AIED ethics, a managerial perspective

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Éthique de l'Intelligence Artificielle en Éducation, une perspective managériale

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Résumé :

Cette recherche en cours vise à étudier la manière dont les valeurs sont intégrées dans les systèmes d'Intelligence Artificielle (IA) en éducation (AIED en anglais). Des recherches récentes mettent en évidence les questions éthiques associées à l'AIED. Alors que les études existantes sont basées sur l'opinion d'experts, notamment de chercheurs, nous adoptons la perspective des managers. Nous nous référons ainsi à l'approche *Value Sensitive Design* (VSD) pour répondre à la question suivante : « Comment les valeurs sont-elles intégrées dans les systèmes d'AIED du point de vue des managers ? » Nous souhaitons réaliser des études de cas avec sept plateformes éducatives françaises. Une collecte de données a déjà été effectuée, nous prévoyons de poursuivre par une second phase centrée sur l'étude du cas des plateformes. Les résultats préliminaires mettent en évidence le paysage français des systèmes AIED, et la prédominance des chercheurs en tant que gestionnaires responsables des plateformes éducatives.

Mots clés : Intelligence Artificielle ; Éducation ; Étude de cas ; *Value Sensitive Design* ; Valeurs

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Abstract :

This research in progress aims to address how values are integrated into Artificial Intelligence Education systems. Recent research points out ethical issues associated with Artificial Intelligence in Education (AIED). While existing studies are based on opinion experts, e.g. researchers on AI in Education (AIED), we take a manager's perspective. Doing this, we refer to the Value Sensitive Design (VSD) approach to address the following question: "How values are integrated in AIED systems from a manager's perspective?". We applied the case study method to seven French educational platforms. We already made the first data collection to obtain an overview of each platform. In a second phase, not yet launched, we plan to study in detail the design process of the AIED project of a few selected platforms. The preliminary results highlight the French landscape of AIED systems and the predominance of researchers as managers responsible for educational platforms.

Keywords : Artificial Intelligence ; Education ; Case study ; Value Sensitive Design ; Value

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Introduction

The arrival of generative Artificial Intelligence, among which ChatGPT is an example, has highlighted the progress of AI and its increasing ubiquity in our life, especially in education (Dwivedi et al., 2023). However, the integration of AI in education is not as recent as it may seem. The application of AI for educational purposes has been considered since the 1960s and has become a mature field of research (Doroudi, 2022). Various AI techniques and tools have been developed to support learning, teaching practices, and educational management. For instance, Intelligent Tutoring Systems provide feedback to learners based on their profiles and their knowledge (Chichekian & Benteux, 2022), curriculum can also be automatically personalized (Vo et al., 2022). AI systems were also developed to reduce teacher workload by automated marking (Vittorini et al., 2021), and to automatically select and assign learners to a curriculum.

Most of these examples are subject to ethical questions (Zhang & Aslan, 2020; Tahiru et al., 2021; Bozkurt et al., 2021; Chen et al. 2022; Huang et al., 2021; Chiu et al., 2023, see also the upcoming European AI Act). As many ethical challenges have already been identified based on AI specificities and expert opinions, less is known about how the ethics of AI is considered by shareholders in charge of implementing it. In others words, the AIED from a *managerial* perspective is, at this time, understudied. To complement the existing literature, we propose to study the ethics of AIED from a platform manager perspective. We refer to the Value Sensitive Design (VSD) as a valuable approach for understanding and managing ethical issues. VSD is "a theoretically grounded comprehensive approach to the design of technology that accounts for human values in a principled manner throughout the design process" (Friedman et al., 2006, p. 348). We consider the implementation of AI in educational platforms as an opportunity to handle ethical considerations through human values. The research question is therefore: "How values are integrated in AIED systems from a managerial perspective ?"

This research in progress aims to address the question through a case study (Yin, 2009) with the collaboration of seven educational platforms. The first data collection phase provides preliminary results regarding the French AIED landscape, available data, and the main ethical concerns. The next step is an in-depth case study on how AIEDs are implemented through VSD. We aim to contribute to both AIED and IS literature by providing an overview of the ethical challenge currently faced by platform managers and a process model of value integration in AIED systems.

