Guest Editorial Preface

Special Issue on "School Revolution? Let's Start from Teachers' Digital Literacy and Competences!"

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The development of digital technology in recent years is transforming learning and teaching by increasing the complexity of the educational practices at all levels, so demonstrating that one of the priority needs of training is to overcome an accessory and auxiliary use of ICT, in favour of an integrated use of the digital technology, in order to ensure adequate acquisition processes in learners. This number of the *Journal*, placing itself in a logic of continuity with the two previous issues, mainly focuses on the idea that the relationship between technology and education should be rethought in a new design logic, that helps to revisit the tools, the environments and teaching-learning contexts, by starting from various educational functions performed (communications, reports etc.), and from adequate initial and ongoing training of teachers in multi-modal and multifunctional manner. The literature shows that in this area the research and the experiences that students and teachers have made of the use of technological learning environments to improve teaching and learning effectiveness are actually not always in accordance in highlighting negative and positive aspects of "teaching/learning" with and through ICT, and in being able to unequivocally give account of how to fully consider them an integral part of the educational action system. It is a trend that needs to focus more on the development of skills and knowledge which act within a transverse dimension, the methodological one, to be able to combine the formal, non-formal and informal methods of learning with ICT in the intent to develop digital skills in teachers increasingly appropriate and responsive to specific educational needs. The tendency to focus on teaching as "problematic issue" of education quality, regardless of a positive context of development of the methodological skills of teachers and the central role of the learner, has little chance of success because the digital divide between teaching and learning is increasingly expanding today and is assuming new configurations and is radically transforming the educational intervention areas. The teaching-learning relationship in fact, in a perspective of simultaneity and interactivity, requires to teacher the possession of higher order skills (critical thinking, reflectiveness, etc..) and appropriate methodological skills (management, planning, assessment etc.), which allow the proper planning of educational processes and let the student learn and develop gradually autonomously (Nuzzaci, 2011a). If, therefore, the teacher's necessary skills substantially change over time requiring continuous updating, the digital ones for their "transformative" nature, are often associated with the use of new tools and devices in teaching involving procedural and logistical difficulties identified as the main sources of concern in the action of professionalization of teachers and that sometimes lead to unwarranted assumptions about the social and educational nature of education itself (Nuzzaci, 2012). The link between quality of education and the expansion of new technologies requires alphabetic

prospects pursued through innovative direct training methods to work through information and communication networks that expand teachers' cognitive repertoires and improve the overall quality of their teaching, heavily dependent on political support to their professional development (OECD, 2010; Scheerens, 2010; Rizza, 2011). In the perspective of continuing education, through digital skills, teaching aims to increase performance, educational effectiveness, commitment, identity and teachers' satisfaction with their work, by improving the effects of teaching performance on students' productivity, of which at least three quarters can be explained by the teacher variable (Rivkin, Hanushek & Kain, 2005). In this interpretative approach the problem of digital skills appears to cross the mobile context of teacher training at an early stage and continues, involving the understanding of the formation, or as a real border and intersection that views the pedagogical *literacy* accompanied, enhanced and amplified by the technological *literacy* through the use of precise methodological and digital skills as well as the incurring of intentional, conscious and responsible behaviours and attitudes required for adequate management of the teaching-learning process and for the realization of education effectiveness and quality. This is what is claimed by the European Commission (2013), which launched the initiative "Opening up education through new technologies" presenting plan and actions to implement a strategic orientation for the operations financed under the Erasmus + and Horizon 2020 programs, directed to support an open and flexible teaching able to fully exploit the potential of new technologies to improve education and training systems and align them to the current digital world, increasing the effectiveness of education, enabling more efficient use of available resources and responding adequately to the growing demand for education around the world in order to pursue equity. Opening education to all and empowering them to learn at any time and place, with the support of anyone and with the use of any instrument capable of responding to a "skills shortfall" that Europe has recently recorded and that prevents individuals to find work in the near future if not equipped with appropriate digital skills, as 90% of jobs will require possession of these kinds of competences required to be achieved by the education systems. This initiative also includes the portal (http://openeducationeurope.eu/) that helps teachers and students to find open educational resources and strengthens the visibility of the many quality resources produced in Europe. The digital revolution under way involves a redefinition of these skills, since the different sources of information are changing its nature. An attempt to removing barriers to entry to education, the Open Education Resources (OER) defined by UNESCO in 2002: "teaching, learning or research materials that are in the public domain or released with an intellectual property license that allows for free use, adaptation, and distribution" (1). Just as what happened for digital learning and recent prospects of Open Educational Resources (2)

