



The development of adolescents in a hyper-technological ecosystem and the hybridization of educational experience: towards a new educational model

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01. Background

The human being during adolescence faces a transformation that cannot be compared to any other age of life in biological, psychological and social terms (Mancaniello, 2018; Lucangeli & Vicari, 2019; Lucangeli, 2020). In our time, digital innovation and ICT influence the subject's habits, emotions, ways of socialising and ways of conceiving and interacting with reality (Floridi, 2007; Chalmers, 2022; Lavanga & Mancaniello, 2022), an *onlife dimension* (Floridi, 2014).

Subjects' learning patterns, influenced by technologies, are changing profoundly along with their cultural and educational ones (Rivoltella, 2020). Pedagogy of adolescence has a duty to develop new educational models to respond to the needs of new generations, in order to overcome the risk of the drift of the human being (Morin, 2015).

02. Technologies included

The hypertechnological ecosystem can be defined as a complex and interconnected system characterized by the pervasive integration of advanced technologies that interact synergistically to influence social, economic, and cultural processes (Wheeler, 2005).

An interdisciplinary review of the literature has revealed several aspects that characterize adolescent development within the hypertechnological ecosystem.

Among the most cutting-edge technologies in educational research, three have been identified as having the most significant impact by 2050:

- Generative Artificial Intelligence (GenAI)
- Extended Reality Technologies (XR Technologies)
- Social Robotics

03. Research questions

The main research questions started from how adolescents development is influenced by the *onlife dimension*. How do they perceive reality and, learn and perform within the *onlife dimension*? Through this «background questions», deeply analysed within the theoretical research framework, more questions were developed focusing on:

- a) digital habits;
- b) identity representation;
- c) onlife awareness.

04. Methodology

The research has designed using mixed methods. Mixed methods are particularly useful in addressing complex research questions that cannot be fully explored using a single method. By combining the strengths of both qualitative and quantitative methods, they can offer richer insights and more robust conclusions (Creswell, 2013).

Mixed methods in educational research allow to transform an untied set of events, behaviours and statements of individuals into a knowledge inherent in a given reality (Trincherò, Robasto, 2019). Within this framework one of the goals is to foster new solutions for pedagogical research.

Interviews with renowned experts were also conducted to explore the relationship between humans and technology, focusing the analysis on adolescents and the educational use of technology, both in formal and informal settings, with the aim of gaining different perspectives on the theme of adolescent development within the hypertechnological ecosystem.

The research was structured into a three different activities involving adolescents aged 14 to 17 from upper secondary schools within the Tuscany Region (see 07).

05. Research Aims

- To understand how adolescents represent themselves through a 3D avatar and how the interaction between physical reality identity and online identity occurs;
- To understand how adolescents envision their future within a hypertechnological ecosystem;
- To understand how adolescents perceive the three technologies included;
- To understand if digital competences levels have an impact on their critical thinking skills;
- To foster new hybrid models for education and didactic activity design;
- To understand teacher perspectives on adolescents' use of technologies and envision of the future.

06. Research Lab

ACTIVITY_1 – DIGITAL HABITS QUESTIONNAIRE

Initially, participants complete a questionnaire on MapUs.io to assess their digital habits, and that involves 5 different areas: use of devices, use of the screen, wellbeing, security, relation with parents on the use of devices.

ACTIVITY_2 – 3D AVATAR CREATION

The core activity of the workshop involves stimulating critical and creative thinking: participants are first asked to share their ideas about what they believe the metaverse and avatars to be, thus introducing a moment of collective reflection. Following this, using the Union Avatars platform, each participant creates a personalized digital avatar, imagining it as a representation of themselves in a hypothetical metaverse. The students are then invited to produce a written description of their avatar, explaining the reasons behind their customization choices, such as which physical, symbolic, or identity-based characteristics they selected and why.

Finally, the data collected throughout the process – from the initial questionnaire results to the written descriptions – are aggregated and linked to the created avatar through a unique identification code, ensuring anonymity and compliance with data protection regulations. This approach allows for the analysis of the relationship between digital skills, perceptions of virtual identity, and individual choices in an innovative educational context.

ACTIVITY_3 – ONLIFE AWARENESS

The core activity of the workshop focuses on addressing contemporary challenges related to Artificial Intelligence (AI), Social Robotics, and XR Technologies (Mixed Reality, Augmented Reality, and Virtual Reality). Initially, students reflect on their understanding of these topics, which informs the facilitator's brief introduction, provided only if the group demonstrates minimal knowledge. Otherwise, key concepts related to AI, Social Robotics, and XR Technologies are embedded within the feedback delivered during group presentations. Each group selects one of three predefined problems to tackle:

- (1) the ethical and societal challenges posed by deepfakes (AI),
- (2) the dynamics of coexistence and co-presence between humans and robots (Social Robotics),
- (3) the lack of shared regulations in virtual environments (XR Technologies).

Working collaboratively, each group develops a proposed solution, which they present in a format of their choice—such as oral presentations, visual representations, or digital prototypes—thereby encouraging creativity and agency in their work.

Data collection plays a central role in the workshop. The individual digital skills assessed through the digital competences questionnaire are linked to the final outputs of the groups via unique identifiers. This connection enables an analysis of the relationship between individual competencies and collective problem-solving performance, providing valuable insights into how diverse skills contribute to innovative solutions. By combining theoretical exploration with practical engagement, the workshop offers a dynamic, inclusive learning experience, equipping students to critically examine and address pressing technological and ethical issues in today's interconnected world.

07. Lab Tools



3D avatars maker



Digital Habits

08. Main References

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