The paper is structured as follows. The first section presents the AIED research field, its main ethical issues, and the VSD framework. Section 2 describes the methodological choices and the seven cases. Section 3 presents some preliminary findings. The section 4 discuss the preliminary results and gives the expected contributions.

1. Theoretical framework

1.1 AI in education

AIED is a field of research at the cross-road between computer science and education science, devoted to the implementation of artificial intelligence for educational purposes. Given the sudden sharp increase of literature during the 2010s, at the beginning of the 2020s, a substantial effort has been devoted to structuring existing research through literature reviews (Hinojo-Lucena et al. 2019; Zawacki-Richter et al., 2019; Chen et al., 2020c, 2022; Bozkurt et al., 2021; Huang et al., 2021; Tahiru et al., 2021; Zhang & Aslan, 2021; Zafari et al. 2022; Pham et Sampson, 2022; Chiu et al., 2023; Rizvi et al., 2023). Some of this research identified use cases of AIED (Chui et al., 2023), whereas others are more focused on the landscape of AIED publications, including AI technologies used and topics of interest (Chen et al., 2022).

The first set of studies shows that AIED concerns three audiences: teachers, learners, and administrators, i.e., educational managers. Education refers to the educational system, i.e., the set of processes that support the formal instruction of individuals within recognized organizations. The literature describes various use cases, including automatic assessment and marking, intelligent tutoring systems for supporting learning through personalized feedback, or personalized and adaptive curricula. The second set of literature reviews highlights that research themes and topics of interest change over time according to the evolution of technological possibilities and market demand (Chen et al., 2022). Regarding technology, literature has recently drawn attention to advanced AI techniques in Machine Learning, Artificial Neural Network and Natural Language Processing.

In a nutshell, AIED literature refers today to a mature field of research, both vast and heterogeneous. Regardless of the diversity of technologies, use cases, educational objectives, and outcomes, AIED literature assumes, somewhat too optimistically, that AI is a lever for improving education for all stakeholders. "*AIEd has enormous potential to improve learning, teaching, assessment, and educational administration by offering students more personalized and adaptive learning, fostering teachers' understanding of students' learning process, and providing anywhere anytime machine-supported queries and immediate feedback*". (p. 1, Chui et al., 2023). Throughout previous developments in AIED, the literature has focused on use cases and their expected benefits, paying less attention to potentially undesirable effects. In recent years, however, it has become more and more recognized that AIED could have a negative impact on humans and society (Ivanov, 2023) and should take more into account the "human part" (Bingley et al., 2023) for mitigating risks. Among its opportunities and benefits, AIED also raised ethical challenges. The following section is devoted to studies on this subject.

1.2 Ethical issues of AIED

Since the beginning of 2020, ethical issues have been considered one of the main future challenges of AIED (Zhang & Aslan, 2020; Tahiru et al., 2021; Bozkurt et al., 2021; Chen et al. 2022; Huang et al., 2021; Chiu et al., 2023). First, education is a highly sensitive process that involves children and young adults. Second, the representation of AIED, and its acceptance,

is determined by trust, which could be built on the respect of ethical and legal guidelines (Holmes et al., 2022; European Union[1]).

The acronym of "FATE" for Fairness, Accountability, Transparency, and Ethics has gained interest as it represents the main concerns surrounding the ethics of AIED (Memarian & Dolek, 2023). In their systematic literature review, these authors identified and analyzed publications associated with each concept. *Fairness* is the most prevalent, it refers to the concerns that algorithmic processes do not create, or when they perpetuate discrimination through algorithmic bias. The second most mentioned term is *Accountability,* defined as the "*set of preventative or mitigation strategies that make owners, designers, or users or artificially algorithms or human committees/stakeholders for strategic decision making so there may be many levels of accountability*" (id., p. 6). *Transparency* is the third most encountered FATE term, namely the willingness to make institutional policies, algorithms, and their outcomes as transparent as possible. Lastly, *Ethics* is an umbrella term that refers to various issues beyond the three previously mentioned. As a complement to FATE, Khosravi et al. (2022) also mentioned the concept of "Explainable AI". In their bibliometric analysis of AI ethics for educational purposes, Yu and Yu (2023) pointed out five ethical principles: transparency, justice, fairness and equity, non-maleficence, responsibility, and privacy. Synthesizing existing literature and guidelines, Hong et al. (2023) proposed a data ethics framework for AIED with 5 ethical concerns: Transparency, Privacy, Accountability, Inclusiveness, and Security, which apply to algorithms, data, and policy, with 4 steps of data process collection consumption, maintenance, and disposal. In the same vein, Nguyen et al. (2023) analyzed current policies and ethical guidelines of AIED to find consensual principles. They found seven principles: Governance and Stewardship, Transparency and Accountability, Sustainability and Proportionality, Privacy, Security and Safety, Inclusiveness, and Human-Centered AIED.