are enabling fundamental changes in the education world, expanding the educational offer beyond its traditional formats and borders. New ways of learning, characterised by personalisation, engagement, use of digital media, collaboration, bottom-up practices and where the learner or teacher is a creator of learning content are emerging, facilitated by the exponential growth in OER available via the internet. Europe should exploit the potential of OER much more than is currently the case. This requires good computer skills, but some Member States are still lagging behind as seen in the Education and Training Monitor 2012, with 9 Member States with over 50% of 16-74 year olds with no or low computer skills. While the use of ICT in education and training has been high on the policy agenda, critical elements are not in place to enable digital learning and OER to be mainstreamed across all education and training sectors. A coherent strategy at EU level could address the scope, size and complexity of the challenges in support of actions of the Member States and the entire chain of stakeholders…. (European Commission, 2012a)

The 7th Open Educational Resources Conference, *OER16: Open Culture*, will be held on the 19th-20th April 2016 at the University of Edinburgh. The aim is to focus on the value proposition of embedding open culture in the context of institutional strategies for learning, teaching and research. The growing availability of OER provides new learning opportunities for students and teachers, allowing them to acquire and provide knowledge in a flexible and personalized manner. This prompts teachers to assume critical attitudes, evidence-based, allowing them to respond appropriately to student achievement, connecting the elements of knowledge within and outside the classroom in order to adapt their teaching practices.

It is necessary also to support educational institutions in the development of new teaching and operating models and launch strategic initiatives and research on a large scale to test new innovative approaches that put at the centre a proper planning and evaluation of study programs and curricula by skills for the training of teachers at all levels. This also because 70% of EU teachers recognize the importance of training on methods of teaching and learning with digital tools, although in fact only 20-25% of the students have motivated and competent teachers in the digital domain (3). The majority of teachers make use of information and communication technologies in order to prepare the educational activities rather than use them to work with students during class.

In this direction, the literature shows (Sadler, Amirshokoohi, Kazempour & Allspaw, 2006) how the teachers usually feel unprepared to deal with controversial discussions involving the entire class mainly attributing this failure to a lack of adequate personal and cultural resources capable of structuring experiences of this kind and thus to render measurable results. It is about, therefore, essentially to induce different ways of thinking of technology in order to stimulate teachers to improve the quality of their work, strengthening transversally those domains of skills and knowledge that will allow them to carry out at best those professional tasks which they are called upon to do today and in the future, because education is an activity that requires the use of a set of techniques, tools and actions designed to produce change through "conscious and deliberate efforts" and to build skills, knowledge and attitudes in individuals. This discussion is strengthened when in educational activities we turn to use new technologies to make more effective educational proposals; but this use generally conveys an asymmetrical relationship between teacher and student in terms of skills (often more advanced in the students than in the teacher) and that requires taking a cross-cultural and equality of opportunity perspective. The integration of ICT in education brings with it the metaphor of "hybridization" and cultural "métissage" underway in the global society, which evolves boosting creolisation precisely because of new information and communication technologies, which constitute an important condition for contamination between the educational and teaching cultures and their new configuration (Nuzzaci, 2014a; 2014b). This process of contamination between teaching cultures covers both aspects and forms of life and professional habitus, both specific skills, abilities, knowledge, teaching styles etc., sometimes very far apart, pushing education towards continuous exploration of new models and original techniques which bring with them the need to activate customized and individualized alternative routes based on the ability to

- Identify more effective teaching strategies with ICT in relation to the desired goals;
- Choose and select the icts as a function of appropriate teaching strategies;
- Use effective and relevant technologies in relation to the tasks and teaching strategies employed;
- Combine different types of ICT in relation to the tasks and teaching strategies employed;
- Assess the advantages and disadvantages that each time a certain technology can produce within the relevant context and the teaching-learning environments.

