The Ethics of Intelligent Systems in Secondary Education: Issues and Perspectives

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Abstract: In this article, our research aims to address the potential issues raised by the use of intelligent systems in a context where these tools are becoming increasingly prevalent and present on an almost daily basis in the teaching-learning process. Although these intelligent systems as tools offer major and growing opportunities for personalizing learning and improving educational effectiveness, they also present major challenges in terms of responsibility, fairness, transparency, and trust. Faced with these transformations, teachers are confronted with ethical dilemmas that require careful consideration and appropriate solutions. The article consists of three parts: first, the ethical challenges faced by teachers; second, suggestions for more ethical use; and finally, a survey conducted among a large number of secondary school teachers who use these intelligent systems.

Keywords: Ethics in education – Educational values – Ethical digital competence – Human agency

Résumé: Dans l'article présent, notre recherche a pour objectif d'aborder les enjeux possibles à soulever par l'usage des systèmes intelligents dans un contexte où l'usage de ces outils est de plus en plus prégnant et présent d'une manière à peu près quotidienne dans le processus enseignement-apprentissage. Bien que ces systèmes intelligents en tant qu'outils offrent des opportunités majeures et croissantes dans la personnalisation des apprentissages et l'améliorations de l'efficacité pédagogique, ils présentent également des défis majeurs en matière de responsabilités, d'équité, de transparence ainsi que de confiance. Face à ces transformations, les enseignants se trouvent confrontés à des dilemmes qui éthiques qui exigent une réflexion approfondie et des solutions adaptées. L'article comporte trois parties, d'abord les défis éthiques auxquels les enseignants sont confrontés, ensuite des pistes pour une utilisation plus éthique et enfin une enquête menée auprès d'une masse d'enseignants au cycle secondaire qualifiant utilisateurs de ces systèmes intelligents.

Mots-clés: Ethique en éducation – Valeurs éducatives – compétence numérique éthique – Agentivité humaine

Introduction

In our era, the advent of Intelligent Systems (IS) is no longer limited to a simple technological evolution, but represents a profound civilizational change involving a new restructuring of practices in all fundamental sectors, including health and industry, and is now particularly evident in the field of education (Espartinez, 2024; Shladover, 2018; Ren et al., 2019; Simens & Baker, 2012). This integration, driven by Artificial Intelligence (AI), is widely seen as a powerful lever capable of delivering on the promise of professionalizing learning on an unprecedented scale and improving the teaching and professional practices of those involved in the teaching-learning process (Holmes et al., 2022). In theory, AI could provide educators with the necessary tools to finely tune their interventions to address potential changes in the role of teachers: from dispensers of knowledge to designers of individualized learning experiences (Djelti & Kouninef, 2022).

However, it is precisely the scale of this potential that exposes the field of education to fundamental ethical dilemmas. According to Zawacki-Richter and his co-authors, the use of these tools requires reflection on systemic issues concerning fairness, accountability, algorithm transparency, and the trust that the educational community can place in these systems (Zawacki-Richter et al., 2019). Faced with these transformations, the United Nations itself has been compelled to formalize a global framework recognizing the urgency of ethical governance focused on human rights and well-being (UNESCO, 2021).

At the heart of this issue lies human agency in the act of teaching. The questions raised are conditioned by the sustainability of fair and inclusive education: How can we ensure that the widespread adoption of these technologies does not become, through algorithmic bias or lack of access, one of the new vectors contributing to structural inequality among learners, contrary to what we hope for, namely a factor of inclusion? Above all, how can we ensure that teachers are not stripped of their ethical role in ensuring critical and responsible mastery of smart tools (Selwyn, 2024)?

Through this reflection, we hope to contribute to a better understanding of intelligent systems in educational settings and to propose concrete solutions that can help and support teachers at the heart of this digital transformation by making ethics the foundation of successful innovation. With this in mind, the shift

from a purely action-based approach to an axiological approach, where values and ethical goals guide educational activities and trainer training, becomes the imperative of our research.

1. Ethical issues surrounding intelligent systems for teachers

As intelligent systems have become an integral part of teachers' daily professional lives, their integration raises ethical questions for teachers as key players in the teaching-learning process (EL KARFA, 2023). These issues are not limited to the simple use of a new tool that has suddenly appeared in professional practices, but touch on the very essence of the teaching profession (Karsenti, 2018).