Although existing research studies provide an overview of the main ethical AIED issues, they refer to guidelines defined a priori by governments or Non-profit organizations, or fragmented research on various ethical issues. They are therefore less representative of the ethical issues faced by users of AIED systems. At this time, studies based on empirical data remain rare and offer a limited view. For instance, Holmes et al. (2022) collected the main ethical issues of AIED according to 17 researchers of the AIED community. Focusing on Fairness issues, Fenu et al. (2022) also carried out surveys and interviews with expert researchers to identify their views on the challenges and needs. As AIED researchers have a deep understanding of the use of AI for educational purposes, they are one shareholder among others. Teachers, learners, and managers represent the shareholders impacted by the AI implementation. To our knowledge, at this time, no study focuses on managers ethical issues and how they deal with them in AIED systems. Our study aims to explore this research question with the Value Sensitive Design approach.

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[1]https://op.europa.eu/en/publication-detail/-/publication/d81a0d54-5348-11ed-92ed-01aa75ed71a1/language-en

1.3 The Value Sensitive Design

The Value sensitive design is a methodology used in human-computer interaction, which proposes a way to integrate human values in the design process of a technology (Friedman et al., 2006). Values are understood in a broader sense as "*what a person or a group of people consider important in life*" (p. 2 Friedman et al., 2006). The approach implies three types of investigations: conceptual, empirical, and technical. Conceptual investigations consist of identifying the values through a literature review. Empirical investigations allow an understanding of the human context through various social science methods, including observations, and interviews. Technical investigations refer to technical affordances and constraints of the technology. Technical, empirical, and conceptual investigations are carried out together in an iterative process so that they can be mutually supportive.

VSD has been used in various projects despite several methodological issues (Winkler & Spiekermann, 2006; Gerdes & Frandsen, 2023). Xu et al. (2012) refer to it for exploring Privacy Enhancing Support Systems (PESS). Deng et al. (2016) draw on VSD to identify the values of micro-tasks crowdsourcing. More recently, the approach has been applied to autonomous weapons systems (Boshuijzen-van Burken, 2023), preventive health check apps (Strikwerda et al., 2022), m-Health apps (Cenci et al., 2023) or OpenStreetMap (Jaljolie et al., 2023). Several authors applied it to AI technologies. To minimize the risk of the opaque architecture of autonomous vehicles, Umbrello et al. (2022) used the VSD to integrate both values of explainability and verifiability in the system's design. They concluded that VSD represents a "strong enough foundation" for designers who aim to impulse an ethical orientation. Studying the collaboration of human-machine in industry 5.0 with the VSD, Longo et al. (2021) argued that this approach is necessary regarding the growing ethical issues surrounding the industry of the future. According to Umbrello and Van de Poel (2021), AI, especially Machine Learning, presents specific challenges that justify adapting the VSD. Machine Learning is opaque and has the potential to disembody values incorporated into systems. The authors propose therefore three modifications to the original approach. The first consists in integrating AI for Social Good principles (AI4SG), such as situational fairness, and privacy protection, as design norms. The second is to make a distinction between values promoted during design vs actually respected. The third is to extend the VSD process to encompass the whole life cycle of AI. The following VSD process is proposed: context analysis, value identification, formulation of design requirements, and prototyping.

In this study, we decided to apply VSD since it represents a promising approach for exploring ethical issues of AIED through human values. It is also suitable in the educational context which is highly sensitive and demands a careful consideration of ethical principles. Although we agree with Umbrello and Van de Poel (2021) when they stated that AI presents specific challenges, we do not refer to their VSD adaptation. We assume that education also has specificities that could influence the value at stake.

