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ISYDE2023

Italian Symposium on
DIGITAL EDUCATION

Reggio Emilia, 13 - 15 September 2023

Innovating Teaching & Learning.
Inclusion and Wellbeing for the Data Society

Tommaso MINERVA & Annamaria DE SANTIS (Eds.)

Conference PROCEEDINGS

Pearson

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Preface

ISYDE, *Italian SYmposium on Digital Education*, is the yearly conference organized by the *Italian e-Learning Society* (SIe-L, https://www.sie-l.it/) in line with previous conferences (EMEMITALIA and SIEL), whose organization was interrupted by the COVID-19 pandemic.

As it resumes its conference activities, SIe-L aims to broaden the focus from *e-Learning* and media education to *Digital Education* in a wider meaning as a concern emerging from recent years' experiences.

ISYDE addresses and debates the major transformations induced by technologies in the processes of training, learning, continuing education and knowledge construction as well as citizenship and interpersonal relations.

The 2023 edition focused on "Innovating Teaching & Learning. Inclusion and Wellbeing for the Data Society".

As always alongside the pinning down of the main thread, the conference served as a meeting point and sounding board for the research, experiences, developments and technological applications that are fostering development in the following significant, though not exhaustive, subject areas: AI in Education; Digital Citizenship; Blended Learning; Career Development and Training; Collaboration Projects and Networks; Computer Supported Collaboration; Digital Inclusion; Data Literacy & Education; Digital Literacy; Digital mediated diseases and behavioral risks; Digital Wellness; Distance Learning in Times of Crisis; e-Content Management and Development; Educational Software & Serious Games; e-Learning; Emerging Technologies in Education; Experiences in Education and Research; Faculty Development and Higher Education; Gaming and Gamification in Education; Learning Spaces; Pedagogical Innovations in Education; Post-Digital Education; Third Spaces Literacies; Trends and Issues in Education.

Topics refer to application areas, including: University; School; Continuing Education; Public Administration; Health Care; Society; Culture; Technology Use, Integration, and Development; Business.

The conference was held at the University of Modena and Reggio Emilia (Italy) from September 13 to 15, 2023.

Participants presented more than 50 contributions in ten Sessions that we merged into four Sections in the proceedings:

- Artificial Intelligence and Analytics (7);
- Design (5);
- Games, Social Networks, and Virtual/Augmented Reality (8);
- Scenarios, Experiences, and Research Reports (12).

The conference, as also shown in the Plenary Sessions, prepared the ground for the process of innovation of higher and lifelong education toward the design and establishment of nationwide *Digital Education Hubs*, which represent the new challenge faced by Italian universities.

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PNRR and school innovation between inclusive processes and potential scenarios

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Abstract

This paper aims to analyze the potential development of teaching practices and methodologies within the future perspectives of innovation in relation to the upcoming project implementation of the PNRR School 4.0. Starting from the inclusive educational act and the need for renewal we investigate to what extent the development of technologies intended not only as facilitators, but as a paradigmatic bridge of learning in today's society, can influence the learning standards of pupils in the Italian Education system. The difficulties that emerge are related not only to the absence of long-term planning, but are substantiated through two guidelines that characterize our education system. On the one hand, we have fragile territorial realities, where social marginalization, the absence of civic virtues due to easy deviance represent potential implementation obstacles; on the other hand, the reality of educators and teachers who are unlikely to be able in such a short time to train and update themselves to be able to apply these new teaching methodologies. A subsequent analysis of the field of inquiry concerns teachers' digital competence required for the implementation of new teaching practices through the use of new software and hardware. Recent studies have shown that teachers' basic digital skills, as measured through The DigComp 2.2, are lacking and teachers have difficulties in reworking them in a didactic key, including through metacognitive processes.

Keywords: Digital Skills, Inclusion, School 4.0, Innovative Methodologies, UDL.

