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EDITORIAL

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# Aligning human values and educational technologies with value-sensitive design

## INTRODUCTION

The rapid emergence of increasingly transformative and agentic technologies like generative artificial intelligence (GenAI), including large language models (LLMs), has thrust the ethical considerations of technology design into mainstream discourse (Hagendorff, 2024). Issues, including intellectual property rights, attribution challenges, algorithmic bias, as well as environmental and human labour costs (Huang et al., 2025), now demand attention from researchers and practitioners alike—even if they were already there before the arrival of these specific technologies. These ethical dimensions, while widely discussed in domains, such as healthcare and surveillance (eg, Ning et al., 2024), have particular relevance for educational contexts.

Although education is fundamentally an ethical endeavour (Noddings, 2015; Pring, 1987), ethically minded investigations of complex educational technologies remain relatively scarce. Exceptions do exist, such as work analysing ethical aspects of Learning Analytics (LA; Tzimas & Demetriadis, 2021; Viberg, Kizilcec, et al., 2024), as well as recent investigations into micro-ethics (Knight et al., 2023) and data sharing risks (Beardsley et al., 2019). However, these efforts tend to focus on isolated ethical issues, specific contexts, and/or particular technologies (eg, issues of privacy and LA in Drachsler & Greller, 2016). Indeed, we need to go beyond post hoc analyses of educational technologies to *design* technologies that are ethical from the outset. As technologies become more and more complex (from black-box predictive models of learner performance to automated feedback by fundamentally unexplainable LLMs) and widely adopted, designing and evaluating educational technology that does not harm what we consider important (eg, human well-being, agency and learning) becomes even more critical, as noted for a long time in the AI research community (cf. the 'value alignment problem', see Russell, 2020) and in human–computer interaction research (HCI; Friedman & Hendry, 2019).

As complex technologies like LLMs and black-box predictive algorithms are increasingly adopted for use in education, the ethical dimension of their design and use becomes quickly apparent: Should we allow students to use LLMs for learning (and how)? Should we use LLMs to grade students' work and provide feedback (and what would be the effects)? How should we support stakeholders (teachers and students) in the effective adoption of these tools in their teaching and learning practices in responsible ways?

As a critical tool to tackle these questions, the notion of values (in the sense of 'whatever is important for a person or group', for example, autonomy, power, privacy or the curiosity of learning new things) has emerged in fields as disparate as psychology, cultural studies or HCI (Friedman & Hendry, 2019). Reflecting this broader value-oriented consideration, research in educational technology is embracing human-centred approaches as a means to uncover the stakeholders'—teachers, students, instructional designers and policy makers—values and needs and integrate them into the design approaches (Topali et al., 2025). Values

help us understand what motivates us (Sagiv & Schwartz, 2022), including our motivations to learn and teach; and how different stakeholders' underlying motivations—including those embedded in technology—can align or conflict. Consider an LA dashboard that is very accurate and reveals the tiniest detail of students' behaviour to teachers: how will it be perceived and used by an individual (or a culture) that considers privacy of great importance?

Emerging from the ethically minded side of HCI research, value-sensitive design (VSD) is a theory-grounded approach to technology design that places values of both direct and indirect stakeholders at the center of the analysis, striving for more human technology that benefits (or minimizes tensions) between them (Friedman & Hendry, 2019). In this special section, we argue that VSD may help us solve value alignment problems in educational technology, by eliciting values from multiple stakeholders, analysing values embedded (explicitly or implicitly) in the technologies we use for learning and teaching, and helping us researchers and designers to think more creatively about (often, not only technical but rather socio-technical) solutions that better promote learning and well-being for all stakeholders involved.

However, VSD is still seldom applied in educational technology research. Chen and Zhu (2019) imported its ideas and methods to the field of LA; Viberg et al. (2023) called for the need to include culture and cultural values in the design of educational technology; Prieto et al. (2025) have started applying values research and VSD instruments to design doctoral education technology. The tide is rising, but there are still few frameworks and methods specific for the values-oriented design of *educational* technology, and there remain very many educational technology settings where this kind of analysis has not been performed yet.

This special section brings together recent research on the application of VSD to the design and analysis of educational technology, and argues for its becoming an integral part of any such research process. We believe this is especially relevant when second-order, unexpected impacts of educational technology are possible—which we need to recognize is more likely to happen as education becomes more hybrid (Mineshima-Lowe et al., 2024) and its technological deployments more complex. The widespread adoption of technologies, such as LLMs designed primarily in certain cultures (eg, United States and China), will also increase the need for cultural values (and tensions) analysis. In the following sections, we briefly introduce VSD for the uninitiated, survey its use so far in educational technology research, suggest a framework for thinking about values when designing/researching such technologies, present the papers making up the special section, and outline directions this area of research could head towards next.

