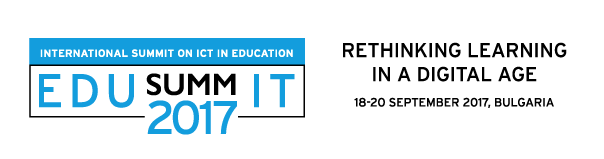
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**Thematic Working Group 8**

**Theme: Upbringing in a digital world: Opportunities and possibilities**

**Discussion paper**

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**Rationale**

The discussion paper focuses on the changing characteristics of upbringing in a technology and information saturated world, in which technological developments pose physical, cognitive, emotional, social and ethical challenges to human society at large and to the education milieu specifically. Opportunities and possibilities are immense, as education is potentially accessible and available disregarding boundaries of place and time, information is ubiquitous and knowledge develops exponentially. These are key issues in understanding future orientations of technology use and the impact of the digital world on the 21st century generation.

The main objectives for this discussion paper will be to present recent developments of research and development within the field of upbringing in a digital world. The three main objectives are: First, the need to examine traditional conventions regarding new opportunities and possibilities of upbringing in a digital world is necessary for utilizing information and communication technologies in full capacity, e.g. IoT, wearables, 7D environments. These technologies change the relationship between humans and knowledge, thereby creating an enmeshment of the physical and the virtual. Second, the need to understand socio-cultural dynamics of institutions such as family, kindergartens and schools linked to upbringing. This would include issues of participation in diverse communities using technologies as meditational means. Also, the growth of maker cultures for children and youth provide new opportunities for creative practices. Third, the need to explore children and youth as agents of change using diverse technologies. Increasingly, at an early age young children are becoming accustomed with technologies as part of their upbringing, in play and learning, with implications for development and trajectories of learning. All three objectives have implications for policy and practice.

**Introduction**

Challenges of upbringing in a digital world are influenced by social and cultural changes worldwide. International processes of globalization in several domains, accompanied by technological advancements, transform our lives and demeanor in all aspects of our lives, especially the lives of future generations, in some ways we cannot even imagine, as portrayed in a paper summarizing discussions on this topic during the last decade (Voogt, Erstad, Dede & Mishra, 2013). These raise yet another issue, namely: what is the purpose of school (e.g. better grades, to educate the young generation, to prepare youngsters for their future), particularly with the growing role of serendipitous and ubiquitous learning beyond school (Kaufman, 2013). There is also growing need of creativity and innovativeness in preparation of future working force, for jobs that did not exist prior to the ICT era. Hence, technological developments inflict new challenges, necessitating changes in the ways in which we transfer our cultural heritage to future generations. Hence, digital technology is transforming education rapidly, towards e-learning and mobile learning in ways that question traditional schooling. Digital literacy, collaboration, communication, problem solving, critical thinking and digital citizenship are examples of essential components in the upbringing of future generations in the digital era (Voogt et al., 2013). Yet the purpose of many schools may not truly reflect best learning practices for these generations; hence the concept of 21st century skills, aiming better and relevant education (Kaufman, 2013).

**Digital childhood and youth – a constant transition**

Twenty-first century skills may clash with traditional schooling guided by standards. However, schools nowadays are more prone to developing students as individuals and exploring directions such as creativity, as adjunct to ICT literacy to leverage lifelong skills that are vital to future accommodation to the digital era, e.g., leadership, ethics, accountability, adaptability, productivity, interpersonal skills and social responsibility. Media and ICT skills are evidently daily necessities, enabling children to search, organize, evaluate and produce information using technology. This implies that technology is not merely gadgets and devices, but also engaging in the handling of information (Kaufman, 2013).

One key aspect of media culture today, compared to only a decade ago, is the pervasiveness of media, especially due to the development of mobile technologies. Very few spaces or places today have no media use going on. There are, of course, both concerns and prospects in line with these developments.

In the research literature, two concepts of relevance are used: mediation and mediatization, which have different traditions and orientations. Mediatization is often used to analyze the impact of media on our societies and in our cultures (Lundby, 2009). Within Media and Communication research, this concept has been used to express ways of understanding the implications of media developments as such, as well as on education and schools as social institutions. The concept of mediation has a stronger link within learning theory, with the tradition building on Vygotsky, who emphasized how different cultural tools and the human conditions interact to create meaning, and how this changes over time (Wertsch, 1998). Mediatization theories lack a fundamental understanding of the meaning making processes between people and media in specific settings, while mediation theories lack a theoretical framing of media within cultural domains, as such.