1. Introduction

The process of renewing the Education System in Italy identifies the needs expressed by a continuously evolving society, which proposes new models of knowledge and sharing and which phenomenologically develops increasingly multidirectional and polycommunicative communication processes (Lo Iacono, 2020). The school system, representing within the society the training and educational pillar for children up to the age of eighteen, struggles to control and adopt innovations, as well as to incorporate and implement within the required times the innovations and progress proposed by the models operating in the community. The National Recovery and Resilience Plan (PNRR) is proposing an idea of innovation that the world of education will be able to understand only if it manages to arrange new developments in a structured and organic way.

Its true implementation cannot exclusively pass through the modernization of learning spaces; it must certainly be accompanied by collateral and simultaneous interventions supporting the construction of this new structural framework. In fact, the training of school staff is a further step in this direction. The new Futura platform actually offers courses dedicated to the transition to digital, enriching the teachers' skills, at least on a theoretical level. The application of these new required skills will certainly need to be monitored on a proactive and operational level over the years.

However, digital skills and cutting-edge tools alone will not be sufficient to fully support this change. In our opinion, the reconstruction and modification of methodological constructs and didactic practices in the work of teachers must be supported by a profound change in thinking. Innovation, and therefore the change in practical and mental behavior in schools, will be made possible only if the operators involved are deeply aware of the improvements required for their teaching action. The inner acquisition of a transversal idea of inclusion and of a strategic and methodological mindset, aimed at enhancing the teaching/learning process starting from the specificity of each student and capable of

educere, i.e. bringing out each child's potential, prefigures the success of the renewal process that the education system is preparing to face.

The new challenges will also be dictated by the ability to acquire a new digital teaching paradigm, complementing the static vision of technologies solely considered as tools and aids; a digital that becomes method and practice, which changes minds, ways of thinking and acting, which develops different, avant-garde trajectories. Furthermore, it will be necessary to monitor the implementation speed of these processes and their enactment, the ability to create structures and buildings suitable for the development and practice of the new methodologies and the risk of accentuating the gaps and disadvantages already present on the national territory.

2. From PNSD to PNRR: structuring a new digital paradigm

The process of digitalization of Italian teaching and school organization began over 15 years ago with the implementation of the first digital transformation measures, which introduced interactive multimedia whiteboards in around 35,000 classes (LIM Action), IT equipment for teaching experimentation in over 400 pilot classes (Cl@assi 2.0 Action), the creation of WiFi networks in schools, the launch of training courses for teachers.

But since 2015, with the approval of the National Plan for Digital Schools (PNSD) and the synergy with the European structural funds of the National Operational Program 2014-2020, the digital transition of Italian schools has experienced a strong acceleration and diffusion in all schools thanks to the implementation of the 35 actions of the PNSD.

With the funds of the National Recovery and Resilience Plan and the European structural funds of the 2021-2027 program (including those of the REACT-EU initiative currently being implemented) this process is now complete and, at the same time, a new, strong impulse, both for the relevance of the investments and for the systemic approach of the actions.

From 2014 to today, total investments have been approximately 1.9 billion. The overall funds primarily derive from the National Operational Plan PON 2014/2020 for the ESF projects, for the development of skills and the ERDF for the renewal of instrumentation and connections; subsequently from the PNSD for the implementation of the 35 planned actions and finally thanks to the funds allocated for the REACT-EU programming. The lines of intervention move through the creation of new learning environments, the use of innovative and engaging teaching strategies created through digital methodologies, the training of teaching staff and the development and improvement of connectivity through wired and wireless networks.

The PNRR goes in this direction and becomes the largest investment ever made in the radical renewal of the Italian education system. Mission 4 "Enhancing education services offer from kindergartens to universities" (MIUR, 2023) involves 5 lines of intervention which will have a direct and indirect impact on school digitalization processes:

- School Buildings - Investment 1.1
- Gaps - Investment 1.4
- School Personnel Training - Investment 2.1
- STEM Training - Investment 3.1
- School 4.0 - Investment 3.2

Within the School 4.0 line of intervention, 2.1 billion are intended for the construction of new digital-oriented learning environments, with two different operational programs: *nextgen classroom* and *nextgen lab*, through which educational institutions will be equipped with thematic learning environments or multi-functional laboratories. The Organisation for Economic Co-operation and Development (OECD) has defined some characteristics of physical learning environments, which must be adequate (meet minimum requirements to ensure the comfort, access, health and safety of users), effective (support the different teaching and learning needs to allow the school to achieve its educational objectives), efficient (maximize the use and management of space and resources to obtain the maximum result both for students and teachers).