According to Ouoba (2024), one of the main ethical challenges associated with the use of intelligent systems in education lies in redefining and redistributing responsibilities between teachers and technological tools (Ouoba, 2024). As these systems have become capable of performing various tasks similar to those performed by teachers, such as data analysis, recommending teaching approaches, identifying areas for improvement, and even evaluating student responses (ido, 2016; Demonte, 2013), Several doubts arise regarding this distribution: To what extent should teachers rely on these tools? And how can we ensure a balance between their professional judgment and the contribution of these intelligent systems?

However, the question now is no longer whether teachers should use these technologies, but how they can adopt them in a way that allows them to increase their capacity for action without relinquishing their central roles. On this subject, some researchers point out that "Teachers must evolve from the role of 'sage on the stage' to that of 'guide on the side,' but AI is now pushing them to become 'learning engineers,' orchestrating a multitude of human and artificial resources" (Mishra & Koehler, 2006).

According to a study by VALÉRY PSYCHÉ and PERRINE RUER published in 2019, intelligent systems such as adaptive learning platforms and data analysis tools aim to optimize educational processes by personalizing educational content and identifying the specific needs of each student (Psyché & Ruer, 2019). Take, for example, tools such as DreamBox or Knewton, which use algorithms to adapt exercises in real time based on student performance (Holmes et al., 2022). Although the opportunities offered by these technologies are significant, they still risk marginalizing the role of the teacher by reducing their ability to exercise thoughtful and personalized pedagogical judgment (Collin & Marceau, 2022). According to Selwyn (2020), this increased dependence on intelligent systems could pose a significant risk of compromising or even negatively influencing professional autonomy, due to the application of these tools' recommendations without always understanding the underlying principles.

Another major challenge facing teachers is the risk of becoming disengaged from their responsibilities in the face of the recurrent, widespread, and successive use of intelligent systems, which could be seen as a dehumanization of the role of the teacher (Houha, 2025). When these tools are perceived as infallible or completely objective, teachers may be tempted to follow their recommendations systematically without even taking the initiative to review them first, which risks limiting and stifling critical thinking among professional educators. Williamson (2017) draws attention to this trend, explaining that despite their sophisticated appearance, algorithms are never objective in their decisions: on the one hand, they reproduce the biases of their designers and the data on which they are trained. Williamson (2017) draws attention to this trend, explaining that despite their sophisticated appearance, algorithms are never objective in their decisions: on the one hand, they reproduce the biases of their designers and the data on which they are trained.

In the same vein, Cardon, in his 2015 book entitled "What Algorithms Dream Of ," confirms this idea by stating that algorithms do not simply process data, but that by classifying and prioritizing information, they contribute to creating our digital reality and structuring the cognitive and cultural frameworks in which we perceive the world according to classification criteria that are neither neutral nor purely technical (Cardon, 2015).

Furthermore, given the regular use of these tools, this dependence can influence teachers' confidence in their own skills, causing them to feel less valued and stripped of their traditional role as guides, facilitators, and transmitters of knowledge to their learners (Luckin, 2018). This feeling can be exacerbated when school culture places greater value on metrics and quantitative data produced by intelligent systems than on qualitative observation and the teacher's pedagogical intuition, creating tension between the art of teaching and the science of data.

Although it is clear that intelligent systems offer opportunities to personalize learning and meet students' needs, they also risk exacerbating existing inequalities between students (Akgun & Greenhow, 2022). Thus, it can be said that another pressing ethical issue related to the use of intelligent systems in education is that of equity and inclusion (Collin et al., 2024). On this point too, according to Holmes (2022), unequal access to these tools can widen the digital divide, reinforcing existing disparities. Contributing to this divide is the fact that some schools have significant infrastructure and more resources, enabling them to adopt high-performance smart systems, while other less fortunate schools risk being left behind (Fal Merzaki, 2024).

In the same vein, a study by Van Deursen and Van Dijk conducted in 2019 indicates that this digital divide is not only a question of access, but also of skills (Deursen & Van Dijk, 2019). In other words, inequality lies not only in whether or not one possesses technology, but also in the ability to use it critically and effectively, as this further reinforces socioeconomic inequalities and limits educational opportunities (Brotcone & Valenduc, 2009).