In this sense, digital skills and technological knowledge in initial teacher education programs must empower the professional profiles of the latter pointing to the construction of a set of methodological skills that make them capable in classroom settings to effectively guide students in achieving the learning objectives. It comes to guiding future teachers towards proper management

of ICT in educational contexts, to selectively and strategically use different technologies and adopt appropriate teaching and assessment conducts that feed the processes of change in the direction of educational success. This implies an actualization process and transfer of skills for the unhinging of obsolete teaching concepts and the demolishing of the obstacles preventing the modification of the didactic action systems through technologies for the emergence of an active digital citizenship. These aspects can be supported and strengthened by proper training of teachers, especially in the initial phase, which should aim at ensuring effective use of technology in the school environment, which becomes essential tools to support education processes and individualization strategies in dealing with "differences" and support the cultural variation, in terms of original and incisive perspectives on disciplinary and methodological level. A review of the literature on the role that ICTs play in the acquisition of skills in training contexts and professionalization of teachers and students shows obvious strengths and weaknesses. In particular, the quantitative and qualitative studies have often focused on the general importance of ICTs in the teaching-learning processes, but few have been those that have focused attention on the relationship between digital skills and methodological skills, necessary instead to ensure a proper educational planning and assessment through ICT effective and efficient and qualitatively appreciable. The experimental studies are still limited, often only aimed at analysing specific teaching and learning activities in formal and informal settings with specific types of ICT. The link, however, between digital skills and methodological skills recalls deeper aspects of the transformation of the *pedagogical literacy*, more and more multiple (*multiliteracies*), by involving different didactic structural components (communication, planning and evaluation), disciplinary components (math, history, geography, etc.,) and sectorial didactics (mathematics, science etc.), as well as interdisciplinary and transversal components involving the intake of specific higher order skills (problem solving, reflectiveness, critical thinking etc.) essential to teaching. Given the complexity of the problem, the need for interpretative approaches to multi-dimensional and multi-level teaching is necessary to avoid compromising the generalizability of the factors which influence the innovation activities and implementation of learning processes.

In this light the objective of studying the mechanisms that are able to strengthen teacher skills in initial and continuing education becomes central, focusing on the relationship between digital skills and methodological skills, often considered as central by the more advanced national and international debate, as they are considered "characterizing" teaching and connoting of educational innovation. Exploring ways and forms to consolidate teachers' methodological competences in initial and ongoing training through the acquisition of appropriate digital skills and relationships that link the former to the latter, particularly in instructional design and assessment processes, helps to rethink the ground of teaching constantly evolving and in a more and more interdisciplinary and knowledge transposition perspective. The system of skills (knowledge, skills and attitudes) required for teaching in the 21st century is so high as to lead to pose a continuous focus on what needs to be learnt to teach more effectively in order to ensure that all citizens acquire the skills they need.

Recognizing the role of digital competence in today's society, the European Parliament and the European Council in 2006 in its recommendation on key competences for lifelong learning when it identified digital competence as one of eight key competences essential for all individuals in a knowledge-based society: "Digital competence involves the confident and critical use of Information Society Technology (IST) for work, leisure, learning and communication. It is underpinned by basic skills in ICT: the use of computers to retrieve, access, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet". European Commission's 2010 Digital Agenda for Europe devoted a whole pillar to digital literacy, skills and inclusion. Furthermore, recognizing the need for indicators to measure the extent of digital competence in Europe, one of the actions of the Digital Agenda was to "propose by 2013 EU-wide indicators of digital competence and media literacy".

This is so true that, in recognizing the role of digital competence in today's society, the European Parliament and the European Council in 2006 in the recommendation on key competences for

Table 1. UNESCO ICT competency framework for teachers Area of educational focus

	Technology literacy	Knowledge deepening	Knowledge creation
		'Modules' – Phases of knowledge acquisition	
Understanding ICT in education	Policy Awareness	Policy Understanding	Policy Innovation
Curriculum and assessment	Basic Knowledge	Knowledge Application	Knowledge Society Skills
Pedagogy	Integrate Technology	Complex Problem solving	Self-Management
ICT	Basic Tools	Complex Tools	Pervasive Tools
Organization and administration	Standard Classroom	Collaborative Groups	Learning Organizations
Teacher professional learning	Digital Literacy	Manage and Guide	Teacher as model learner

lifelong learning had identified digital competence as one of the eight key competences essential for all individuals in a knowledge-based society (see Table 1): "Digital competence involves the confident and critical use of Information Society Technology (IST) for work, leisure, learning and communication. It is underpinned by basic skills in ICT: the use of computers to retrieve, access, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet".

