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Learning Technologies & AI: Who are we designing for?

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Abstract

Focused on children and the learning context, we argue for the importance of designing artificial intelligence (AI) technologies that take a holistic view of their target users. Rather than prioritize system performance, these smart technologies can be tuned to assist users throughout the task completion process. We argue that considering children's diverse cultural, social, and emotional backgrounds is critical to pursuing inclusive and adaptive technologies that foster children's personalised learning and development.

Keywords

Children, Educational Technology, Personalization, Artificial Intelligence

1. Designing Smart Learning Technologies for Inclusion: A Holistic approach

We live surrounded by technologies that are supposed to help and entertain us. Their development and improvement travel at the speed of light, sometimes delivering on the promise of improving our life and others failing. For instance, a dyslexic person can overcome difficulties in learning thanks to devices and software designed to meet their needs. On the other hand, one of the side issues that affect dyslexic people—low self-esteem—is not taken into consideration in the design of the aforementioned software. Technologies can sometimes lighten or solve some disabilities and relieve us from heavy or risky tasks, but can they foster the issues coming from differences in cultural, social, and emotional backgrounds? User experience (UX) research is often centred on user needs. It considers three dimensions: (1) ecological, focused on the influence of the environment the new technology is going to introduce, (2) interaction, describing how the users will interact with it and (3) emotional, which aims at making desirable the design [1]. Here, the cultural and social dimensions are not explicitly accounted for, yet we

believe these to be crucial when designing technology for education. Moreover, Artificial intelligence (AI), defined as "a system's ability to correctly interpret external data, learn from such data and use those learnings to achieve specific goals and tasks through flexible adaptation" [2], could support the development of adaptive smart systems. Still, these are generally built upon large user data sets where individual differences are not visible and cannot be catered for specifically. Pandemics and wars have entered our schools, with more complexity to manage. Can the existing technologies support us? Could we rely on them to deal with these scenarios and support individual needs?

Research has proved that promoting high-quality education significantly impacts social and cultural inclusion. Side by side with teachers, technology has become a strategic ally in teaching, and learning [3]. Motivated by these facts, in this position paper, we argue that if designers focus their projects on the outcome rather than on supporting the specific tasks and users themselves, whichever they might be, the answer is no. Consider the two situations below:

- *Emma is an 8-year-old clever student. She is active in interacting during discussions and brainstorming. Teacher Mari introduced Agenda 2030 and asked the class to search for general information about it. Emma is stuck and appears unable to complete the task. Since Mari knows that Emma is timid and needs encouragement and reassurance to start, she comes to Emma's desk and talks to her. That seems to work; Emma is now more confident and ready to try.*
- *Also aged 8, born in Italy to a Peruvian couple, Nicola is a gentle and intelligent boy. He speaks Italian at school, and his parents talk to him in*

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Spanish at home. The result is that he needs help with writing texts using the Italian language because Spanish phonetics causes issues. Teacher Mari gives him additional support as soon as the task requires him to write, as happened when she asked the class to search about Agenda 2030.

Nowadays, teachers can rely on tools that target a specific task: Nicola's teacher has the support of translators and platforms that can help international students to learn a new language. On Emma's side, dyslexia has numerous compensatory and dispensation tools to choose from. In both cases, technology supports learning but not enough to let Nicola and Emma feel capable of working autonomously as their mates. What is missing? The teacher has a holistic vision and comprehension of each student; she/he can intervene to ease the learning path whenever needed on different kinds of necessities (technical, social, and others). Research and design approaches optimised/focused on performance improvement of a group of users, even at the cost of personalisation, should adopt and allocate resources to research and develop technologies that have the user and, therefore, personalisation at the centre that should ease the process. To help teachers, educators, and service workers to be more efficient and able to foster personalised support to different people even in less time, we need technologies that can be more like Emma's teacher.

Adaptation in the Edtech realm often responds to a "single" perspective, e.g., a specific age or skill; also, with search tools (e.g., visual query formulation for a particular age group) [4, 5]. The vision for the future is to design systems that can adapt to context and traits descriptive of individuals. Emma and Nicola deserve interactive interfaces and other technologies (algorithms) that can adapt and respond on-the-fly to a "holistic" view of the user and his/her context. They need technologies that consider cultural, social, emotional, learning, and cognitive factors, impacting what children -or adults- need and how they react to technology. AI, along with AI for Education (AIED), embody this vision, even if not yet completely. AI technologies are already entering schools and universities: intelligent robots and adaptive learning systems, for instance, help educators on the path to personalised learning. It comes with concerns that experts and international agencies are underlining regarding incorporating AI into the classroom, as this has "the potential to improve education, it may also introduce unforeseen complications. Artificial intelligence in education will be more effectively utilised in the future by people who are aware of the possible drawbacks associated with its usage" [6].

Tackling the future of education, UNESCO has focused on AI in learning environments and the need to consider the risks and prevent "asymmetric access to knowledge

and technologies" [7]. We can imagine a future with AI designed to avoid the already-mentioned risks. Nevertheless, Nicola and Emma need AI technologies that respond to the child as a whole, not just focused on the task; an AI that emulates teachers' approach when supporting students by adapting their actions to context and traits descriptive of individuals. A starting point for this discussion can be grounded on ongoing studies on the application of AI in education, but extending their reach as most of these studies focus on remote/online learning [8]. Another anchor is the research and design of child personas in a child co-design process [9] as it allows designers to target child-specific needs better [10]. In the end, we argue for the need for researchers and practitioners in the broad areas of computer science and AI -but also colleagues in education and experts in other areas of study that can support diversity- to continue to allocate efforts to the personalization for inclusion. The aim is to support children's holistic development and ownership of their learning while improving how teachers can support the learning process of their students [11, 12].

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