However, the complexity of these tools is often referred to as "black boxes" due to their opaque machine learning algorithms, which can make them difficult to understand (Steyer et al., 2021). This is mentioned in the institutional report produced for the European Commission by Karpan and Mladenovic (2025) as part of the European Digital Education Hub, which states that if teachers do not understand how tools make their decisions, It will not be possible to critically evaluate the recommendations made by these tools, how they make their decisions, or justify these decisions to students or even their parents in the event of questions. This will limit the role of the teacher and portray them as mere executors of technological commands rather than reflective and autonomous professionals in their field (Karpan & Mladenovic, 2025).

2. Prospects for ethical use by teachers

In order to ensure that smart systems are allies of education rather than vectors of inequality, it is very important to work on a culture that aims to develop skills among teachers and future teachers. These skills include critical thinking and the knowledge necessary to navigate the education system and this complex technological ecosystem. Far from a fatalistic approach, there are several concrete ways in which the ethical challenges mentioned above can be transformed into opportunities to strengthen teaching professionalism.

2.1 Strengthen "AI literacy" through training

Long and Magerko (2020) in "What is AI Literacy" confirm that such literacy requires the ability to identify and discuss the main ethical issues related to artificial intelligence, such as privacy, bias, transparency, and employment or responsibility, in order to assess the conditions under which it is appropriate to use these technologies in an educational context. According to the practical guide published by Quebec's Ministry of Higher Education entitled "Responsible Integration of Artificial Intelligence in Higher Education Institutions: benchmarks and best practices" published recently in 2025 and in Chapter 3 of The editors announce the need for robust and ongoing teacher training: "...it becomes possible, within the framework of AI governance work, to structure training courses tailored to different stakeholder profiles [...]". This goes beyond simply mastering a tool. It is about developing true "artificial intelligence literacy."

The research by Long & Magerko (2020) is consistent with the instructions in the guide we just mentioned, where this official document on page 22 emphasizes the importance of developing true artificial intelligence literacy so that teachers can develop a set of skills that will enable them to recognize when they are interacting with intelligent systems and understand their various basic principles, such as representations, decision-making and learning from data, as well as identifying the types of tasks for which these intelligent systems are particularly effective or, conversely, limited and may provide erroneous information (Long & Magerko, 2020).

However, initial and continuing training must therefore include specific modules on the ethics of intelligent systems, addressing various aspects such as the detection of algorithmic bias and the principles of student data protection in order to respect their privacy, not to mention, of course, the measurement of the educational implications of automated decisions and the risks of reinforcing inequalities (Holmes et al., 2022).

In practical terms, teachers could be trained to identify situations where the recommendation of an intelligent system is pedagogically questionable and to intervene judiciously in order to be able to make a decision: adjust it, reject it, or even contextualize it.

2.2 Cultivating a reflective practitioner mindset

Beyond formal training, it is very important to make teachers aware of the ethical implications of their choices (Jutras, 2013). This means encouraging them to adopt what Donald Schön calls the stance of the "reflective practitioner," who constantly analyzes and adjusts their practice (Schön, 1992). Adopting this stance encourages teachers to ask themselves fundamental questions before and during the use of any smart tools: What are the ethical risks associated with using this tool? How can I ensure that its use benefits all my students equally? What is the educational philosophy behind this algorithm?

To reinforce this culture of reflexivity, spaces for dialogue are essential. As Selwyn (2024) suggests, teachers can discuss their experiences within communities of practice. These collaborative workshops provide an opportunity to share concerns and discuss the challenges encountered, and undoubtedly to jointly develop solutions tailored to their context. This reflection is in line with the vision of Wenger and his co-authors: "It is through exchanges with peers that teachers can transform individual uncertainty into collective intelligence, thereby creating local and shared ethical standards" (Wenger et al., 2002). Similarly, institutions can catalyze

these initiatives by setting up mentoring programs where experienced teachers accompany their colleagues who are less familiar with these tools in a spirit of support and supervision (Tasho Kasongo et al., 2025).

2.3 Need to establish a clear and supportive institutional framework

In its 2021 report, UNESCO explicitly mentioned recommendations on the ethical use of intelligent systems, providing a global framework that can inspire these local policies by emphasizing the principles of transparency, justice, and the primacy of human beings (UNESCO, 2021).

In the same vein, another avenue that we believe is essential is the involvement of educational institutions (Razkaoui, 2025). These institutions must provide a clear ethical framework accompanied by appropriate support. This institutional framework should include jointly developed guidelines, as recommended by Williamson (2017).

At the same time, ongoing support is necessary. This support can take the form of continuing education, the provision of dedicated teaching resources, and personalized technical and pedagogical support (Luckin, 2018). The aim is to ensure that teachers are never left alone to deal with the complexity of the tool or face an ethical dilemma.

