School, curriculum and technology: the what and how of their connections

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Abstract
Technology is, here, meant as an umbrella concept that finds its location in some dimensions of the school governance such as a practice of scrutiny and a means to develop teacher training, but mostly as part of students' background and expectations to be shared in a co-constructed curriculum.
Technologies, nowadays, have been developing a new "world order" where education can cover some of the gaps students can hardly handle by just "living" the digital reality in which they are fully involved also thanks to a continuous online connection aided by the mobile devices.
Being autonomous in managing online contacts and information doesn't mean being digitally confident citizens and educational institutions can help identifying personalized and self-regulated learning path where students' needs and potentialities can find in the collaborative construction of the curriculum a common ground which ensure equity of the educational offer and respect of diversity at the same time.

Keywords: technology, curriculum, school.

Introduction

The relationship between the umbrella term/concept "technology" and the school as a system appears to be multifaceted and cannot be simply located in the only connection with the needed development of students' digital competences and the training of digitally confident teachers and administrators.

The advent of digitalization, the development of online environments and mobile applications requires a reconceptualization of the meaning of technology itself for the educational process.

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As Mott and Lohr highlight:

> Many of our current life pressures and our need to learn are tied to what has been termed the "New World Order" brought about by complex and rapid social, technological, and global change, by quickening knowledge obsolescence, and increased ambiguity (2014, p. 87).

It can be assumed that the so called "new world order" implies new skills in information literacy and critical thinking, both are related to the need of finding new approaches to develop students' autonomy in their learning path.

If it is true that technology offers a variety of opportunities in terms of information creation, reuse and sharing the way we organize such knowledge in a structured way in any formal educational system requires a solid reflection on what comprehensiveness and comprehension in a curriculum mean for today's students. Petrina (2004, 2007) underlines how curriculum theorists have been working since late 1970s to integrate the vision of the curriculum with an ecological approach (Gibson, 1979; Timberlake, 1984) rather than conceiving it as a mere "technical procedure of writing objectives, choosing activities, content and methods and modes of assessment" (Petrina, 2007, p. 255). He focuses on the following questions when addressing the issue of curriculum planning:

- What kind of world do we want?
- What do we have in common and how do we represent our differences?
- How can we demonstrate and organize knowledge for learning?
- What practices and public forms of scrutiny will we use?

In the present article technology will be the object of reflection trying to give a meaning to the above mentioned inputs for the curriculum construction and school actions towards a systematic vision of innovation.

What technology?

Before discussing the role of technology in the educational context it's necessary to briefly describe the changing landscape and, specifically, the connotations technology has been gaining in the last decades for our life. If in the Eighties technology was clearly identified with the computer (or any machine) with a set of technical skills to acquire in order to be able to interact with the it the requirements we need, today, to handle with technology embrace a variety of dimensions, meanings and processes.

With the advent of the web and, later, at the end of the Twentieth century with the development of the so called web 2.0 the focus moved from the

machine (hardware and software) to the communication and interaction flow that technology (Internet, online social environments, app, mobile devices) can activate.

Nowadays technology is not only reified in a desktop computer, but consists in a variety of devices and, most of all, is the set of community connections and relationships opened by the social web: thanks to mobile app technology is embedded in our lives.

Students and teachers bring to school their knowledge of the world that acquires an added dimension brought by the own online experience with its different "order".

An easier access to current technology in terms of design and production of learning materials, teaching resources and their availability for all actors involved (teachers, learners, school staff and parents) is possible thanks to online environments that can contain, aggregate and disseminate those artefacts.

When we refer to technology in the educational context, thus, we can discriminate between two macro levels: technology in terms of "power of action" offered to students and teachers by user-friendly applications, services, software, and technology in terms of "exploitation" of that power of action, today commonly through the online dynamics offered by the web 2.0.

Statistics on social media and online presence of users of different ages are available for nearly all countries and just to refer to some leading organizations in this field the data that will be reported are drawn from the latest reports by Statista (https://www.statista.com), the Pew Research Center (http://www.pewresearch.org) and CommonSense Media (https://www.commonsensemedia.org).

The reports on kids in UK and USA (Statista, 2016; The Common Sense Media, 2017) and teens in USA (Pew Research Center, 2015) highlight similar data.

The report on media use by kids (aged 0-8) (The Common Sense Media, 2017) shows a wide access to mobile devices at kids' home (from 52% in 2011 to 98% in 2017) and states that the average time spent with such devices each day has tripled from 2011 to 2017 with a third of total screen time devoted to them (from 4 % in 2011 to 35% in 2017). The survey run in 2016 in the United Kingdom (Statista, 2016) with 335 respondents (children aged 12-15) aimed at disclosing the use of any social media site or app highlights a high percentage in the use of social networks (Facebook 82% and Instagram 56 %) while the report on 13-17 respondents in USA (Pew Research Center, 2015) shows how the convenience in the use and the Internet access provided by mobile devices brings 92% of teens online daily (24% of them go online "almost constantly").