## VALUE-SENSITIVE DESIGN

Value-sensitive design is a theoretically grounded approach to considering the design of technology through the lens of human values (Friedman, 1997; Friedman et al., 2013). At its core, VSD utilizes an integrative and iterative methodological approach: conceptual, empirical and technological investigations. *Conceptual* investigations focus on specifying and determining what values mean for different people. For instance, who are the indirect and direct stakeholders that are affected by technologies? What are the value tensions and trade-offs in the design? Do some values have more weight than other priorities? In the conceptual space, we attempt to conceptualize values and clarify the fundamental aspects within a design. For the empirical investigation, values are informed by specific human contexts in which the design is situated. *Empirical* investigations could be used to evaluate how a design is implemented into a space or human activity. Therefore, the goal of the empirical investigation in VSD is to consider what can be observed, measured or documented (either through qualitative, quantitative or mixed methods). Indeed, a range

of research methodologies can be used to understand the intersection of stakeholders, design and their values: not only questionnaires and interviews but also technology probes, log analysis and a plethora of VSD-specific research methods developed by that research community (see Friedman et al., 2017; Friedman & Hendry, 2019 for a catalogue of such VSD methods). Finally, *technological* investigations focus on how existing technologies and designs support or hinder human values. While similar to the empirical investigation, the technical investigation of VSD dives deep into the technology: while the empirical investigation focuses on the individuals, groups or social systems, the technological investigation looks at the technology itself and its features (Friedman et al., 2013).

With these three aspects (conceptual, empirical and technological) in mind, VSD seeks to be a part of the design process of technologies, rather than post hoc analysis. For instance, the conceptual, empirical and technical investigations can be applied iteratively and integrated early into design processes of new technologies. VSD is not just interested in whether the technology works for people (eg, usability); it is a methodology and perspective that deeply considers the role of ethics and morality in the design of our systems. Values are not separated from the technology or the design. Instead, VSD as an interactional perspective examines values as part of the features or properties that people design directly into the technology. For instance, an online chatbot for tutoring supports learners' accountability to education but may make privacy and security difficult, as students must input information into the system. Values are also not acultural; instead, they must also look into how individuals, groups and cultures make prioritization in their use of technologies.

For these examinations of values to take place, VSD performs multi-stakeholder investigations, considering both the *direct* users and other *indirect* stakeholders that do not use but are affected by the use of technology. In education technologies, we might think of direct stakeholders who are at the forefront of engagement with the design, such as a student or a teacher. An indirect stakeholder is one that might be ignored or forgotten in the process. For education technologies, we may forget the impacts of the technologies on families or education policymakers. Overall, while VSD has been at the forefront of computer-supported collaborative work and HCI, there is nothing that stops VSD from having an impact in education technologies, both in the design and the study of how humans make meaning from learning.

## VSD AND EDUCATIONAL TECHNOLOGIES

As we noted above, education is fundamentally an ethical endeavour (Noddings, 2015; Pring, 1987), as it often involves our young or novice learners: we desire to develop them into capable members of society, but also to preserve their well-being. Furthermore, educational settings represent complex human systems with multiple stakeholders—teachers, learners, parents, administrators, technology developers, future employers and broader society—all embedded in particular cultural contexts (Viberg, Cukurova, et al., 2024; Viberg, Kizilcec, et al., 2024). When we introduce digital technologies into these already complex environments, education is not anymore just a social form of distributing utility and interpreting values; we create ‘hyper-complex’ socio-technical systems requiring deeper consideration of these values, with numerous unpredictable consequences.

In this process of embedding complex technologies into education, critical questions emerge: What values should guide the integration of LLMs in classrooms? Which values matter for learning management systems that collect metrics for years beyond students' active learning periods? How should we address privacy and security values when deploying corporate enterprise software for learning purposes?