The OECD has defined the innovative learning environment as an organic whole encompassing the learning experience organized for certain groups of students around a single "pedagogical core", which goes beyond a predefined class or program, includes activities and learning outcomes (it is not just a "place" where learning takes place), and has a shared leadership making decisions about how to improve learning for its participants. The role of teachers in the management of space is therefore of great importance, as it is enhanced by 7 learning principles which must be kept in mind to design innovative learning environments (OECD, 2017) (Figure 1).

Figure 1 - OECD's 7 principles of learning.

Learning environments will have to represent not only a physical and material product, studied and calibrated for the development of people's connections, relationships and cooperation through transdisciplinarity, but they will also have to be designed and calibrated as intelligent systems, capable of virtually modifying and redefining themselves, as a technological adaptive system which puts learners in the foreground, improves their learning experiences based on personal characteristics, preferences and progress achieved, promotes a growing commitment by increasing access to knowledge with adequate accompaniment and feedback, uses media and artificial intelligence resources, neural networks and smart technologies.

It is therefore clear how the nature of the structural intervention requires at the same time an expanded vision of the idea of technologies. This is made possible only by the birth of a new paradigm for the teaching/learning process which lays its foundations through the revolution of the didactic mindset. If on the one hand the resources and tools are needed, on the other the idea, its development and its practice are fundamental. Inclusive didactic action certainly represents the theoretical substrate on which to develop this new paradigm, which rethinks the digital as a methodology, developed through an ex ante modeled agency in the mental construction and re-proposed in the form of a method within a digital development. Inclusive action must become a systemic approach aimed at in-depth knowledge and understanding of the students' subjective configurations and their specificities emerging from the way in which their strengths and weaknesses interact, while at the same time considering their levels of emotional, social and physical maturity, the effects of any pathologies, disorders and needs and the influence of one's life context (Aiello, 2015). From this perspective, it is pertinent to point out how an already consolidated agency capacity of teachers specialized on special education activities should be transferred into the mental aptitudes of each teacher who will operate within this revolution in the education world. In fact, agency is identified with the acts intentionally performed by teachers, since they are provided with the faculty of generating actions aimed at certain purposes and with a creative, generative and proactive mind capable of creating worlds or at least having the illusion of escaping their own Umwelt (Berthoz, 2011). The concept of Umwelt therefore represents the key to understanding the new digital teaching paradigm. The environment moves from

an extrinsic representation to an internal perception, so as to create an inner microcosm, a subjectivity of universality, a manifest inner necessity. In the field of inclusion pedagogy and teaching, the concept of Umwelt has already stimulated reflection on the most effective ways to perfect and refine the learning process, creating the conditions for structuring the learners' subjective universe starting from their educational needs and possible tools for action (Sibilio, 2015; Aiello, 2016). Digital teaching will therefore have to absorb this idea within its development in the teaching/learning process, so that it becomes truly decisive and effective.

The vision conceived here is therefore closely linked to this concept of agency, which represents the only way to achieve incisive, plastic, effective teaching. The teacher must be able to mentally develop, organize and undertake sequences of operations necessary for effective teaching actions (Sharma et al., 2012). The mission will be to translate these dynamics within a new digital-oriented context, through the use of productive thinking developing innovative and high-performance digital methodologies within modular physical spaces, which can become learning environments phenomenologically corresponding to the students' inner environment, and which can comply to the Umwelt.

3. Towards digital didactics

The formulation of a new idea of teaching, of new methodologies aimed to create a learning/teaching process which is more suited to the abilities and specificities of the students, demonstrates how the simple idea of technologies is now disconnected from school contexts. Ultimately, the new model proposed hereby develops starting from the belief that digital is not merely technology, intended as tools and facilitators (Calvani & Cottini, 2020), and that instead technology technically supports the development of structured digital thinking, through new teaching practices in which mental constructs based on other variables are created. The idea of agency expressed herein above, the effectiveness of planning through the creation of an internally habitable Umwelt, the ability to develop positive and proactive inner environments for students as active subjects of their own didactic process, the construction of a teaching system starting from the needs and specificities of the individual, the transversal idea of inclusion (Cottini, 2017) are therefore fundamental elements for the realization of this process of change that the school system must bring to completion. Within this scenario – a paradigmatic bridge supporting a significant renewal of teaching practices – we must however consider the digital skills that will have to be increasingly present in the School 4.0 teacher's knowledge and skills.

