Options	• Prepare the IWB with test aids. • Prepare the IWB with instruments and images to guide and orient class activity. • Highlight the key elements in bold, italics, underlying and other graphic processing. • Prepare instruments and tutorials for instructing pupils on the use of the keyboard, Braille writing, Italian Sign Language (LIS).

Table 1. Exemplifying the assistive-compensative functions of educational technologies (Cottini, 2019, p.40)

– *dialogic relation and sharing macro-area* – (table2) it includes: agile devices (tablet PCs and smartphones); application and web services to exchange and publish short notes or little content; useful tools for cooperative educational activities online (virtual noticeboards and wikis); online teaching platforms (Edmodo, Moodle, Google, Microsoft). All in all, these technologies are functional to class/home, offline/online and special needs co-designing for the creation of cooperative educational activities;

Dialogic Relation and Sharing Functions	
1. Presentation-Oriented Options	• Prepare online libraries with simplified resources and shareable alternatives. • Prepare files of resources dedicated to controlled work and research. • Prepare multilingual dictionaries and glossaries to be shared online. • Prepare tutorials for using technology in class and at home.
2. Organization-Oriented Options	• Prepare cooperative writing and participated production environments. • Prepare resource-sharing areas on a per-topic basis, e.g. by web directory or field-trip structuring. • Design online multimedia classes or research activities. • Prepare MDM (Mobile Device Management) system for the control and secure use of mobile devices at class. • Prepare a dashboard of mobile devices and the accessories needed. • Prepare online questionnaire-administering forms and

	learning rating sheets.
3. Processing-and Elaboration-Oriented Options	• Prepare virtual worlds or environments to support formative role-playing activities. • Prepare online systems aimed at supporting peer-to-peer corrective feedback actions. • Design meta-cognitive reflection and self-assessing recording and promotion systems.

Table 2. Exemplifying the dialogic relation and sharing functions of educational technologies (Cottini, 2019, p.41)

– *interactive-multimedia and manipulative macroarea* – (table3) it includes all autonomous educational activities, multimedia (maps, e-books, video-classes) and interactive (educational software, videogames): i.e. Open Educational Resources (OER) (Atkins et alii, 2007). Converseluy, the Learning Object (LO) (IIEE, 2011) includes all those remote educational activities that could be performed through an Interactive White Board (IWB) or portable devices. Moreover, some specific interactive multimedia software has been designed to run educational activities on the IWB (Cottini, 2019). In the end, Cottini's innovative perspective envisages a teacher that co-designs learning (Laurillard, 2012; Limone, Pace, 2016) and simultaneously identifies digital resources and adapts them to his/her own advantage. In so doing, he/she identifies the digital resources which are most suitable for the fulfilment of UDL principles – such considerable changes will make technology at school more and more popular as an important educational resource that will profoundly transform overall teaching and learning.

Interactive-Multimedia and Manipulative Functions	
1. Presentation-Oriented Options	• Prepare the proper resources for topic retrieval or anticipation, such as mind maps, audio-summary sketches , short videoclips. • Retrieve the necessary alternative and detailed-study resources from online and personal files. • Select the parts of the textbook to be shown on the IWB through the digital version of it.

	• Produce texts by means of the appropriate editing software. • Prepare the lesson structure with the IWB - software. • Prepare further reference in augmented reality (AR) to be linked to the paper documents. • Prepare questionnaires and digital surveys to support any possible choice.
2. Organization-Oriented Options	• Design the necessary graphic organizers. • Schedule classwork audio- and video-recording moments. • Design and create digital modules for consolidating or testing the notions and skills acquired. • Prepare checklists to show on the IWB or tablet PCs. • Prepare learning progression graphics and tables to project on the IWB.
3. Processing- and Elaboration-Oriented Options	• Provide tools for the autonomous processing and elaboration of digital notes and mind maps. • Make sure digital drills are designed in such a way as to keep an adequate number of stimuli and distractors in order to keep the cognitive load under control. • Shoot photos and videos to document learning experiences and foster the use of episodic memory. • Schedule moments of reactivating and regenerative recess. • Schedule moments of reactivating and regenerative recess by means of dedicated web apps or services.

Table 3. Exemplifying the interactive-multimedia and manipulative functions of educational technologies (Cottini, 2019, p.42).

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2. Educational Technology in a UDL Perspective

Universal Design for Learning (CAST, 2011; 2018) and technology are a perfect combination. Whatever is digital improves the teaching/learning process inasmuch as, once within a UDL environment, it acts as a promoter of independence and autonomy.

Creating a UDL-based educational curriculum entails indicating how educational technology can be used flexibly in order to meet all students' needs. Digital devices used according to UDL criteria enable us to dismantle each and every barrier and valorize diversity by putting into practice a form of education that can favourably respond to the growing heterogeneousness and variegatedness of the pupils' needs.

