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AIED in K-12 Classrooms: Challenges and Opportunities from an Ethics Lens

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Abstract: The recent growth of the AIED field has made available several new tools to facilitate personalized learning and teaching. However, this has also raised concerns over the ethical principles and inclusivity guidelines that should monitor the use of AI tools in the classroom, especially in K-12 settings. This paper looks at some primary use cases of AI in education and reviews the concerns and challenges raised by AIED researchers over applying AI in K-12 educational spaces. We then discuss the ethical guidelines suggested by global agencies, government organizations, and AIED scholars, to direct educational policies that can help integrate AI tools in K-12 classrooms in a more ethical and inclusive manner.

Keywords: AI in K-12 education, Personalized learning, Ethics, Inclusivity, AIED Policy

1. Introduction

The research field of Artificial Intelligence in Education (AIED) has grown considerably over the last decade, leading to the availability of a range of new AI-driven tools to facilitate learning. The primary end-user of most of these learning tools, viz., intelligent tutoring systems, is the learner; while other tools aimed more directly to support classroom educators, such as teacher dashboards and automated assessment systems, have also been developed. More recently, the growth and popularity of generative AI and large language models like ChatGPT (OpenAI, 2023) has led to further interest in leveraging the power of generative AI for applications in education.

While personalized learning tools driven by learning sciences principles and AI technologies have facilitated a greater understanding of learner difficulties and therefore enabled the provision of adaptive support to address student needs during learning, the application of AI models in classroom settings comes with its own ethical challenges. This becomes even more important when AIED tools are applied to K-12 (elementary through high school) spaces, where researchers have noted an ethics policy gap in governing the use and impact of AI for children (Adams et al., 2023).

In this context, this paper presents an overview of some of the major use cases of AI in education, outlines the key ethical concerns and risks identified by scholars and practitioners on the use of AI in K-12 educational spaces, and discusses guidelines and opportunities that can be used to develop educational policies to address these concerns for AI-integrated K-12 classrooms.

2. Applications of Artificial Intelligence in Education

The rapid development of artificial intelligence (AI) technologies in the last few decades has presented several opportunities for computer scientists and learning sciences researchers to develop AI-powered learning tools and systems to support and enhance student learning. Personalized computer-based learning environments such as intelligent tutoring systems (Anderson et al., 1985; Azevedo et al., 2022), and open-ended learning environments (Land, 2000) track student activities during the learning process to inform “learner models” that attempt to capture an understanding of the dynamic cognitive, emotional, and behavioral

states of the learner as they learn. This information is used to detect the key moments during learning when the learner is facing difficulties and may benefit from receiving external support. This support, or *adaptive scaffolding*, is then often provided through system prompts or via pedagogical agents who engage the learner in conversational dialogues to gain a more contextual understanding of their current learning needs and guide them accordingly towards more efficient learning strategies and improved learning outcomes (Segedy et al., 2013; Munshi et al., 2022). The use of these personalized learning systems in the classroom also has the potential to reduce teachers' workload, especially in large classrooms where it may be difficult for the teacher to keep track of the obstacles faced by each individual learner as they work on a problem or task. Since teachers are at the epicenter of the classroom learning process, researchers have developed "teacher dashboards" to communicate the learner assessment information gained by these AI systems to the teacher (Aleven et al., 2022).

Beyond applications to directly foster student learning via intelligent learning environments, AI also has other use cases in K-12 education. For example, AI-driven automated essay scoring or exam grading tools can be used to assist the educator with administration tasks. AI models can also act as an instructional aid to the teacher by analyzing syllabus and course materials to propose personalized content (Chen et al., 2020).

Over the last year, with the availability and increased attention on generative AI tools like ChatGPT, there has also been discussions in the research community on using generative AI to address challenges in education. Kasneci et al. (2023) suggest how large language models like ChatGPT can help elementary school students develop reading comprehension skills by providing explanations and summaries of complex texts, and also help semi-automate students' task grading by identifying both the strengths and weaknesses of the learning task at hand (Kasneci et al., 2023; Soc & Heng, 2023). However, researchers also caution against potential unethical and discriminatory use of AI technologies like ChatGPT in learning contexts (Mhlanga, 2023).

In summary, the field of AIED has grown in conjunction with recent advances in educational psychology and the learning sciences to come up with AI-powered learning systems that can both provide learners with a personalized learning experience and support educators in their instructional process in the classroom. However, ethical concerns raised around the use of AI systems in K-12 education need to be identified and addressed before these systems are integrated into classrooms. We discuss some of the major concerns below.

3. Ethical Concerns Around the Use of AI in K-12 Education

Akgun et al. (2022) outline the key ethical concerns associated with AIED applications in K-12 education along four categories: *(1) privacy; (2) surveillance; (3) autonomy; and (4) bias and discrimination*.