Young children around the globe are growing up in a digitalized world, yet little is known about the ways in which they develop ‘emergent digital literacy’ or ways of meaning making (Marsh, 2015) in homes and communities. There is emerging evidence that suggests online and offline boundaries are fluid for contemporary children, as their play activities cross physical and ‘virtual’, material and immaterial domains in fluid and dynamic ways (Merchant et al., 2013; Marsh et al., 2015). However, there is still much to understand about what this relationship looks like and means in terms of broader cultural practices (Sefton-Green, Marsh, Erstad & Flewitt, 2016; Grimes and Fields, 2012; Holloway, Green & Livingstone, 2013). By the age of two, research has found that most children are using a tablet or laptop and for those children aged under five who have access to tablets in the home, approximately a third of them own their own tablet (Marsh et al., 2015). More than one in three children under five are using mobile phones to access apps and games, and online games like Minecraft have engaged young children in global networks. Touch screen technologies herald a digital sensory revolution, where new touch-sensitive interfaces are set to reconfigure what can be touched and how in digital and online environments. These technological developments call into question the centrality of language in communication and literacy practices, and have inescapable implications for young children, not only for their early literacy development and play, but also in terms of how education can help to equip today’s young citizens for a digitally connected future (Sefton-Green, Marsh, Erstad & Flewitt, 2016).

Today, large amounts of empirical data are available regarding digital youth. One line of research is directed towards quantitative studies of use patterns and frequencies. For example, in one study of media use among American youth, the Kaiser Foundation used the term “Generation M2” to describe the increasing time spent with media among American youth, tracing developments from 1999 to 2009 (Rideout, Foehr, & Roberts, 2009). Another example is the study “UK Children Online” (Livingstone & Bober, 2005) and, further, the “EU Children Online” study, that is now being expanded on a global scale. These studies document risk behaviors when using the Internet by a broad set of youth, showing that many young people are not very elaborate or reflective users.

However, in order to grasp the more qualitative aspects of media use, we need to specify certain focus areas of media use, such as the work by Gee (2003) on gaming cultures, Lankshear and Knobel (2006) and Black (2008) on fan fiction cultures, or Buckingham and Willett (2009) on media production. The affordances of these technologies are linked to their action potential, portraying the relationship between a certain technology and users’ intent to use it; therefore, the focus is on the user’s objectives and competencies. By looking at technologies as sets of affordances and constraints for users, explanations can be drawn on how and why similar technologies are used or in different contexts with diverse outcomes (Majchrzak, Markus & Wareham, 2016). In this way, we get a better understanding of how specific groups of young people are engaged in using digital media for different purposes, and the implications that these ways of using media have for their broader social and cultural lives. Similar examples of the different ways children and young people use different media and their implications are evident in other research (Coiro, Knobel, Lankshear, & Leu, 2008; Drotner & Livingstone, 2008).

Furthermore, the age-specific use of digital media is often more complex than the impression gained from public discourse. On certain social networking sites, age groups in their 20s and 30s are even greater consumers than youth, since younger age groups switch to new platforms more easily when they become accessible. However, there are certain aspects of the contextual embedding that these media have for youth rather than for adults that seem different, especially in terms of how digital media seem to play a role in identity constructions among youth (Vasbø, Silseth & Erstad, 2014). As such, it is important to define digital youth by examining the emerging practices in digital media use and how these change over time. In this way we gain a better understanding of the development of social patterns of media use, how they are distributed among the population as a whole, and the social, cultural, and educational implications they might have.

Using an ethnographic approach, Mimi Ito and colleagues have studied “digital youth” in the US (Ito et al., 2010), and later on in the ‘connected learning network (Ito et al., 2013). In what they describe as media ecologies, they manage to document the broader social and cultural contours, as well as the overall diversity, in youth engagement with digital media. This research is important in the way it broadens our understanding of media use and participation in social media among young people.

One interesting term used by Craig Watkins (2009) in analysing media use, especially during the last two decades, is “digital migration.” In his rich sets of data, Watkins shows both how young people gradually migrate from traditional mass media towards digital media, how they migrate between different online sites, such as MySpace, YouTube, and Facebook, and also how mobile technologies are creating new patterns of use anytime, anywhere.

Another example is the ways in which digital media influence the civic engagement of youth (Cassell, Huffaker, Tversky, & Ferriman, 2006; Selwyn, 2002). In recent years, this has become an interesting area of research that documents how some groups of young people either become engaged in sites made for such purposes or create their own spaces to express their own opinions or make collective statements (Loader, 2007; Rheingold, 2008). Research shows that the Internet can serve as an information resource and community-building tool for civic engagement and political participation among young people (Rainie & Horrigan, 2005). Therefore, the influence of the Internet on children and adolescents can perhaps play a positive role of engagement, a role that other institutions in society are no longer filling.