2. Research design

2.1. Method

This research is part of Educ'action, an interdisciplinary CNRS research project. Educ'action aims to bring together researchers and professional partners for a better understanding of AIED ethical issues. It involves French and international researchers from computer science, education science, and information systems management, working on seven French educational platforms. The chosen research method is a case study since it is well-suited for studying in-depth complex phenomena (Yin, 2009). In addition, as a qualitative approach, it represents a relevant way to address an emergent topic such as ethics in AIED. As the support of educational platform managers provides access to several fields, we decided to implement the multiple case study design (Yin, 2009). This research design consists of studying simultaneously different cases to make comparisons, reinforce conclusions through convergent findings across cases, and build theoretical propositions thanks to divergent findings. In the study, each education platform in the Educ'action initiative is a case. All of them are strongly associated with AIED since they have already used AI or have the project to do so soon. They are presented here below.

2.2. Presentation of use cases

The educational platform A is the only physical platform. It is an AI-empowered classroom, a physical classroom with sensors that collect data regarding participants' behavior (including gestures, posture, and face direction). Data is then anonymized and feedback can be provided to teachers and students afterwards. Platform A aim is to develop teaching and learning analyzes in an environment close to the usual classroom and with privacy-safe data collection and analysis.

The education platform B is an online platform for teachers and students in psychology. It offers courses, exercises, assessments, and progress monitoring.

The education platform C is an online platform used by more than 10,000 users in 14 universities and 10 high schools. It offers a variety of services to students and teachers, including course structuring and scriptwriting, automatic assessment of computer programs and mathematical models, personalized surveys, resources, and best practices sharing through a community.

The Education Platform D is an online platform for students and teachers in computer science. Teachers can drop computer science exercises (wording, solutions, answers) and visualize student activities through dashboards. On the other hand, students can choose exercises, do them, test their program with a set of predefined test and obtain feedback on their work.

The education platform E is an online platform that supports the collaborative production of scientific writing between students, including laboratory notebooks, project reports, and exercise notebooks. The platform provides a set of tools to students and teachers for the learning of experimental methodologies. The final users are universities and high-school students.

The educational platform F is an online platform mainly dedicated to the assessment of medical students. It also includes an ontology and a knowledge base available to students.

Educational platform G is an online platform for the assessment and certification of digital competencies.

2.3. Data collection

The project planned a two-fold data collection process. The first step involves all the education platforms, to obtain an overview of French AIED initiatives. The platform manager was requested to fill out a survey with open questions regarding the main characteristics of their devices and concerns. Results were presented and discussed during a plenary meeting. Afterwards, we proposed an ethical thinking process based on the Value Sensitive Design approach. We asked managers to identify direct and indirect users, where precisely in their research process values could be in tension, and what was the risk-benefit balance of the use of their platform.

Platform managers have agreed to undertake the process and to share their outcomes. Although this initial data collection remains limited, it offers a departure point for selecting cases that will be studied in-depth and identify the main issues faced by the platform regarding ethics in AIED. This work in progress presents the preliminary results associated with this first step of data collection.

The second step of the data collection has not yet been launched. We plan to select several cases according to their maturity, specificities and their implication level. The objective is to follow AIED projects to understand how key values are included in the device through sociotechnical choice. Data will be collected through interviews, participation in meetings, and documentary resources.

3. Preliminary results

3.1. Main use cases and ethical concerns of AIED

An overview of the case study points out three main preliminary findings: a situation regarding AIED implementation in universities; the data collected and available for AIED, and the main ethical concerns of platform managers.

First, results show that AIED is still in its infancy in our French platforms sample. Only two of them are currently using AI techniques. Platform D integrates in 2021 a model for generating representations (embedding) of the programs submitted by the students to enable the teacher to visualize the students' activity in a semantic space (2D projection). This functionality is operational but has not yet been tested by teachers. The platform D uses adaptive learning techniques to manage the skill test. The next question submitted to a participant is defined by an algorithm based on Computerized Adaptive Testing and Item Response Theory. Other platforms do not use AI techniques but their managers plan to implement IA shortly. For instance, platform B managers are currently working with a doctoral student to develop several case studies regarding adaptive learning and intelligent tutoring systems. In the long term, it also aims to implement AI admission support systems. Platform D managers plan shortly to develop functionality to assist teachers with tasks such as propagating feedback, detecting atypical solutions, and analyzing learner trajectories.