AI tools often require the user to consent to sharing sensitive personal information (gender, demographics, location, etc.) as part of the initial user agreement. This presents *privacy* concerns, especially in cases where the use of these tools is required by the school and there is less agency on part of the end-users (teacher and students) to decide on consenting to the collection of personal information by the tool. AIED systems that use machine learning and predictive modeling algorithms to better understand learner behaviors and adapt the learning process to their needs may also need to track and monitor learner activities and/or conversations in the learning environment, thereby leading to *surveillance* concerns. In this context, the knowledge of being monitored may also make the learner feel unsafe and inhibit their level of participation in the learning task (Akgun et al., 2023). AIED platforms that are less open-ended and compel the learner to move along a specific learning trajectory driven purely by the judgments of a predictive algorithm may also take away learners' decision-making *autonomy* on their own learning process. Additionally, research has shown that AI models may have their own inherent *biases* (Roselli et al., 2019; Ntoutsi et al., 2020). If a K-12 learner is given feedback based on incorrect interpretation of their mental states or other behavioral characteristics by a machine learning model, it may disengage the learner or have even more harmful effects on their mental, socio-emotional and cognitive processes. Therefore, a learning environment that is purely AI-driven - without a human

educator in the loop – can inadvertently promote discriminatory assessment practices that affect learner grades and are detrimental for their future career prospects.

To address these concerns, it is imperative to develop guidelines and educational policies that ensure that AI systems are used in K-12 classrooms to foster learning in a fair, responsible, and inclusive manner.

4. Educational Policies to Govern the Use of AI in Classrooms

Initial conversations around ethical guidelines on the use of AI in education were started more than twenty years ago by Aiken and Epstein (2000), but they did not see widespread adoption in the development of AIED systems. However, the more recent development of AIED systems and the associated recognition of the power of AI in transforming the classroom learning space has led to a renewed focus and attention on the ethics of using AI technologies in educational contexts. We discuss recommendations from some AIED ethics documents below. We adopted the following inclusion criteria for selecting the documents reviewed in this section: (a) the document was published by a global agency or government organization; (b) it provides policy recommendations on the ethical use of AI in schools; and (c) the document was released between the years 2018 and 2023, thereby more accurately reflecting the changing education landscape during the COVID period and the increasing shift towards digital learning in a post-COVID world that makes it even more important to develop ethical policies for the use of AI in education.

Adams et al. (2023) performed a content analysis of four globally relevant AIED ethics guidelines released between the years 2019 and 2021 by the World Economic Forum (2019), IEAIED (2021), UNESCO (2021), and the United Nations Children's Fund (2021) – and identified four key ethical principles to guide AI policy development specifically pertaining to K-12 applications:

(1) ensuring *pedagogical appropriateness* of the AI system by weighing its positive effects (adaptive learner support) against potential negative social or development outcomes;
(2) protecting *children's rights*, by taking steps such as actively involving children in AI policy development or by ensuring the AI is explainable in age-appropriate language that allows the child to provide informed assent to its use;
(3) taking initiatives to develop *AI literacy* for students, teachers, as well as parents; and
(4) ensuring *teachers' well-being* and clearly defining teachers' roles and preparing them to work effectively in AI-integrated learning spaces.

These principles are further echoed in an "Insights and Recommendations" document released by the US Department of Education in May 2023 on the use of AI in schools, which discusses the need to develop a national education-focused AI policy (Cardona et al., 2023). The guidelines in this document emphasize keeping humans (teachers and students) in the instructional loop, aligning AI models to a shared vision for education, designing these models using modern learning principles, prioritizing trust, informing and involving educators, and focusing research and development efforts on addressing context and enhancing trust and safety in AIED.

The European Union's recent ethical guidelines on the use of AI in teaching and learning focus on ensuring agency and children's rights in system design and use, maintaining AI-driven learning systems' technical robustness and resilience to attack, and overall building "trustworthy AI" that is transparent, accessible, and inclusive considering use by children of all genders and demographic characteristics, with a special focus on learners with special needs (European Commission, 2022).

AI policy strategies produced by several other countries also focus on taking measures to promote ethical and inclusive AI in education with more contextual focus on the unique education landscapes of these countries. For instance, the National Strategy for Artificial Intelligence released by NITI Aayog in India calls for developing "AI technologies that are capable of imparting quality education to India's linguistically diverse population" and setting up "a consortium of Ethics Councils at each Centre of Research Excellence" to ensure that the development of AI products adhere to standard ethical practice guidelines (NITI Aayog,

2018).

UNICEF's recent policy guidance for the use of AI on children further emphasize that AIED businesses must create system guides and have internal codes of conduct in place that ensure that their software and hardware development teams implement these AI systems keeping the ethical considerations and their effects on children in mind (UNICEF, 2021).

In the changing educational space where AI technologies are heavily applied in the classroom, AIED researchers further caution against developing systems that "attempt to replace the teacher" or "diminish the human role and the human potential for learning and growth" by relying only on inferences provided by data-driven systems. Instead, AIED models should be transparent and explainable, and help teachers better understand learner needs and optimize their teaching process, and additionally provide teachers with "new and creative roles that might not have been possible before the use of technology" (Holmes et al., 2022).

5. Towards Ethical and Inclusive AI-Rich K-12 Classrooms

This paper reviewed some major application areas for artificial intelligence in the field of education and outlined ethical challenges and concerns raised by AIED researchers, policy-makers and other stakeholders. While AI-driven personalized learning models have the potential to positively transform the classroom teaching and learning process by providing educators and learners with a wide range of tools and scaffolding mechanisms to become more efficient at the task at hand, AI system developers must understand the risks and concerns of their end-users and take all possible steps to build ethical and inclusive AI learning environments. Clear government policies on ethical AIED, driven by the guidelines reviewed in this paper, can be a great first step towards ensuring accountability, transparency, privacy, and fairness in AIED system development, so that educators and all learners can feel safe in leveraging the benefits of integrating AI into their classrooms.

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