When we look at exploitation of technology in education some characteristics of online environments/processes need to be taken into account: the easier informal approach in the professional relationships (e.g. teachers and students sharing the same social networks) the instability and variability of sites/resources (e.g. products/services in continuous progress, the so called "perpetual beta status"), the uncertainty of the sources (e.g. information is no longer dependent on clearly identifiable authors), overexposure of own presence (e.g. mixing personal and professional details in undifferentiated environments).

Information, identities and relationships do not have a definite order, but they exist as a weave of connections.

The quality issues are clearly more complex than in the past, one of the main concern tied to the use of technology is in terms of real/fake information, real/virtual (multiple) identities and proper relationships. If we widen the perspective, current technology heavily affects the quality of life (QoL) (OECD, 2017).

Technology in terms of QoL in school can help ensuring means of connection with the current world order valorizing students' background and their expectations.

Equality of opportunities and inclusion, security and an ethical vision as digitally confident citizens can be the dimensions of a transversal curriculum that can affect students' well-being in the contemporary world.

The cross-cutting nature of technology

If we look at the EU efforts and the recent documents that aims at defining a conceptual framework around the digital competences we will notice how wide the competence areas and their dimensions are. Digcomp 2.1 and DigCompEdu (Carretero *et al*., 2017; Redecker and Punie, 2017) refer to information literacy, communication, content creation, safety and problem solving. Technology and digital competences can be a connection line in the school curriculum (the overall planning of educational actions) and in the different teachers' curricula set to organize the teaching/learning process (at macro and micro level).

It was previously mentioned that users today have a "power of action" that is enhanced by digital technology and that the digital world lets users exploit that power in different ways (using services, platforms, networks) and at different levels (personal, professional). The gap between the results of the action and its proper exploitation in terms of quality can be covered by school.

A curriculum planning in which technology is not also included, but can support the co-construction of the learning paths for learners can help answering the open questions set by Petrina (2007).

Actually teachers don't need to force their curriculum to include technology since technology is already embedded in the students' background and expectations. On one hand technology lets teachers take advantage of students' attitudes to develop reflection paths that can convert the student's autonomy in the digital world in critical thinking.

Selecting quality information and contacts on the web require a deeper autonomy than just producing, online publishing and disseminating digital artefacts. Teachers can direct the students' power of action, daily and informally experienced through digital technology, into opportunity of self-regulation in the identification, assessment and use of information (information literacy).

On the other hand technology in terms of digital tools and environments facilitate the creation of co-constructed learning paths where, for example, the design process is shared with students through digital organizers (like maps) and in which the curriculum becomes a dynamic process (Rossi, 2016).

Digital organizers can satisfy different levels in the co-construction of the curriculum.

- Teachers can modulate their planning through flexible tools in order to have a generative curriculum in which content, approaches and resources can vary according to the specificities of the group class and individual learners (Giaconi, 2016). In this direction the European project DEPIT (designing for personalization and inclusion with technologies, http://bct.unimc.it/it/ricerca/european-projects-1/depit) has just started with the coordination of University of Macerata that promoted a three year (2017-2020) research process to create a digital tool to support teachers in the design;
- Teachers and students can take advantage of the digital format of the curriculum to store and easily visualize it during the class and outside its time-lapse. The accessibility of the curriculum aided by a graphical visualization lets students connect the class activity with its "position" in terms of meaning and timeline. Students can, thus, suggest changes and/or additional inputs thanks to a deeper awareness of their learning path as initially designed by the teacher.

A co-constructed curriculum through a digital format may be relevant for developing students' autonomy and could be one of the strategies to represent and act upon students' commonalities and differences. The implications for its practice include a strong collaboration between teachers and students: "teachers can provide students with high-quality interpersonal relationships – relationships rich in attunement and supportiveness – and out of that relationship context, students can experience and begin to exercise their own sense of autonomy" (Reeve and Jang, 2006, p. 217).

Teacher training and school self-assessment

The recent communication of the European Commission (2017) focuses on school development and high quality education pointing at the following aspects that require targeted actions: (1) developing better and more inclusive schools; (2) supporting teachers and school leaders for excellent teaching and learning; (3) governance of school education systems: becoming more effective, equitable and efficient.

In respect to the first area technologies are referred to as both a self-assessment means and object of analysis. Specifically schools are offered the opportunity to self-assess themselves through a digital tool about their "digital capacity". The reports collected from participating school can represent a rich database of the current situation in Europe.

