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Young Children, Digital Technology and the School of Tomorrow

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Abstract

Our society is being digitised, which means that digital technology transforms every aspect of the society. Smartphones and tablets have literally invaded our daily life and children are becoming digital users from an early age. They easily adapt to these everyday objects. Alternative pedagogical approaches share common values enhanced by digital culture, such as development of the senses, investment and mutual aid, as well as autonomy. The relationship between alternative approaches and digital technology creates a new type of education called "Education by digital technology". The underlying idea of this type of Education is to consider digital technologies as pedagogical tools instead of risks for young children. Thus, digital technology serves the child's development, in the context of a pedagogy stimulating the interaction between the young child, the teacher and the digital tool. Numerium, the author's diploma project, is a device that allows "Education by digital technology". It is a digital tools tank in which children are informed and educated about digital technology. By raising awareness of digital technology use among young children, we support them to become responsible, intelligent users of digital technology.

Our society is being *digitised,* which means that digital technology transforms every aspect of the society. Smartphones[1], tablets and computers have invaded our daily life, and thus children become digital users from an early age. They easily adapt to these everyday objects.

Even though the environment around children is being digitised, it is not the case in schools and even less in kindergartens. Teachers, by lack of means or by reluctance, do not use digital technologies very often in their classrooms. Usually, people do not want to put young kids in front of screens even though most of them have already used a smartphone or tablet on their own (for some children, this happens everyday).[2]

Early childhood is the fastest and the most complex stage of our development as human beings. What we realise at this age will have an influence over our future life. Through raising awareness of digital technology use among young children, we influence children's perception of these tools. We support them to become responsible, intelligent users of digital technology.

We tend to consider digital technology only as screen interfaces. And these are often perceived in a negative way. However, used wisely, these interfaces can be beneficial to the child's development. Moreover, digital tools are not only screen interfaces, but also tools with numerous sensors that can generate new functionalities.

The underlying idea of this paper is to consider digital tools as pedagogical materials instead of risks for young children. Thus, digital technology serves the child's development, in the context of active teaching stimulating the interaction between the young child, the teacher and the digital tool.

1. Digital Technology and Alternative Education

In order to understand the issues related to the relationship between young children and education, I became increasingly interested in early childhood education's role, as well as the emergence of alternative pedagogical approaches.

Early childhood Education is the period when the young child develops many skills such as speech and language development, gross motor skills, social and emotional behaviour, or even learning of reading, writing and counting. The first three years of primary education have an influence on cognitive, social and behavioural development.[3] These are the years of emancipation, when the child builds his own personality.

A young child's development depends on the pedagogical approach used from a very young age, e.g. his education between two and five years old. Over the last few years, the success of alternative pedagogical approaches has increased around the world. We could considerate this phenomenon as a school renewal with new pedagogical methods fostering children's well-being. Montessori, Reggio Emilia, Decroly, Steiner Waldorf and Freinet are the main educators who have revolutionised the 20th century School. These different pedagogical approaches share common values, such as development of the senses, investment and mutual aid, as well as autonomy and knowledge and understanding of the environment.

By taking interest in Montessori Education and Reggio Emilia Education, I have noticed common features. For example, in Montessori, the concept of *"The Absorbent Mind"*[4] is really strong. The child "absorbs" and replicates the movements and actions that he has observed in his own environment: speech is a good example of absorption such as touch screen gestures in our present world.

In Reggio Emilia's approach, the term *"The Hundred languages"*[5] refers to the endless ways and opportunities in which children have to express themselves such as painting, writing, dancing, playing music, and so on. We can perceive digital tools as means of expression—for example, the smartphone can be used as a camera.

These examples prove that alternative approaches can be improved by digital technology instead of being against. Their values can be enhanced by digital culture.

2. Towards a New Education by Digital Technology

The relationship between alternative approaches and digital technology creates a new type of education that I call *Education by digital technology*. This Education uses digital interfaces to facilitate new interactions. Not only does this pedagogical approach motivate students but it also leads to perceiving the digital tools differently—with all its sensors, smartphone can become a musical instrument for example.

Digital tools have not been created with a pedagogical intention, however they hold pedagogical virtues such as autonomy, children's curiosity solicitation and educational support. Indeed, digital interfaces encourage a multi-sensorial experience by relying on touch, sight and hearing at the same time. Moreover, the emotional dimension focused on digital tool engages a child's motivation, which helps to develop investment and mutual aid.

The purpose of *Education by digital technology* is to perceive digital technologies differently by using all the sensors and the functionalities supported by these intelligent tools. Even though they have not been designed for education, they can easily become pedagogical actors combined with play.