The transformative, long-term impact of education further amplifies the importance of these considerations. Researchers (or technology designers) need to explicitly question and

investigate their own values as well as those of stakeholders in any socio-technical system. Yet, we seldom find such systematic investigation when we examine the current design of learning technologies. Instead, what we often encounter in ethically oriented educational technology research is a focus on just one value as crucially important (eg, privacy), or a selection of important values without much discussion of who espouses these values, or why these values are more critical than others. How can educational technology researchers and designers navigate the aforementioned hyper-complexity without defaulting to 'designing as we always have and hope for the best' in terms of value alignment? VSD offers a structured approach by systematically considering stakeholders, values and how educational technologies interact with those values throughout the design and implementation process (Friedman & Hendry, 2019).

This special section and the contributions in it differ from previous work in educational technologies, such as 'designing for values' (Richards & Dignum, 2019), which calls for integrating values in the design of AI-based pedagogical agents, specifically. While sharing some of the same elements—stakeholder identification and value elicitation—we posit that we need to go beyond just thinking about values when designing educational technology. We need a more systematic approach that helps us put human values at the center across the design, implementation and evaluation cycles of such technologies. A VSD approach and VSD methods (including new methods and conceptual frameworks *specific* for the value-oriented design of educational technology) can help guide us in doing so.

As demonstrated by the theory of basic values (Schwartz, 2012) and other work in cross-cultural psychology (eg, Xu et al., 2023), values can be structured and studied systematically across cultures. By merging VSD and such cultural values research, we can provide educational technology designers and researchers with a foundation for understanding stakeholder values and potential value conflicts. By applying VSD methods specifically adapted for educational contexts, we can better ensure that our technologies align with the values of those they serve, whether we are designing for doctoral students' persistence (Prieto et al., 2023), younger learners' financial literacy (Yip et al., 2023), or teachers' instructional design (Abramenka-Lachheb et al., 2025). In the remainder of this section, we outline a conceptual framework that fits this description (ie, utilizing VSD and cultural values' ideas, adapting them for the specific case of educational technology).

## A FRAMEWORK OF VALUES TO CONSIDER IN EDUCATIONAL TECHNOLOGY DESIGN

A key dilemma for educational technology designers attempting to adopt VSD approaches concerns *which* values to consider during the design process. How should such values be organized? How do values intersect with learning goals and processes? These questions are particularly challenging given the aforementioned hyper-complexity of technology-enhanced educational ecosystems, which involve multiple stakeholders and are embedded in particular cultural contexts. Ethical and value investigations in educational technology thus far tend to focus on just one value (eg, privacy in LA research), without a systematic investigation of how that value interacts (or is at odds) with other potentially relevant values (eg, trust and fairness). Further, the selection of which values are important is often determined solely by researchers, without much discussion of *who* espouses these values, or *why* these values are more critical than others. Deciding which values are important to look at when designing technology for learning and teaching in a certain context (or cross-cultural contexts) thus remains a fuzzy, largely intuitive business for the learning technologies researcher and designer.

As educational technology researchers, we may also wonder whether we should simply adopt VSD as developed in other fields (and the list of values that have been traditionally investigated in VSD), or whether there are *specific values* or *methods* particularly relevant to educational technology. Further questions emerge about how values are impacted by the distribution and adoption of learning technologies, including community adoption patterns, corporate interests, and policy considerations.

To begin addressing these questions and gaps, we propose a framework to more systematically elicit and consider values in educational technology design. This framework draws from established research on human values, particularly Sagiv and Schwartz's (2022) work, which recognizes that values are contextual (different values manifest in different situations) while also acknowledging the existence of basic, cross-contextual values (eg, the welfare of people close to us, self-direction or the seeking of comfort and pleasure) that apply across various situations and that can be studied across cultures.

When investigating educational technology phenomena through a VSD lens, we contend that we need to consider both the values of the different stakeholders involved (teachers, learners, parents or administrators) but also three distinct layers of values, which give the framework its name, B(LT)T:

1. *Basic values (B), including cultural values*: These are trans-situational values as posited by, for example, Schwartz's theory of basic values (2012), which includes constructs, such as self-direction, benevolence, universalism, security and power. These values are relevant to educational technology because of their relative stability and applicability across situations, including educational technology situations. Depending on the research purpose at hand, and whether it features cross-cultural elements or has a larger group as the main unit of analysis, cultural values (as defined, eg, by Hofstede, 2001), such as power distance or individualism, may also be critical to focus on (eg, Viberg, Cukurova, et al., 2024). All these basic values will also condition, for example, learner attitudes towards the concerned educational technologies (or technological ecosystem), and may drive behaviours (eg, adoption of the innovation or its use in an effective way) in such situations.
2. *Values related to learning/teaching (LT) situations*: Regardless of whether technology is used, learners (and teachers) hold different goals and motivations when engaging in learning (or teaching). For learning, these include values, such as curiosity, critical thinking, meaning-making and collaboration. We could also resort to existing instruments and taxonomies for learner motivation (eg, intrinsic motivation and test anxiety, as defined by Pintrich et al., 1993). For teaching, critical values could include care or a reasonable workload (cf. the concept of orchestration, see Dillenbourg, 2013). The basic values of a learner/teacher may connect to these learning motivations; for instance, learners with high self-direction as a basic value will more likely engage in learning out of curiosity or passion for the subject/topic.
3. *Values related to technology use (T)*: When learners and teachers use educational technologies, they consider different aspects of related practices as important. Frameworks like the technology acceptance model (TAM; Davis, 1989) suggest certain desirable qualities of a technology use situation, such as ease of use and usefulness. Literature on design principles for learning technology, as for example, Dillenbourg's (2013) suggestion of minimalistic technologies, can also serve as a starting point for such technology use values. Specific technologies may have specific values that need to be considered as important (eg, safety, reliability and trust in AI technologies, see Shneiderman, 2020). We could also resort to classic lists of values investigated in the context of technology design, such as Friedman and Hendry's (2019). Given the multitude of such desirable qualities or principles in educational technology design, investigating the hierarchy of educational technology-related values espoused by the different educational stakeholders can be fruitful.

This multi-layered approach recognizes that values—which can differ considerably among the concerned stakeholders—operate at different levels in educational technology contexts, from the general and trans-situational to the specific and contextual (see Figure 1). It also acknowledges that the concrete set of values in each plane will likely be context- (and culture-) dependent. For example, the values relevant to investigating AI technologies for doctoral education in Spain may differ significantly from those pertinent to the investigation of a learning management system for kindergarten education in China.

Examining previous work in educational technology ethics or VSD through this lens reveals interesting patterns. For instance, Chen and Zhu's (2019) work on value-sensitive LA design identifies values such as transparency, fairness and accountability. Using our framework, we can see that these values could be related to *Basic* values (fairness relates to universalism in Schwartz's theory), but mainly seem to focus on *Technology* use values (transparency as a quality of the technology). Similarly, work by Viberg et al. (2023) on culturally aware LA seems to focus mainly on the *Basic/Cultural* values plane, in its calls for more systematic investigation of values when designing and transferring such innovations across different cultures. Indeed, we conjecture that so far few works have systematically investigated values in all three planes, and for the multiple stakeholders inherently involved in any educational technology scenario.

We could briefly analyse one example that comes close to this multi-layered approach, and how it can be instantiated with concrete research methods. Prieto et al. (2023) describe initial steps in their design of an LA/AI system to support doctoral student persistence and well-being. While such a study was limited in that it examined only the values of one kind of stakeholder (doctoral students, in this case) and did not consider the role of culture and cultural values (despite being a study across countries where this aspect could be relevant), their conceptual and empirical investigation may help illustrate the value of this approach.

Their study, part of an iterative design-based research (Wang & Hannafin, 2005) project, investigated doctoral student values at the different layers, using different instruments (from prior literature or custom-developed for this research), in several iterations:

1. For *Basic* values, they used the Portrait Values Questionnaire (Sagiv & Schwartz, 2022) to understand participants' basic value hierarchies. In subsequent semi-structured interviews, students were asked to evaluate and/or provide their own value scenarios (Friedman & Hendry, 2019) that represented alternative technology designs highlighting different basic values.
2. For *Learning* values, in the absence of specific values theorization or instruments related to doctoral education, researchers had students perform a value-ranking exercise using

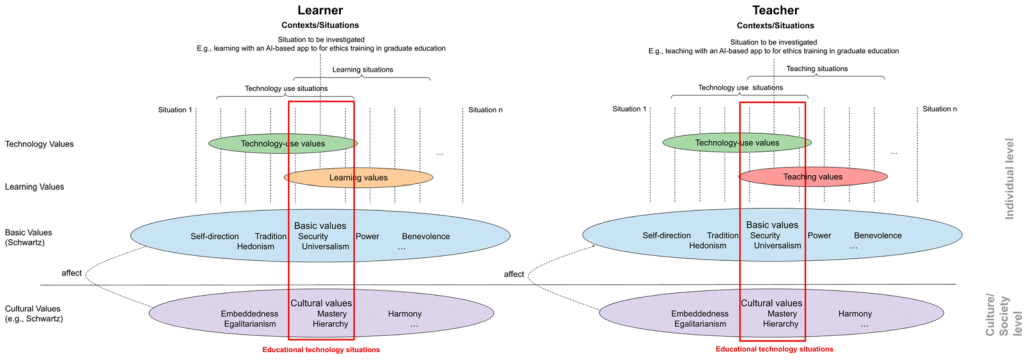


**FIGURE 1** Graphical representation of the B(LT)T conceptual framework of values to investigate in educational technology research.