The initiative reified in the SELFIE[2] ("Self-assessment tool for digitally capable school") developed by the JRC in collaboration with the Directorate General for Education, Youth, Sport and Culture (DG EAC). It is based on the descriptors present in the conceptual framework "Digitally-Competent Educational Organisations" (DigCompOrg).

More than 600 European school classified as ISCED 1,2 and 3, that is ranging from primary to upper secondary education (including vocational ones) according to the International Standard Classification of Education set by UNESCO are testing the first prototype of the tool. The final version is foreseen to be ready for early 2018.

The rationale behind the diagnostic tool is that the school should be able to frame its current situation in terms of efficiency of digital technologies use for innovation and learning and thus have the right opportunities to reflect on the direction to take to improve its state. This process involve each interested actors, teachers, students, and school leaders.

It's a validated tool that took advantage of the results collected between 2011 and 2013 thorough the project SCALE CCR "Up-scaling Creative Classrooms in Europe" that was launched by the Information Society Unit at the Institute for Prospective Technological Studies on behalf of the Directorate General Education and Culture (DG EAC) (Bocconi *et al*., 2012).

We can assume that among the many objectives of the SCALE CCR project SELFIE focussed on the results of the conceptual work done within the need to classify "ICT-enabled innovation for learning" and develop the concept of "Creative Classrooms" (CCR).

[2] The project overview is available at the following link: https://ec.europa.eu/jrc/en/digcomporg/selfie-tool.

The second aspect, related to teachers' professionalism development, is strictly connected to the "openness" concept in training and teaching. We can not only refer to the multiple educational opportunities of Massive Open Online Courses (MOOCs), but also to the wide and diverse databases of open educational resources (OER) and scientific production for teachers and professionals working in the field. But the opportunities offered through the web and the digital resources need an effort by the teachers to identify, select, classify and reuse them with a full awareness of their licence and properties.

A new concept of "digital literacy" is being discussed and frameworks currently available aims at focussing the attention on the new skills needed to face the digital richness of the web. The *Framework for Information Literacy for Higher Education* (ACRL, 2016) clearly shows the multifaceted (students, teachers, librarians) training action in the educational context:

> The rapidly changing higher education environment, along with the dynamic and often uncertain information ecosystem in which all of us work and live, require new attention to be focused on foundational ideas about that ecosystem. Students have a greater role and responsibility in creating new knowledge, in understanding the contours and the changing dynamics of the world of information, and in using information, data, and scholarship ethically. Teaching faculty have a greater responsibility in designing curricula and assignments that foster enhanced engagement with the core ideas about information and scholarship within their disciplines. Librarians have a greater responsibility in identifying core ideas within their own knowledge domain that can extend learning for students, in creating a new cohesive curriculum for information literacy, and in collaborating more extensively with faculty (p. 2).

A supporting action from the wider community outside the educational context would be also relevant to take advantage of the potentialities of the web and be prepared about its downsides. In this direction the communication of the Commission suggests the development of online communities/networks for student teachers, early career teachers and their mentors. Those three profiles, that show a different expertise in terms of working years and direct involvement in the school context (from student teachers to experienced teachers), can activate through online interactive environments a productive exchange and triangulate their perspectives.

A major attention is dedicated to novice teachers and their induction to school practices and procedures. As an example of integration of the digital technology in newly qualified teachers training is the Italian national case here briefly reported. In Italy induction processes for teachers are active since 1994 and have been deeply revised in 2015 by MIUR (Ministry of Education, University and Research) so that in the same year it was activated a training

in which an online educational offer aimed at building an e-portfolio system becomes a structured step of the whole training (Mangione *et al*., 2016).

With reference to the last point, the one addressing the school as a system whose governance aims at developing a more effective, equitable and efficient educational offer technologies can well support the dialectics between "equity" in offering everybody the opportunity to reach their learning goals, and "diversity" in optimizing the individual potentialities (Baldacci, 2005; Fedeli, 2013). The previous paragraph highlighted the opportunities opened by digital tools in supporting teachers' design also with a personalized format where students with their peculiar needs and abilities can find the representation of their commonalities and diversities.

Conclusion

The four questions suggested by Petrina (2007) cover the following dimensions: ethical (the connection between the educational process and the desired world), socio-cultural (the complexity of the school/group class in its heterogeneity), organizational (the strategies to reify the educational process) and, finally, evaluative (the focus on the analysis of the school mission and related activity). The article tried to give a feedback to each input presenting some examples of what and how technology can interact in the educational process and be part of the curriculum.

The connections between technology and the school system have implications on the governance at European, national and local level of the specific educational institutions and the territory they interact with. A successful inclusion and full reception of technology in the curriculum should be consistent with the conceptual frameworks the European research centers have been developing and the national guidelines produced in each country to ensure a quality educational offer.

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