The reference Framework is DigComp 2.2, which represents the measuring standard for digital skills within the European Union. The structure is divided into 5 areas of competence, with different descriptors relating to the levels of mastery. The 5 areas (Figure 2), as represented in the figure, semantically correspond to compulsory and consequential steps; in fact, competence is achieved through the intersection of knowledge, attitudes and skills.

The five dimensions represent the skills that every citizen within the EU should possess; the different levels of mastery are represented on a scale from 1 (Beginner) to 6 (Pioneer).

The latest EuroStat surveys (2022) (Figure 3) highlight that the competence level is inversely proportional to age. In the 24/54 age group, Italy has a percentage of less than 50% in mastering digital skills; the percentage drops furthermore, below 25%, if referring to ages over 54.

Recent studies point out that Italian teachers, particularly those qualified for special educational needs, have good skills in area 1 for around 60%, between the ages of 25 and 45; however, this percentage drops to 20% from 45 to 65; furthermore, in the subsequent areas the percentage of those with good digital skills is between 20% and 30% (Lo Iacono & Cardinali, 2022). Other studies in literature (Guillén & Mayorga, 2020; Montoro et al., 2015; Romero et al., 2019) prove that teachers possess a basic level of digital skills and that, within the different areas, some are quite deficient. Blayone et al. (2017) highlight that also technical skills (creating and editing documents and managing online accounts etc.), social skills (communicating via e-mail, sending and receiving messages and participating in social networks etc.), and information literacy (finding and using articles, news and

videos etc.) are deficient. In addiction, Amhag et al. (2019) point out that teachers do not use digital tools for teaching purposes and need extensive pedagogical support to create quality digital teaching.

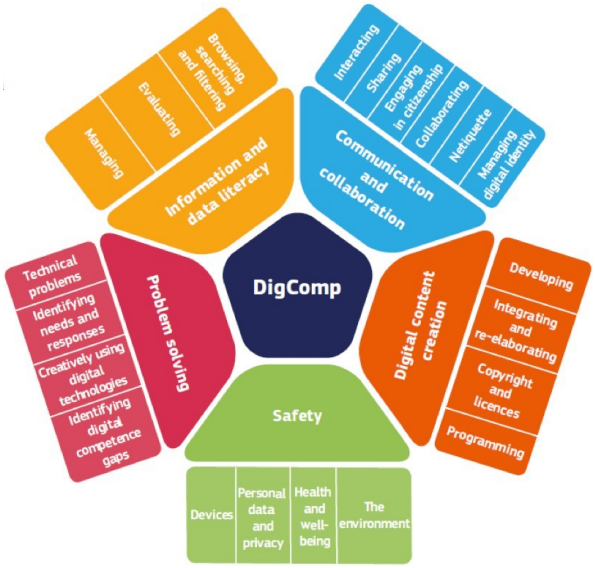

Figure 2 - 5 DigComp Areas.