As Zouaoui (2025) points out, it is essential that the educational community as a whole engage in this debate to ensure that technology remains a means to serve a humanistic educational project and not the other way around. The risk, as warned by educational philosopher Gert Biesta (2015), is falling into a "logic of measurement" where only quantifiable performance counts, to the detriment of the deeper goals of education such as citizen training or individual empowerment. The question is therefore not only "how can we use AI ethically?" but also "for what kind of education and society do we want to use AI?"

Finally, at a time when education systems are questioning their role, the introduction of intelligent systems forces us to collectively reflect on the values we wish to preserve and promote.

3. Survey of teachers using intelligent systems

As part of this work, a survey of teachers has two objectives:
- First, collect data on teachers' actual practices in using intelligent systems.
- Second, identify the ethical challenges encountered when using these intelligent systems, as well as training or support needs.
- Finally, understand teachers' perceptions of the impact of these tools in terms of equity, transparency, and educational accountability.

The objectives of this survey are to provide a clear vision for a more ethical and effective use of these tools, while taking into account the educational and social issues associated with their deployment.

3.1 Survey methodology

The survey methodology was designed to ensure rigorous and representative data collection. The target audience consists of secondary school teachers who incorporate intelligent systems into their teaching practices.

Data collection was based on an online questionnaire distributed via Google Forms, consisting of both closed questions to facilitate quantitative analysis and open questions to gather detailed testimonials and perceptions.

The sample consists of 150 teachers who were selected to reflect a diversity of geographical and socioeconomic contexts in order to ensure that the data collected is diverse and representative.

3.2 Survey topic

The survey focused on three main themes:
- The first concerned usage practices, examining the frequency and contexts of use of smart systems, as well as the types of tools preferred by teachers.
- The second theme focuses on the ethical challenges encountered and examines teachers' perceptions of three main risks that we see frequently: accountability, equity, and transparency.
- The third theme focuses on the impact on students, analyzing teachers' perceptions of the effects of intelligent systems on equity and inclusion, as well as the measures put in place to adapt these tools to the different needs of students, particularly those from disadvantaged backgrounds or with special educational needs.

3.3 Survey results
Theme 1: Usage practices

Table 1

Question	Answers	Percentage
Frequency of use of intelligent systems	daily	45%
	weekly	30%
	monthly	15%
	rarely	10%
types of tools used	Adaptive learning platforms	60%
	generative AI	30%
	others	**10%**

Theme 2: Ethical challenges encountered

Table 2

Question	Answers	Percentage
Learner's perception of liability risks	high risk	50%
	moderate risk	35%
	low risk	15%
Perception of risks linked to equity	high risk	60%
	moderate risk	20%
	low risk	20%
Perception of risks related to transparency	high risk	55%
	moderate risk	30%
	low risk	15%

Theme 3: Impact on students

Table 3

Question	answers	percentages
Perception of equity effects	Positive	40%
	Neutral	35%
	Negative	25%
Measures taken to adapt the tools to students' needs	Yes	70%
	No	30%

4. Analysis of the results

4.1 Usage practices
Regarding the use of smart systems, the survey revealed the following results:

45% of teachers report using them daily, which indicates strong and regular integration into their teaching routine. This high frequency suggests that these tools have become indispensable for a significant portion of the teaching staff.

30% of teachers use them on a weekly basis, indicating sustained use but probably linked to specific or planned activities such as assessments or student monitoring.

15% of teachers use them on a monthly basis, which may reflect occasional use limited to certain projects or specific needs.

10% of teachers use them rarely, showing that a minority remain on the sidelines either by choice or due to technical, pedagogical, or even institutional constraints.

4.2 The ethical challenges encountered
Half of teachers (50%) consider the level of risk to be high when it comes to determining who is responsible in the event of a malfunction or bias in intelligent systems. Just over a third (35%) consider this risk to be moderate, while only 15% consider it to be low.

Concerns are even more pronounced when it comes to fairness:

60% of respondents perceive a high risk, making this the most sensitive category. This concern stems from the fact that intelligent systems, when trained using incomplete or unrepresentative data, can reproduce and amplify existing inequalities between learners. Teachers therefore fear that certain automated decisions, such as assessment or content recommendations, may not benefit all students equally. Opinions are more divided for moderate and low levels, each representing 20% of responses.