UDL's inclusive paradigm stresse the importance of new technologies as supporting tools that guarantee accessibility for all (Rose et al., 2009). An application can be called accessible when it can be used by a great number of users; in fact, the availability and accessibility of environments, tools, instruments, services and facilities can be considered principles which shun all kinds of discrimination and guarantee the valorization of the human being. Educational accessibility translates into understandability, availability and reachability, which makes us infer that talking about accessibility means going about being inclusive, with a view to identifying the real obstacles to learning and fostering positive actions and practices (Aquario et al., 2017).

The technological tools designed by the Center for Applied Special Technology (CAST) (2018; 2011) according to UDL criteria provide interesting examples of how digital skills can improve each and every pupil's educational experience by promoting his/her cognitive and meta-cognitive processes. Consequently, a form of education which meets the growing heterogeneousness and variegatedness of the needs cropping up in the various classes annuls any difference, and does so mainly because, by means of universally-designed technology, students are called upon to express their own opinions and emotions, as well as collectively participate in any kind of activity at school.

In the light of what has been said so far, one must admit that technology plays a fundamental part in education inasmuch as it improves the teacher's ability to apply UDL principles and, in so doing, guarantee meaningful learning experiences for each and every pupil.

So, the aforesaid Cottini model evinces his willingness to give students the opportunity to choose from among a variety and variegatedness of methods, materials, means for action, representation and expression whereby digital technology pledges to ensure inclusivity in the education process. All this means enabling the student to access knowledge according to his/her own personal learning style by making sure he/she understands how he/she learns and giving him/her an inclusive education at the same time.

Therefore, from the very early stages of each and every pupil's learning process, an inclusive curriculum enables him/her to feel accepted and stimulated, and the class context becomes a more and more welcoming setting where his/her own personal peculiarities are taken into due consideration. However, the creation of inclusive contexts must even envisage our possibility to choose against an a-priori individually-focused curriculum in favour of a collectively-oriented one, with a view to adapting it to individual students' needs.

The Universal Design for Learning is a very important element of the inclusive curriculum: it is about a way of designing educational materials, methods and strategies whose main objective is an a-priori devising of an instrument that everybody can use through a flexible approach tailored to each and every pupil's needs.

UDL's educational approach sets great store by a multiplicity of teaching/learning materials and methods as its main educational design strategies. This multiplicity is not only about different levels of task performing difficulties, but also a qualitative differentiation entailing the addition of human mental activities which are useful for everybody (Savia, 2016).

A concrete example of UDL implementation is the famous Rubik cube, which was also devised for the sight-impaired (with white faces and integrated with tactile features). This feature has also widened the range of options for everybody, not only for those with perception difficulties (Ianes, 2016), which means that, as UDL theory has it, what is necessary for some is useful for all.

4. Conclusions

The performing development of digital education, together with the use of Artificial Intelligence project us into possible teaching/learning scenarios where the margin for planning, structuring and creation error is getting smaller and smaller. Technological advances support and enable a form of evolution in all fields of social life and, even more so, in education, which is still among the most archaic and least efficient social services and institutions. There are multiple programs and schemes that would foster this evolution in Italy, and only their development and simultaneous application would allow for a renewal of an education system that would focus on pupils' needs and integrate the various learning styles in an inclusive sharing perspective. Even the Italian school system's ability to provide pupils with solid and situated digital skills through constant monitoring for the development of a conscious digital citizenship will enable us to create sound, effective and fruitful routes for teaching and learning (Lo Iacono, 2022). AI's latest frontier opens educational scenarios which are much richer in stimuli and perspectives than in the past; the idea that the mechanization of knowledge could jeopardize the systematic exercise of meta-cognitive thoughts and structures seems to be outmoded. We can consider the use of AI a deep reinforcement of some sort of heuristic strategy whereby pupils will activate exploration structures through a form of autonomous research which is stimulated by self-referential, self-determining and self-effective attitudes. The challenge will no doubt be a motivational one, for teachers and pupils likewise; for the former, all will depend on their ability to become motivators in the educational process by acquiring and adopting innovative digital-education-assisted methodologies; for the latter, all will be centered on their ability to rediscover themselves as active protagonists of their own learning and become aware of their ability to improve their own performances through the re-use of such digital resources as they will have become

quite familiar and conversant with from having used them on a daily basis for so long, albeit without an educational aim; if so, this non-educational use can sometimes be sterile at best and dangerous at worst (Riva & Mancini, 2023).

In these respects, it might be useful for us to develop a UDL-based paradigm which would first undergo a digital restructuring process and then merge into the Universal Digital Design for Learning (UDDL). This new way of reconsidering and reprogramming teaching and learning would basically envisage a form of designing based on digital methods and tools to make education reproducible, equal-opportunity-oriented, inclusive and universal.

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