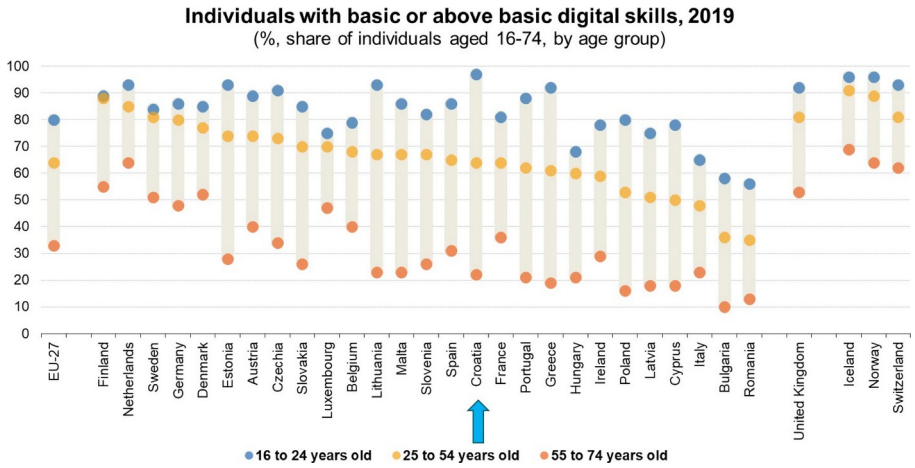

Figure 3 - Basic Digital skills in UE Countries

The poorest area is the one relating to Digital Content Creation, since it is clear that possessing basic skills cannot imply the ability to develop and create learning objects to be promoted through digital education, within teaching/learning processes. The use of dedicated apps and software, through which to conceive and manipulate contents and offer them within new classroom contexts promoting a creative, bidirectional, proactive transmission, entails such ability and agency, as said, which does not only imply possession of basic skills. The digital teaching methodology can be implemented only if it is rethought through the simultaneity of action, through the recognition of the individual Umwelt. Only a variety of knowledge, combined with attitudes and skills, will therefore lead the teacher to be able to design effective paths through inclusive (Calvani & Cottini, 2020) and equal (Rivoltella, 2020) digital processes.

Training therefore becomes the main path to follow. Nevertheless, it should focus both on transmitting skills to use and manage all the software applied within the new learning environments (such as immersive classrooms, virtual reality and STEM laboratories), and on providing a varied possibility of choice for the implementation of sustainable and effective paths (Calvani, 2013) through a metacognitive process that the teacher will be obliged to follow.

In parallel with the training promoted and disseminated through the new FUTURA platform, a movement should finally be created, for which teachers are first and foremost conscious digital citizens (Lo Iacono, 2022), citizens of a constantly evolving digital society whose perspectives are in the process of expanding, where innovations follow one another at twice the speed of their own possible implementation. The school must be ready to accelerate the metamorphosis and overcome digital educational poverty (Pasta & Rivoltella, 2022). Finally, a continuous field monitoring is necessary, aimed at supporting and directing the processes, at re-evaluating and modifying the divergent trajectories, and at ultimately supporting the ongoing methodological changes. The new teaching will therefore be carried out through a new digital methodology, supported by technologies but elaborated through new cognitive and communicative constructs, thus ontologically resulting from our society.

4. Universal Design for Learning in the didactic context

Universal Design for Learning represents a model for designing teaching materials, methods and strategies. Its main objective is to create a priori a tool which can be used by everyone, whose wide accessibility depends on a flexible approach that can be adapted and personalized and allows participation, involvement and learning, starting from personal abilities.

UDL's main objective is "to transfer the principles of design for everyone from the architectural and product creation area to that of education, through an action focused on study programs, which – when excessively rigid – constitute "a significant obstacle for the promotion of a truly inclusive perspective" (Cottini, 2017, p. 82).

Universal Design for Learning is based on three principles.

The first principle represents the "what" of teaching, given that there is not a single way of representation which is ideal for all students. This principle refers to the reasonable accommodation already expressed by the UN Convention on human rights of persons with disabilities, and therefore, "necessary and appropriate modification and adjustments not imposing a disproportionate or undue burden, adopted where needed in a particular case, to ensure to persons with disabilities the enjoyment or exercise on an equal basis with others of all human rights and fundamental freedoms" (United Nations Convention on the Rights of Persons with Disabilities, art. 2 paragraph 4). This principle, expressed in the field of education, commits institutions to prepare every necessary measure to meet everyone's needs. Concretely, it is possible to act on the physical characteristics of the information, on the provision of alternatives so as not to use only individual visual, auditory and textual mediators, on the preliminary explanation of terms, symbols, concepts to make them accessible to all, on the use of supports facilitating understanding (Cottini, 2019).

An example of practice reflecting this principle are digital books with expansions, in which the written text is accompanied by audio, video and image files. In this way the perception of the same information can pass through different languages.