As AI systems should be fed by educational data, a second finding relates to available data. Results show that the main data available comes from the platform logs. They represent students' activities in the platform, such as connection, the performance of exercises, and registration to courses. Two platforms also collect assessment data.

Lastly, platform managers reported their three main ethical concerns regarding AIED. The first one is the measurement issue. The majority of platforms are concerned about how to measure performance indicators in a reliable and relevant way in the AIED context. Platform A managers ask: "How to measure the engagement level based on data?". Platform B managers wonder: "How to measure a behavior based on activity logs?". "How to be sure that an AI-based decision is relevant?" and "How to ensure the accuracy of key performance indicators coming from algorithms ?" are other questions raised. The second concern refers to data use, especially how data will be used by teachers and platform managers, and how to avoid intentional or non-intentional data misappropriation. The third concern is the explicability of AIED. Several platforms reported that transparency and explicability are essential for gaining the trust of students and teachers.

3.2. Users, values in tension, and risk-benefit balance of AIED platforms

Focusing on shareholders and concerns expressed by platform managers, we noticed three points. Firstly, we observed that most platform managers are themselves researchers in computer science. These platforms are still prototypical and have to be closely managed by researchers. In addition, researchers are also considered as direct users in two platforms (A and F). This can be explained by the fact that most platforms are implemented in universities, where teachers are also researchers. Second, the most often considered research step was "doing research" to better understand AIED. Managers are strongly concerned about giving users autonomy (platform E) and letting them engage in the educational process (platform E). Some of them are also aware of the side effects of real-time feedback to users, especially the risks of surveillance (platform A). Finally, the risk-benefit balance has been elicited: on the benefits side, a better understanding (platform D) and a more rational organization of the educational processes (platforms B and F); on the risk side, a risk of surveillance (platform A) and a lack of users' autonomy (platform B).

4. Conclusion

This study in progress aims to understand how values are integrated in AIED systems through the Value Sensitive Design approach and a multiple case study design. The first data collection carried out with platform managers shows the French AIED landscape and the main concerns of platform managers regarding ethics. One of the surprising preliminary findings is the predominance of researchers and research perspectives in the seven platforms of your sample. As we attempt to obtain a managerial perspective by focusing on the person in charge of the platforms, we find that most of them are researchers who express the need for more research in AIED, and consider researchers as final users. This preliminary result suggests a form of intermingling, where the same person is, at the same time, a representative of the researcher, the platform manager, and the final user. The VSD assumes that each shareholder has different values which could enter into conflict to each other during the design process. This may open

the door to conflicts of values at the individual level. What therefore happens when one person has a different status? The pessimistic scenario would be that one perspective dominates and prevents the expression of others, the optimistic one would be a harmonious integration of values. the most realistic scenario falls in between . Our aim now is to study how values are integrated in this situation.

Since this research is in progress, two theoretical contributions are expected. First, to our knowledge, this is the first French empirical study that adopts a management perspective. We already provide a first glance at the AIED landscape in France, including concerns and ethical considerations of platform managers. Existing studies of AIED ethics lie on expert opinions of AIED researchers. We expected to obtain a clearer view of AIED ethical issues faced by managers, to compare them to the findings of existing studies. Some issues will probably be more prevalent than expected, while others less represented. It is also possible to find ethical issues not yet identified. Second, through the Value Sensitive Design approach, we aimed to propose a process model of how values are managed and integrated in AIED projects. VSD has been already used in Information Systems projects (Deng et al., 2016; Longo et al., 2021; Umbrello & Van de Poel, 2021; Umbrello et al., 2022; Strikwerda et al., 2022; Boshuijzen-van Burken, 2023; Cenci et al., 2023; Jaljolie et al., 2023), but never for AIED projects. With this study, we expected to identify the values of platform managers and the various ways to integrate them into an AI system. We will contribute to the IS literature through a model of the VSD approach adapted to educational purposes.

From a managerial point of view, this study plans to offer insights to AIED platform managers. Considering the sensitive nature of education, integrating values in AIED projects represents a promising solution for building trust in AIED systems. Understanding the values, how to integrate them, and what the main issues of their integration represent are the first steps for AIED systems respectful of all stakeholders. We aim to provide some clues for ethical and trustful AIED systems.