3. Impact of Education by Digital Technology on the Environment

Considering that the environment has an impact on pedagogy[6], if we create a new pedagogy, we must rethink the environment, the design of the school and the classrooms. This is also a principle promoted by alternative approaches: in Montessori classroom, there is a "prepared environment" and in Reggio Emilia approach, we talk about the environment as the "third teacher". These two pedagogical approaches promote *"an arrangement that facilitates movement and activity"*[7], "*a learning environment that makes use of our senses, invite curiosity and discovery, and foster relationships"*[8].

Indeed, by integrating new technologies at school, we change the spatial organization. As the teacher is not the owner of learning, *Education by digital technology* encourages numerous interactions between children, teachers and digital tools within the pedagogical environment. The environment should be stimulating, and the furniture must adapt to the different pedagogical scenarios, alone, in-group, with the teacher and so on.

As digital interfaces help to develop autonomy and solicitation of curiosity, the environment should be safe and, the child should feel free to move throughout the classroom, to freely use the tools that he needs. Furniture should be more flexible and easily movable from one place to another, and from one function to another.

4. Numerium

Numerium is my diploma project presented at ENSCI-Les Ateliers in October 2017. After several months of research about early childhood education and the use of digital and pedagogical interfaces, I have met many children, parents and teachers as well as early childhood professionals such as educators, paediatricians and speech-language pathologists. This meeting process has helped me to design the project, furniture and uses scenarios.

Numerium (from the French words: *aquarium numérique* which means digital aquarium) is a digital tools tank in which children are informed and educated, and where the borders allow screening and observation. With this device, we encourage children to use their whole body and senses to change their relationship with digital technology. It is not an alienation of the actual methods and tools, but an enrichment of the education generating new digital practices. I tried to create an innovative device without screen interface for kindergarten, a device promoting the development of the child's abilities. Each scenario is based on an active child's attitude, and then he becomes an actor of his own choices, an author of his own actions, in a changing world.

4.1. Furniture

Thinking by and for digital technologies, the furniture is flexible and mobile. Seat, bench or table, each module is independent in order to encourage modularity in the space of the classroom. We can also assemble the modules in different ways according to the different pedagogical scenarios—in circle or in line for example. Moreover, plans are available in open source, which allows schools to build their own wooden modules that can be assembled without nails neither screw.

4.2. Scenarios

These multi-actors scenarios attempt to develop the senses, especially hearing and touch, in a collective and playing environment.

4.2.1. Child-photograph

In this scenario, children are required to produce a collective piece based on photographs. Each child takes a photo of another child's body. With all the photographs, children can reproduce a body or a face.

Here, we are working on child's body awareness and the relationship between the individual and the collective.

4.2.2. Interactive Stories

This scenario is about telling a story associating sounds and movements, using CoSiMa[9] technology, developed by IRCAM.

Each child is equipped with a smartphone. At some moments of the story, children can reproduce gestures, generating sounds that illustrate the story. These gestures have been selected intuitively in order to ease their learning and their imitation by other children.

For this scenario, we have chosen the story of "We're Going on a Bear Hunt" for its dynamism and the imagination that the story can generate. The imagination is stimulated by the sounds produced by smartphones creating a particular atmosphere. It is a listening, memory and coordination work.

4.2.3. Tactile Atelier

In this tactile workshop, smartphones are hidden under materials in order to perceive the sense of touch associated to sounds and materials.

Thanks to the Scorpion application, also created by the CoSiMa team of IRCAM[10], a "caress touch" activates the sound of the smartphone. Rough surfaces are associated to high-pitched sounds and, soft surfaces are associated to deep tones. Each kid owns a wooden tablet, and he must sort the materials according to their roughness and the sounds associated. This kinaesthetic atelier fosters the children's autonomy and mutual aid.

5. Education by Digital Technology to Education on Digital Technology

The Numerium project has been tested with a hundred children aged between 3 and 6 years old in different Parisian kindergartens. As the new French Kindergarten program includes the use of digital technology, teachers and children have been really motivated by the project. Even if some changes must be incorporated in order to make the project, furniture and applications, more efficient and customizable, this is the first step.

A vector of "Learning by doing", this Education must evolve toward an "Education on digital technology". Children are surprised by *"all the things that we can do with smartphones and tablets"*. They are really curious to know how the technologies work, to discover "*what it is inside the box",* and thus demystify these devices.

Therefore, we can imagine new pedagogical scenarios promoting education on digital technology. Learning to code is one of the scenarios in several schools around the world, but this is just the beginning... At the Centre for Research and Interdisciplinarity, and especially in the Motion Lab, we are currently working to introduce new pedagogical approaches where we teach to teachers and the children how to use digital interfaces. We apply the concept of "Research by practicing", so they can learn the methods and mechanisms of digital research.

Young digital researchers, designers and educators must work together to meet the challenges caused by the current anthropological revolution. Obviously, we should rethink about the School of tomorrow. We should not forget that the learning process starts at the very beginning of life; therefore, digital natives must receive an innovative education by and on digital technology, from a very early age.

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Notes

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