The second principle concerns the "how" of learning, therefore providing multiple means of action and expression. This principle means that students are given the opportunity to choose how they decide to share what they have learned (Evans et al., 2010) and once this level is achieved, a very flexible curriculum and the use of forms of authentic assessment are required, through which students are asked to carry out real tasks.

A concrete example of this principle could concern the students' free choice of the form to give to a narration requested by the teacher, which means written narration, oral narration, or also video narration.

The third principle represents the "why" of learning; therefore its objective is to supply multiple means of involvement to provide students with different motivation incentives to learn. The student's involvement is achieved by connecting learning to real life problems, paying attention to the affective-relational sphere (Evans et al., 2010), which is taken into account for the quality of learning processes. An example of the realization of this principle is the explicit learning of control strategies, which allow students to self-regulate when they experience difficulties in the activity they are performing.

The pedagogical paradigm of Universal Design for Learning attributes a fundamental role to technologies as a support tool to allow accessibility to everyone.

Scholars Rose & Meyer (2002) outline four characteristics in digital media which are beneficial for teaching flexibility and which can be significantly used in the classroom.

These are:

- *versatility*: the ability to adapt to different tasks, i.e. everything that allows digital content to be represented in different formats such as text, still and moving images, sound, multimedia, without implying its modification;
- *transformation capacity*: the possibility for the content to transform, changing from one format to another;
- *marking*: the possibility of using markings in the content. The teacher thus prepares a passage in which important paragraphs or sentences must be selected, allowing the organization of contents and activities to be developed according to the students' needs;
- *connectivity*: the ability of digital technologies to connect. With respect to educational content, this function allows to relate topics, for example by going through a text and creating connections with other elements of the text, or even by establishing connections outside the document through links leading to images, videos, web pages.

In this way, through the Universal Design for Learning proposals, the student has various possibilities to interact with the educational contents.

5. Conclusions

The line drawn here therefore starts from a strong push towards renewing the strategic and methodological constructs of the Italian education system, supported by the remarkable work carried out by all the involved stakeholders in the last decade. The Ministry, researchers, INDIRE, avant-garde educational movements, training centers, regional school offices, territorial centers for digital innovation, schools and teachers, they all tend towards this revolution of "schooling", a programmatic line which for almost twenty years has promoted the students' centrality in the teaching/learning process, making them the protagonists and active subjects in their own educational process.

The new PNRR investments are therefore being implemented and the entire community has the task to encourage the genesis of this transformation within didactic processes, supporting their full realization through constant and analytical monitoring of possible critical issues. As mentioned, in addition to strengthening digital skills and acquiring the equipment and furnishings to create new learning environments, it will be necessary to simultaneously work on the ability to structure and implement new inclusive methodologies and processes, where the skills in creating varied and multifaceted digital didactic paths become fundamental. As said above, the paradigms of UDL, of inclusive didactic action, of the Umwelt, which will structure the foundations of change, must therefore the basis of these processes.

Attention will also have to be placed on possible difficulties arising from the complexities present on the national territory, on the possible causal effect of widening gaps and on the ability to redistribute human and material capital in a fair and sustainable way (Benadusi & Giancola, 2022) from the peripheries to the city centre, from north to south of the peninsula. On the one hand, the creation of new learning environments and of thematic and immersive classrooms, where each student will be able to independently choose the path to follow, develops reflective and metacognitive schemes in the students, making them active subjects of their own learning; on the other, it could trigger processes in which fragile or disadvantaged people may not be able to independently succeed and may need supporting paths which schools will have to provide. In addition, some doubts could arise if we intersect digitalization, inclusion and soft skills: in fact, in the attempt to adapt and align the standards, there may be a decrease in inclusive practices, a lesser development of the pupil's subjective learning potential and finally an impoverishment of students' transversal skills, thus reducing their social and emotional skills (Maccarini, 2023).

Authors' contributions

Although this paper is the result of joint work between the two authors, and each of them supervised and revised the work as a whole, individual paragraphs can be attributed as follows: 2, 3, 5 to M. Lo Iacono; 1, 4, 5 to R. Sgambelluri.

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