Références

Boshuijzen-van Burken, C. (2023). Value Sensitive Design for autonomous weapon systems– a primer. *Ethics and Information Technology*, *25*(1), 11.

Bozkurt, A., Karadeniz, A., Baneres, D., Guerrero-Roldán, A. E., & Rodríguez, M. E. (2021). "Artificial intelligence and reflections from educational landscape: A review of AI studies in half a century", *Sustainability* (Switzerland), *13*(2), 1-16.

Cenci, Alessandra & Ilskov, Susanne & Andersen, Nicklas & Chiarandini, Marco. (2023). The participatory value-sensitive design (VSD) of a mHealth app targeting citizens with dementia in a Danish municipality. *AI and Ethics*. 1-27.

Chen, X., Xie, H., Zou, D., & Hwang, G. J. (2020a). Application and theory gaps during the rise of Artificial Intelligence in Education. *Computers and Education: Artificial Intelligence*. *1*, Article 100002

Chen, X., Xie, H., & Hwang, G. J. (2020b). A multi-perspective study on Artificial Intelligence in Education: Grants, conferences, journals, software tools, institutions, and researchers. *Computers and Education: Artificial Intelligence. 1*, Article 100005

Chen, L., Chen, P., & Lin, Z. (2020c). Artificial Intelligence in Education: A Review. *IEEE Access*, *8*, 75264-75278.

Chen, X., Zou, D., Xie, H., Cheng, G., & Liu, C. (2022). International Forum of Educational Technology & Society Two Decades of Artificial Intelligence in Education. *Technology & Society*, *25*(1), 28-47.

Chichekian, T., & Benteux, B. (2022). The potential of learning with (and not from) artificial intelligence in education. *Frontiers in artificial intelligence*, *5*, 903051.

Chiu, T. K. F., Xia, Q., Zhou, X., Chai, C. S., & Cheng, M. (2023). Systematic literature review on opportunities, challenges, and future research recommendations of artificial intelligence in education. *Computers and Education: Artificial Intelligence*, *4*, Article 100118

Deng, X., Joshi, K. D., & Galliers, R. D. (2016). The duality of empowerment and marginalization in microtask crowdsourcing. *MIS Quarterly*, *40*(2), 279-302.

Doroudi, S. (2022). The Intertwined Histories of Artificial Intelligence and Education, *International Journal of Artificial Intelligence in Education*. https://doi.org/10.1007/s40593-022-00313-2

Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., Baabdullah, A. M., Koohang, A., Raghavan, V., Ahuja, M., Albanna, H., Albashrawi, M. A., Al-Busaidi, A. S., Balakrishnan, J., Barlette, Y., Basu, S., Bose, I., Brooks, L., Buhalis, D., … Wright, R. (2023). "So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy. *International Journal of Information Management*, *71*, article 102642 Fenu, G., Galici, R., & Marras, M. (2022, July). Experts' view on challenges and needs for fairness in artificial intelligence for education. In *Int. Conf. on Artificial Intelligence in Education* (pp. 243-255). Springer .

Friedman, B., Kahn, P., & Borning, A. (2006). Value sensitive design and information systems. In P. Zhang, & D. Galletta (Eds.), *Human-Computer Interaction in Management Information Systems: foundations* (pp. 348–372). M.E. Sharpe.

Gerdes, A., & Frandsen, T. F. (2023). A systematic review of almost three decades of value sensitive design (VSD): what happened to the technical investigations? *Ethics and Information Technology*, *25*(2), Article 26. https://doi.org/10.1007/s10676-023-09700-2

Hinojo-Lucena, F. J., Aznar-Díaz, I., Cáceres-Reche, M. P., & Romero-Rodríguez, J. M. (2019). Artificial intelligence in higher education: A bibliometric study on its impact in the scientific literature. *Education Sciences*, *9*(1), Article 51. https://doi.org/10.3390/educsci9010051

Hong, Y. & Nguyen, A., Dang, B., & Nguyen, B.-P. (2022). Data Ethics Framework for Artificial Intelligence in Education (AIED). International Conference on Advanced Learning Technologies (ICALT 2022)(pp. 297–301). 10.1109/ICALT55010.2022.00095.