This is an example of how skills in using digital media and navigating the Internet are the foundation for the development of broader cultural competencies of importance to our evolving democratic processes. Still, these digital practices represent a challenge of participation and navigation in the Internet culture, of who really participates, and of how competent young people are as democratic participants in navigating between different online and offline spaces of importance to them.

Young people use these online sites to express personal opinions, views, and comments, either through videos taped at home, written text, or other means that are uploaded to shared spaces on the Internet. This implies a space where we are part of the cultural flow of using different media and where we talk about ourselves. Performance is part of the expressive nature of human functioning, and it takes place in different spaces of society, using a range of different tools; for example, as seen in new virtual environments (Laurel, 1993; Turkle, 1995; Butler, 1997).

As such, it is also relevant to question what has been called epistemic agency (Knorr Cetina, 1999; Scardamalia & Bereiter, 2006) and to explore to what extent young people today might be described as a digital generation (Buckingham & Willett, 2006). Epistemic agency is used here to underline the epistemological trajectories of young people involved in their use and explorations of digital media in their everyday practices. They are our culture’s frontrunners in exploring new landscapes, both online and offline. The question to be raised is to what extent this implies epistemological implications, both for themselves and the culture in which they are living.

Another growing body of knowledge refers to the term "digital language", encompassing the necessary digital skills for young people to adapt to the current digital world and to function competently within its boundaries. This comprises of the ability to program as a means of problem solving, often addressed as computational thinking (CT). This notion describes a way of thinking which involves problem solving, design thinking and understanding phenomena by utilizing concepts from the world of computer science (Pinto-Llorente et al., 2017). Hence, CT means recognizing computational aspects surrounding us while applying tools and procedures originating from computer science to help in making sense of and solving issues that refer to other disciplines, or to real-world multi-disciplinary problems. Hence, this requires higher-order thinking and competencies, abstraction and an algorithmic approach to problem solving that is widely accessible and possibly integrated into the curriculum (Qualls & Sherrell, 2010).

Studies conducted with children even at a young age show evidences of the importance of CT for developing higher order thinking skills. For example, the use of robotic software influenced students’ ability to solve problems in a programming language (Elkin, Sullivan & Bers, 2014;Marsh et al., 2016; Mayerové, & Veselovská, 2017). These studies show that robotics can be integrated and used as educational tools for empowering skills of young children, even in primary schools, and even in settings previously excluding technology altogether. Findings establish the benefits of teaching CT in classrooms from an early age. Moreover, students exhibited engagement, enthusiasm and motivation when experiencing tasks, manipulating components, constructing and programming the 3D models ((Pinto-Llorente et al., 2017; Buitrago Flórez et al., 2017). By this, students experienced authentic situations through reflection on their actions. They had the opportunity to practice coping with real-world problems through reflection on their actions and attempts to solve them (Pinto-Llorente et al., 2017).

In conclusion, technological, electronic, computational and screen-based tools can coexist even in children’s lives, together with traditional non-digital devices and tools. Children, even of a young age, may gain academic, intellectual, social and emotional benefits when experiencing several types of digital and non-digital media (Alper, 2013).

**Change agents and maker cultures**

Children’s lives are transformed by flow of information and its result: connectivity worldwide, providing opportunities to actively engage as national as well as global citizens. Consequently, educators' role focuses on the comprehension of the notion of global citizenship, which entails concepts such as respect for human rights, social justice, diversity, gender equality, and environmental sustainability (UNESCO, 2015). This requires planning of opportunities for children to practice critically thinking related to the detailed issues, as well as to act in order to preserve the values of basic human rights in an attempt to make a difference (Bennett, Aguayo & Field, 2016; Livingstone & Third, 2017).

Youth as drivers for change has been a priority for social innovation on European level for more than a decade. It has been stated that “Europe’s future depends on its youth” (EU Commission, 2009: 2), and both the ‘YOUTH’-program and ‘SALTO-YOUTH’ have been set up to involve and engage young people in diverse ways throughout Europe. However, the current crisis compounds the need to nurture young human capital in new ways, and to look for new models, solutions and strategies for solving present and future challenges for Europe.