European Commission has been devoting a great deal of attention to digital skills and literacy of the teachers. So the teacher of today is required to equip themselves with the necessary skills to constantly innovate and adapt. Therefore, Member States increasingly recognize the need to define what teachers should know and, above all, be able to do with ICT, providing clear and concise descriptors, which differ in training programs around the world. Recognizing the need for indicators to measure the flow of digital competence in Europe, one of the actions of the Digital Agenda was to "propose by 2013 EU-wide indicators of digital competence and media literacy". As a first step a literature review was carried out which showed that while the development of indicators for media education is already in place, indicators and measurement of digital competence is still lacking.

Digital skills are therefore now placed at the centre of the more heated debate in training for the structural renewal of teaching and recalled by the most advanced educational research. In fact, at a time in which the alphabetic processes are being transformed, giving way to multiple alphabetic forms and genres (*multiliteracies*), teachers in initial and ongoing training must equip themselves with knowledge and interpretation apparatuses, as well as instrumental, suitable to face new forms of learning through new kinds of teaching, with a view to improve the quality of education. So focusing on the quality and effectiveness of ICTs, such as sources of educational innovation in university contexts of teacher training becomes essential to design and co-design concrete cultural proposals that offer precise acquisition opportunities for all categories of prospective student teachers, providing flexible learning paths that focus on appropriate models of customization and individualization, in

order to provide recipients of education the knowledge, skills and key transferable skills they need to succeed after graduation, in an environment of high quality learning that recognizes and supports good teaching (European Commission, 2013; European Commission/EACEA/Eurydice 2015).

Equity in the digital area is therefore an element that interconnects all the teaching dimensions, which range from the reflection on the school experience to better understand the complexity up to the processes of objectification, including relations between the school and the outside. It connotes primarily the adoption of appropriate behaviours regarding these relations and it brings out the functional or structural dependencies and interdependencies between those components that should help the various acquisitions learned in formal, informal and non-formal contexts, act in continuity. Digital skills guide the practice of teaching, the design and evaluation forms as well as also the use of ICTs in informal contexts of learning (the use of social networks, I-pad etc.), bringing about knowledge, behaviour regulatory mechanisms, skills, mental strategies of planning, coding of information, explicit and implicit methods of knowledge, and so on. This recalls the importance of harmonizing the use that future teachers make of ICTs inside and outside the school. William Rogers (2002) Therefore, developing and enhancing digital skills in teachers means assuming an attitude of respect and confidence with regards to the knowledge, passing through the intentionality of language, behaviour and educational practices through ICTs, because the quality of teaching concerns what teachers "know and are able to do" using the technologies and governing the educational uncertainty because of the many variables that come into the picture in teaching: heterogeneity of the students and their prerequisites, multiple codes, type of technology used and their mastery, situated practices or less, individual or group work, etc. The process of integration of ICTs must be translated into concrete educational events involving the transition from a spontaneous know how to a critical-reflexive know how (Nuzzaci, 2011a; 2011b) in the achievement of positive outcomes related to the performance of the pupils obtained, providing them with all those opportunities that make the improvement of skills relevant to the curriculum possible, with appropriate strategies, with multidisciplinary approaches, multimodal methods and multiple lexical, semantic and pragmatic structural configurations (Nuzzaci, 2012). The "plurality" and "multimodality" that ICTs bring about refer to a different construction and representation of knowledge and of the world, which also depend on the consistency of education actions and the nature of the educational process, as well as the plausibility of the latter in relation to the prerequisites of the subjects in their learning and cognitive worlds. In an increasingly globalized world of information, in fact, students must be taught to look at problems from different perspectives, gather and use information ethically and use social tools responsibly, and this cannot occur without a "digitally competent" teacher. It isn't therefore enough to ask teachers to use ICTs in school and outside, but it is necessary instead to create an interpretative framework within which digital skills may become one of the pillars of the transformation of teacher professionalism and a qualitatively valuable teaching.

This is the reason that in this edition of the Journal the problems of the teachers' training in early stage and during service are faced transversely and at different levels, both in terms of the relationship between specific experiences of training and quality of supports used for learning, both as to the relationship between pedagogical skills and digital skills, up to the focus on specific aspects of the design process in relation to oriented learning objectives and on the effort to combine education with non-formal and informal learnings to develop digital skills of teachers in a sustainable manner. It focuses on certain research questions trying to focus on some issues and key factors that relate to the teacher's skill kit and it provides programs and strong curricular experiences capable of using methodological renewal protocols that leverage the relationship, the harmonization and integration of new technologies and methodological skills in the education field. This is intended to provide an opportunity to improve the quality, applicability and the contamination of pedagogical, methodological and digital skills.