Holmes, W., Porayska-Pomsta, K., Holstein, K., Sutherland, E., Baker, T., Shum, S. B., Santos, O. C., Rodrigo, M. T., Cukurova, M., Bittencourt, I. I., & Koedinger, K. R. (2022). Ethics of AI in Education: Towards a Community-Wide Framework. *International Journal of Artificial Intelligence in Education*, *32*(3), 504–526.

Huang, J., Saleh, S., & Liu, Y. (2021). A review on artificial intelligence in education. *Academic Journal of Interdisciplinary Studies*, *10*(3), 206–217.

Jaljolie, R., Dror, T., Siriba, D. N., & Dalyot, S. (2023). Evaluating current ethical values of OpenStreetMap using value sensitive design. *Geo-Spatial Information Science*, *26*(3), 362–378.

Khosravi, H., Shum, S. B., Chen, G., Conati, C., Tsai, Y. S., Kay, J., Knight, S., Martinez-Maldonado, R., Sadiq, S., & Gašević, D. (2022). Explainable Artificial Intelligence in education. *Computers and Education: Artificial Intelligence*. *3*, article 100074.

Memarian, B., & Doleck, T. (2023). Fairness, Accountability, Transparency, and Ethics (FATE) in Artificial Intelligence (AI), and higher education: A systematic review. *Computers and Education: Artificial Intelligence*, article 100152.

Nguyen, A., Ngo, H. N., Hong, Y., Dang, B., & Nguyen, B. P. T. (2023). Ethical principles for artificial intelligence in education. *Education and Information Technologies*, *28*(4), 4221–4241.

Pham, S. T. H., & Sampson, P. M. (2022). The development of artificial intelligence in education: A review in context. *Journal of Computer Assisted Learning*, *38*(5), 1408–1421.

Rizvi, S., Waite, J., & Sentance, S. (2023). Artificial Intelligence teaching and learning in K-12 from 2019 to 2022 : A systematic literature review. *Computers and Education: Artificial Intelligence*. *4*, article 100145

Strikwerda, L., Van Steenbergen, M., Van Gorp, A., Timmers, C., & Van Grondelle, J. (2022). The value sensitive design of a preventive health check app. *Ethics and Information Technology*, *24*(3), 38.

Tahiru, F. (2021). AI in education: A systematic literature review. *Journal of Cases on Information Technology*, *23*(1), 1–20.

Umbrello, S., Van de Poel, I. (2021). Mapping value sensitive design onto AI for social good principles. *AI Ethics*, *1*(3), 283–296.

Longo, F., Padovano, A., Umbrello, S. (2020). Value-oriented and ethical technology engineering in industry 5.0: a human-centric perspective for the design of the factory of the future. *Applied Science*. https://doi.org/10.3390/app10124182

Umbrello, S., Yampolskiy, R.V. (2022). Designing AI for explainability and verifiability: a value sensitive design approach to avoid artificial stupidity in autonomous vehicles. *International Journal of Social Robot*, *14*, 313–322.

Vo, N. N. Y., Vu, Q. T., Vu, N. H., Vu, T. A., Mach, B. D., & Xu, G. (2022). Domain-specific NLP system to support learning path and curriculum design at tech universities. *Computers and Education: Artificial Intelligence*, *3*. article 100042.

Vittorini, P., Menini, S., & Tonelli, S. (2021). An AI-Based System for Formative and Summative Assessment in Data Science Courses. *International Journal of Artificial Intelligence in Education*, *31*(2), 159–185.

Winkler, T., & Spiekermann, S. (2021). Twenty years of value sensitive design: a review of methodological practices in VSD projects. *Ethics and Information Technology*, *23*, 17–21.

Xu, H., Crossler, R. E., & BéLanger, F. (2012). A value sensitive design investigation of privacy enhancing tools in web browsers. *Decision support systems*, *54*(1), 424–433.

Zafari, M., Bazargani, J. S., Sadeghi-Niaraki, A., & Choi, S. M. (2022). Artificial Intelligence Applications in K-12 Education: A Systematic Literature Review. IEEE Access, *10*, 61905–61921.

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education – where are the educators?. *International Journal of Educational Technology in Higher Education*, *16*(1), article 39.

Zhang, K., & Aslan, A. B. (2021). AI technologies for education : Recent research & future directions. *Computers and Education: Artificial Intelligence*, *2*, article 100025.