Indeed, policymakers, researchers and practitioners need to consider a proper balance of utilizing digital technology for promoting children’s rights. Research, consequently, is necessary for counteracting the contemporary popular tendency of anxiety regarding the risks of digital technologies and its allegedly negative effects. Controversial media coverage of this topic offers a dangerous viewpoint of technology, characterizing a type of technological determinism, e.g., technologies possessing intrinsic powers that affect all people in all situations similarly (boyd, 2014). However, experiences of children and young people with digital media involve advantages as well as complexities. Complexity also characterizes the role of practitioners and researchers in their attempts to promote children’s rights and allowing them to pursue these rights (Coppock & Gillett-Swan, 2016).

Notwithstanding, we know even less about digital citizenship and the conditions for this pursuit for children with disabilities. Children are a generally marginalized population, their voices relatively unheard; hence, even less attention is allocated to children with disabilities and their use of digital media. Children with disabilities face similar challenges to other children, among them addressing opportunities to utilize digital media for social participation. Obstacles to their inclusion may intersect with additional traits, e.g., socio-cultural position, gender, religion, and geographic location. These pose challenges for all involved, firstly, teaching key literacies and ensuring full participation within societies, so these populations do not remain out of reach (Alper & Goggin, 2017).

Researchers in the fields of sociology, education, and youth studies have generated knowledge about the kind of social and material configurations within which young people navigate in contemporary societies. With the advent of the *network society* (Castells, 1996/2010), information technologies have greatly expanded the pace and extension of virtually all cultural operations and outcomes, and the landscape of opportunities and agency for civic engagement have been greatly expanded (Erstad, 2016, Ito et al., 2013). On the other hand, these networked configurations do not only produce new opportunities, but also create “new differences, inequalities and forms of exclusion, or disconnections” (Tufte & Enghel, 2009, p. 13). An important question, therefore, is to understand *how today’s different social and technological arrangements or contexts come to enable or disable young people’s norms, attitudes, values, and readiness to act towards issues of sustainability and inclusion.*

From birth, many young children’s lives are immersed in multiple media (audio, video, printed and screen-based texts) and even very young children are experiencing the 21st-century phenomenon of digital games and gaming. What is most interesting about contemporary media culture is not the participation in itself, but rather the productive- and performance-generated practices that the developments of digital media represent. These developments also raise questions of cultural competencies that are developed as part of such media culture. Jenkins, Clinton, Purushotma, Robinson, and Weigel (2006) included creative designs, ethical considerations, and technical skills to capture youths’ expressive and intellectual engagement with new media. As such, these developments in media practices point towards two important aspects: stimulating mobility and creativity among young people. Furthermore, these efforts to produce one’s own media content have been associated with the growing do-it-yourself, or DIY, movement (Guzzetti, Elliott, & Welsh, 2010; Lankshear & Knobel, 2010).

One of the more recent developments taking place in relation to digital learning is the growth of ‘makerspaces’, and one NMC Horizon report suggests that they have “the potential to empower young people to become agents of change in their communities” (Johnson et al., 2015). The digital literacy and creative skills of young children is developed through participation in creative activities in specially-designed spaces termed ‘makerspaces’. These are spaces that enable participants to create a range of artefacts using specialist tools and resources, such as electronics, laser cutters and 3D printers. There has been interest in recent years in the role of digital ‘making’, the design and production of digital artefacts, texts and products (Johnson et al., 2015) and the creation of fabrication labs, or ‘makerspaces’, in which children and young people use equipment such as 3D printers and laser cutters for these purposes (Blikstein, 2013). There is a need to enable young children to participate in such activities if they are to develop competences and dispositions that will inform their future study.

For example, Kafai, Fields and Searle (2014) document that children creating wearable textiles, ‘e-textiles’, learned how computers and electronics work (p. 542). In relation to literacies, Santo (2011; 2013) contends that critical thinking is developed through participating in ‘hacker literacies’, which is described as a process of revising and being inventive with texts that are found in online sites such as blogs. Engagement in hacking, tinkering and making may, therefore, develop a range of ‘21st century’ literacy skills’ (Jenkins et al., 2006) that are crucial to future employment and leisure opportunities. Nevertheless, whilst positive claims are made about the potential for the Maker movement to inform educational practice, there is very little research that has been undertaken in the area and the work that has been done to date has not addressed this issue in any systematic way. Peppler, Halverson, & Kafai (in press) have pointed to the way in which much of the work on makerspaces to date has been focused on adolescents and adults and it is clear that certain demographic groups have been privileged in these projects, such as affluent groups and males (Blikstein & Worsley, in press). Further, there has been little work on assessing and documenting students’ work in makerspaces and minimal attention paid to matters of student engagement and learning. It is clear that there is much further research to be undertaken on the contribution that makerspaces can make to formal educational settings.