learning values elicited in a prior round of fieldwork (through the qualitative analysis of interviews). These were further delved into in the aforementioned semi-structured interviews.
3. For *Technology* use values, the set of values investigated were again derived from the prior round of fieldwork (doctoral student interviews). Here, again, researchers conducted another value-ranking exercise and subsequent discussion in an interview.

This approach allowed them to understand how doctoral students' values at different levels influenced their perceptions and preferences regarding LA/AI interventions, and to derive design guidelines and insights that were (assumedly) better aligned with these multi-layered value systems (Prieto et al., 2023, see also 2025).

The B(LT)T framework provides several advantages for educational technology designers adopting a VSD approach. First, it offers a more systematic way to organize and investigate values relevant to educational technology contexts. Second, it connects general human values research with specific educational and technological contexts. Third, it can help identify potential value conflicts or alignments across different layers, stakeholders or cultural contexts.

To effectively employ this framework, however, educational technologists should:

1. investigate values at all three layers, rather than focusing on just one,
2. consider the relationships between values at different layers (eg, how basic values inform learning and technology use values),
3. explore how different stakeholders' value systems interact in the educational technology ecosystem and
4. attend to cultural and contextual factors that shape both the set of values to investigate and the value priorities.

Nevertheless, this conceptual framework for what values to investigate in educational technology should be seen as tentative. Its utility ultimately lies in its application to concrete educational technology design challenges. Further research is needed to refine the framework, develop specific methods for eliciting values at each layer, understand how values at different layers interact in various educational technology contexts and finally validate the technology and its effect on values with different stakeholders across educational contexts and countries. We hope that by adopting this multi-layered approach to values in VSD for educational technology, designers can move beyond intuitive or researcher-centric value selections towards more systematic, culturally sensitive and stakeholder-inclusive value investigations, ultimately creating educational technologies that better align with the values of those they are designed to serve.

## THE SPECIAL SECTION

The contributions in this special section provide a broad sample of recent research in educational technologies that puts different human values at the center of the design and evaluation of educational technologies. In their contribution to this special section, Abramenka-Lachheb et al. (2025) delve into the underexplored issue of VSD in the praxis of instructional designers. In particular, the authors report on their empirical work that aims to illustrate the values that instructional designers express in relation to their instructional design work for online courses. The added value of this work includes detailed accounts of instructional designers' values of care (a classic *Teaching* value) towards learners in human–computer interactions to support authentic learning practices in online learning

settings. Furthermore, they exemplify how instructional designers' values are represented in their designed artefacts, stressing their important role as value-sensitive designers.

In their research, Hernàndez-Leo and Ginoyan (2025) investigate the use of a reflective tool designed to help teachers evaluate the benefits and costs of using digital tools in their classrooms. The tool is based on VSD principles, aiming to align technology use with educators' ethical values and teaching goals. The authors explore how in-service teachers use and adapt a structured cost–benefit worksheet to reflect on their technology use, with the final objective to assess how this approach supports critical, value-sensitive decision making about educational technology. In workshops with school teachers, a customizable worksheet was used to weigh perceived benefits and costs of digital tools they currently use or plan to use. The researchers' evaluation showed the usefulness of the reflective tool on teachers´ decision making in maximizing the added value and reducing the potential harms in whether or how they use an educational technology. The teachers' cost–benefit analysis often pitted values specific to *Teaching* contexts, like engagement, inclusion or time-saving, against others like student distraction, albeit more often the tension was with values in the *Technology* use plane: data privacy, inequality, carbon footprint, over-reliance on technology. Their research is also relevant to broader values in education, such as rights of provision, protection and participation, highlighting unseen ethical and pedagogical challenges, prompting deeper reflection on *Basic* values like equity or student well-being, but also teacher workload (*Teaching*), or privacy (*Technology*).