In particular in the contribution by Pierpaolo Limone and Rosaria Pace "Teacher training and digital paths. Revolution in the school: a project for lifelong learning" the experience of the University of Foggia is described in the field of teacher training, starting from a precise role of the

teacher in directing the methodological and technological innovation. It is claimed that the teacher, as an expert and educational leader, needs a repertoire of specific skills that enable the adoption of critical and situated tools, processes and resources for learning. Exploring the educational structure and the characteristics of some on-line courses addressed to teachers in initial and ongoing training, the contribution dwells to clarify which strategic skills are vital for teaching.

Still in the field of methodological skills is the paper by Kyparisia A. Papanikolaou et al. titled "Synthesizing Technological and Pedagogical Knowledge in Learning Design*: a Case Study in Teacher Training on Technology Enhanced Learning";* in a constructivist perspective, the attention is focused on the use of appropriate technologies in reference to the class functioning, to the learning of planning and the involvement of students in a constructive manner for conducting activities and effective courses. In this sense, how the trainees combine precise technologies with specific tools for cultivating specific skills is investigated, focusing on certain types of technological and pedagogical knowledge and factors perceived by the trainees as influential when adopting TEL instruments.

Considering the benefits and challenges brought about by the "digital fabrication" in educational planning processes, the contribution of Rachel Charlotte Smith, Ole Sejer Iversen and Rune Veeresawmy titled "Impediments to Digital Fabrication in Education: A study of teachers' role in digital fabrication" shows how the experiences, challenges and impediments that are linked to the teachers' roles in design processes of digital fabrication, identifying on a research study with eight primary and lower secondary teachers four central impediments for integrating digital fabrication and design into school environments.

Finally, the contribution by Sabine Seufert and Nina Scheffler "Developing Digital Competences of Vocational Teachers" which introduces a reflection on a framework to understand the informal learning processes of teacher training in professional schools, highlighting how in the corporate field of digital media and digital tools are generally more accepted than in educational contexts, also because they are necessary to deal with the rapid changes entering the digitization in many sectors and professions. In the education field learning through technology appears still underdeveloped also because of insufficient digital skills of teachers and for the way in which these gain their knowledge on how to use digital media for learning and informal learning and for the absence of harmonization between non-formal and informal learning which should be better linked in order to develop the digital skills of teachers in a sustainable way.

The importance of improving digital competencies for improving quality education and training and quality of teacher education is considered an high emergency on the policy agenda in all the countries of the European Union, as well as in specific documents, for example in the accompanying Staff Working Document 'Supporting the Teaching Professions' (European Commission, 2012b) that recommends that Member States take action to support the teacher educator profession. It notes that: "the selection and professional development of those who educate teachers is a prerequisite for raising the quality of teaching and improving learning outcomes. Teacher educators guide teaching staff at all stages in their careers, model good practice, and undertake the key research that develops our understanding of teaching and learning". It is an emergency that must be addressed in a systemic and inclusive perspective.

The digital competencies support a role of innovator in teacher education environment that evolve at a fast pace and have become an important dimension of the strategy devised by the European Commission to enhance the efficiency of teaching tools. In addition, such skills have become indispensable for teachers to ensure that they keep up with the technological evolution of society. This requires the teacher to be reflective practitioner, committed to research new approaches and strategies and to familiarize themselves with new educational tools and to use digital media, educational games and social networks to creating the future society.

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ENDNOTES

1. For further information please consult UNESCO website: http://www.unesco.org/new/en/communication-and-information/access-to-knowledge/open-educational-resources
2. Communication from the Commission to the European Parliament, the Council, the European economic and social Committee and the Committee of the Regions - Rethinking Education: Investing in skills for better socio-economic outcomes /* COM/2012/0669 final */ An attempt to removing barriers to entry to education, the Open Education Resources (OER) defined by UNESCO in 2002: "teaching, learning or research materials that are in the public domain or released with an intellectual property license that allows for free use, adaptation, and distribution". For further information please consult UNESCO website: http://www.unesco.org/new/en/communication-and-information/access-to-knowledge/open-educational-resources
3. Thematic Working Group 'Teacher Professional Development' which comprised experts nominated by 26 European countries, and stakeholder organizations. More information can be found at: http://ec.europa.eu/education/school-education/teacher-cluster_en.htm.