**Implications: Crossing boundaries**

Children are prone to exceed the limits through which they are formally taught and prepared for their future as productive citizens, contemplating about issues of concern, such as human rights, with ever greater intensity in the digital age. Although children are perceived as vulnerable and in need of protection, this notion strengthens the conception of young people not as an integral part of a wider digital entity. Yet, in digital media children cannot be silenced and are able to speak their mind directly (Livingstone & Third, 2017).

Contemporary research addresses experiences of pre-school children with digital technologies that shape their communicative and creative practices (for example, Fridin, 2014; Hsin, Li & Tsai, 2014; Sharkins et al., 2016; Sundqvist & Nilsson, 2016). Studies conclude that digital technologies have the potential to expand young children’s communicative and creative skills and competencies, thereby broadening their abilities to create a borderless global culture. Mediated experiences with technologies have significant implications for early childhood education; hence, practitioners are asked to rely on technology-based experiences of children from their homes. This implies the need to take into account the changing environment of the home is as a result of the growing presence of digital technologies, and in accordance – the nature of children’s experiences and their subsequent practices. The competences children develop prior to their formal learning is valuable for their schooling period. Children attending pre-school and primary education grow up in homes enriched with multimedia, digital and diverse forms of communication via digital technologies. Hence, global policy should highlight the importance of further developing these experiences in formal education (McPake, Plowman & Stephen, 2013).

Given the mobility afforded by technology such as smart phones and tablets, texts are produced and read across a range of spaces, and this has brought about profound changes in everyday literacy practices. The implications of these significant changes for young children's digital literacy development need to be urgently addressed. The changes in everyday literacy practices brought about by the miniaturisation, mobility, personalisation and ubiquitous use of digital technologies are as profound as the changes brought about by the invention of the printing press (Kress, 2003). Statistics about changing media use from analogue to digital, and about how digital media are often central to children's everyday interactions with the world, do suggest a sea-change in the way that children experience their literacy lives in contrast with previous generations.

In her presidential address to the American Educational Research Association, called “Learning in School and Out,” Lauren Resnick (1987) considered where and how the economic, civic, and cultural aims of education can best be pursued and whether schooling itself should be reorganized to take account of what we are learning about the nature of competence in various aspects of our lives. (p. 13)

She went on to discuss how school learning differs from other learning, practical from formal intelligence. She was trying to address some of the core questions that seem to have got lost today about characteristics of learning in and out of school and how these change over time. However, her ambition was to show how life in and out of school differs in certain categories, rather than looking at how they connect. Our argument is that these divisions are more blurred now than ever before, especially from the learners’ point of view, and that we need to redefine how we understand these interrelationships between contexts. Our understanding of this has been rather poorly defined and elaborated, even though these interrelationships have been present as educational issues for a long time.

**New opportunities and possibilities**

Children and young people in several countries worldwide are immersed in digital worlds, yet there is little evidence that these activities are contributing to the expansion of knowledge or communication skills. Digital worlds potentially pose opportunities for communication and interactions from remote locations and by all ages, including children, thereby allowing access to the adult world in general, and to position holders in particular. Accessibility to digital media, e.g., email, social media (posts, tweets), collaborative environments, computer-assisted language learning, simulations of scientific environments and additional digital communication tools using smartphones has great potential also for teaching and learning about the world and the way it works. Applications of digital technologies by educators are extremely useful, but unfortunately not fully recognized or utilized. Education can prioritize usage of digital environments in an attempt to close age, gender, socio-economic and geographical gaps, to mention a few (Daiute, 2013).

Furthermore, many children access online sites to play games, watch videos, visit virtual worlds and use sites related to popular television programmes (Burke and Marsh, 2013; Holloway et al., 2013; Marci-Boehncke & Rath, 2013) and these practices require them to have a certain mastery of a range of complex skills and knowledge. There is an increasing synergy between children's online and offline digital literacy practices, with the proliferation of apps and toys that embed augmented reality (Marsh and Bishop, in press). Key areas in which new knowledge is required include the way in which young children’s online literacy practices relate to their offline practices; how augmented reality environments can support early literacy learning and the implications of the commercialisation of children’s online spaces for the development of digital literacy skills. These can be achieved through strategies that include collaboration, creativity, and personal responsibility, among others. Educators are accountable to prepare students for the society as we foresee it. Endorsing the prosperity of countries worldwide requires solving complex social and economic problems; hence, promoting creativity, innovation, leadership skills, social responsibility and additional 21st century skills will properly prepare students for their expected role. Hence, learning should be authentic, engaging meaningful, creative, and student-minded, in congruence with informal and serendipitous learning (Kaufman, 2013).

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