Nguyen et al. (2025), on the contrary, applied VSD to position human values in the development and evaluation of LLM-based chatbots in a high school science curriculum. The authors first explored the values that motivate students and educators to engage with the chatbots. Second, the elicited values were conceptualized in research on ethical AI design, human values, human–AI interactions and also environmental education. Finally, the authors suggest a set of considerations for the LLM-powered chatbots to support students' identity development (which could be seen as a *Learning* value), well-being, environmental sustainability (*Basic* values) and human–LLM interactions (a very specific *Technology* value). In sum, this work provides an example of translating values into the conceptualization, development and evaluation of learning technologies, to increase technology adoption and stakeholders' engagement in using them for learning and teaching.

Shen et al. (2025) performed an empirical investigation into what values can be considered, especially important in online facilitation, discovering new key values absent from the typical VSD literature (social comfort and responsiveness), that we could see as specific of certain learning situations (ie, in the *Learning* plane of the framework above). Their investigation also portrays other values, already investigated in the VSD literature, that are relevant to the learning situation they study. The values they uncovered through interviews with higher education students in China, included autonomy (which we could see as a *Basic* value), freedom from bias, and privacy (both of which are often studied in VSD in contexts of *Technology* use). Further, their results highlight value differences in human and GenAI-based facilitation of online learning activities, which suggest that human and AI-based actors may be complementary in their skills to support different of these values. The authors also discover tensions between some of these online facilitation values and different stakeholders' values (students, vs. researchers or developers), with design implications for implementers of such GenAI innovations in online learning.

Pitt (2025) investigated the values associated with concluding and transitioning community educational projects through a cross-case analysis of two long-term educational technology initiatives. By employing stakeholder analysis and examining value tensions within the VSD lens, the author delves into the educational technology project ecosystem and the power dynamics that shape the interactions between researchers and participants (the discussed values are related to *Teaching* and *Basic* sphere of the above framework). This study

categorizes different types of endings and transitions, both individual and collective, and offers recommendations for fostering equitable termination processes in educational technology projects. Furthermore, it addresses the complexities involved in concluding a project that has maintained a long-term partnership with a community (*Basic* values), proposing strategies that promote understanding, effective navigation and thoughtful planning for the closure process. Ultimately, the work calls for less extractive and more mutually beneficial community research partnerships.

## CONCLUSION AND FUTURE DIRECTIONS

The rapid integration of agentic, opaque technologies like GenAI and LLMs into educational contexts presents a critical opportunity—and challenge—for the ethical design and implementation of technology in learning environments. As stressed in this special section, it is important to recognize the pressing need for specific frameworks and research methods that systematically address the ethical ramifications of these technologies, particularly given their potential to transform educational experiences—both positively and negatively. The emphasis on VSD serves as a vital approach to guide learning technology designers, researchers and educators in navigating the complexities inherent in the intersection of technology and education.

By centering on values throughout the design and implementation process, we can ensure that the technologies we develop not only align with educational objectives but also respect the diverse motivations, preferences and values of all stakeholders, including learners, educators, parents and broader societal actors. The proposed B(LT)T Framework exemplifies this commitment by articulating the layers of basic values, learning and teaching values, and technology use values that must be considered to foster a comprehensive understanding of value conflicts and alignments within educational technology initiatives.

As evidenced by the contributions in this special section, the exploration of values in educational technology is not merely an academic endeavour but an essential pathway towards more human and equitable educational environments. The research highlights the importance of reflective practices and stakeholder engagement in uncovering values that may have been previously overlooked or undervalued. By promoting dialogues around these values, translating them into actionable practices and user-centred design solutions for learning and teaching, practitioners can make informed, ethically oriented decisions that enhance learning experiences while safeguarding individual rights and promoting well-being.

Furthermore, with the ongoing evolution of technology and its implications in education, future research must continue to refine and expand upon the VSD principles, adapting them to incorporate cultural and contextual nuances. This dynamic engagement with values will not only guide the ethical design of emerging technologies but also support the development of educational practices that are inclusive and responsive to the needs of diverse learner populations.

Ultimately, as we move forward into an era increasingly shaped by complex educational technologies with a high transformative potential, a commitment to value-sensitive approaches will be essential in ensuring that these innovations serve to empower learners and educators alike, enhancing their agency and fostering a more just and equitable educational landscape. The work presented in this special section serves as a foundational step in this ongoing journey, underscoring the importance of embedding ethical considerations in every phase of educational technology design and implementation.

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The authors have no conflict of interest to declare in relation to this work.

## DATA AVAILABILITY STATEMENT

Not applicable.

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Not applicable.

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