Regarding the transparency of intelligent systems, 55% of teachers identify a high risk, reflecting concern about understanding the decision-making mechanisms used by machines. 30% mention a moderate risk and only 15% consider this risk to be low.

4.3 Impact on students

When it comes to perceptions of the impact of smart systems on equity, 40% of teachers believe that these tools have a positive impact, reflecting moderate confidence in their ability to promote fairer education. For 35% of survey participants, the impact is considered neutral, suggesting a degree of caution or a lack of clearly identified impact. Finally, 25% consider the impact to be negative, revealing persistent concerns about the risks of exclusion or increased inequality.

When it comes to measures taken to adapt tools to students' specific needs, 70% of teachers say they have made adjustments, demonstrating a genuine commitment to inclusion. Conversely, 30% say they have not taken any specific measures, which may reflect technical obstacles, a lack of training, or a lack of appropriate resources.

5. Discussion of the results

This survey of teachers paints a picture of a rapidly changing educational landscape in which intelligent systems are gradually becoming indispensable tools. Three questions were used to explore this transformation: usage practices, ethical challenges, and the impact on students.

In everyday practice, the figures speak for themselves: 45% of teachers say they use smart systems every day. This high rate reflects their deep integration into teaching routines, where these tools are no longer seen as accessories but as levers for efficiency in the teaching-learning process. In addition, 30% use them every week, often for specific tasks such as assessments or individualized monitoring. On the other hand, 25% of teachers (15% monthly and 10% rarely) remain on the sidelines, revealing disparities in access, training, or confidence. This divide highlights the importance of differentiated support and the need to develop a framework tailored to the issue in order to promote more equitable adoption.

But this adoption is not without its questions. Teachers have expressed significant ethical concerns. The issue of liability in the event of algorithmic malfunction or bias is considered high risk by 50% of respondents, while 35% consider it moderate and 15% low. This legal uncertainty raises questions about who is responsible when the tool makes a mistake: the teacher, the publisher, or the institution? These uncertainties are dampening enthusiasm.

Concerns are even greater when it comes to fairness, with 60% of teachers perceiving a high risk that intelligent systems will reinforce inequalities, particularly by reproducing social or cultural biases. Only 20% consider this risk to be moderate, and the same percentage consider it to be low. Finally, the transparency of algorithms is also a source of tension: 55% of teachers believe that the lack of clarity in decision-making mechanisms constitutes a potential risk, compared to 30% who consider it moderate and 15% who consider it low. These figures reflect a strong demand for clarity and control.

Despite these reservations, teachers are not remaining passive. When it comes to assessing the impact on students, the responses are mixed. Forty percent believe that intelligent systems have a positive effect on equity, reflecting moderate confidence in their potential for inclusion. Thirty-five percent consider the effect to be neutral, and 25% consider it negative, revealing persistent concerns about the risks of exclusion or standardization.

Faced with these challenges, teachers' commitment to inclusion is remarkable: 70% say they have made adjustments to adapt tools to the specific needs of students, particularly those from disadvantaged backgrounds or with special educational needs. This figure demonstrates a genuine desire not to let technology decide alone, but to accompany it with discernment. The remaining 30%, who have not taken any specific measures, nevertheless emphasize the need to strengthen resources and training.

6. Recommendations

The integration of intelligent systems into the educational landscape opens up promising prospects for personalized learning and pedagogical effectiveness. However, this transition raises major ethical challenges

that require a rigorous framework for action. Based on this literature and survey, we make the following recommendations to ensure the responsible, equitable, and humane use of these technologies:

Ethical monitoring of educational technologies could play an important role in the ethical use of intelligent systems. The educational community, as an independent structure composed of teachers, researchers, students, and experts, would be tasked with continuously monitoring the impact of intelligent tools on teaching practices. This observation, accompanied by regular reports, would highlight any deviations and propose solutions to ensure that technological innovation and the preservation of educational values evolve in tandem.

Another aspect of the issue that may be of interest concerns the establishment of collaborative teaching laboratories. These spaces for collaboration between teachers and developers would enable tools to be tested and refined before their widespread deployment. This approach ensures that innovation meets real needs in the field and respects the pedagogical expertise of trainers. By valuing teachers' creativity, we transform technological tools into a lever of choice rather than a constraint.

Faced with the rise of intelligent systems, educational institutions must reaffirm their role in socialization by preserving spaces and times exclusively dedicated to otherness. These "disconnection zones" devoted to debating ideas, artistic activities, friendly exchanges, etc., are essential for cultivating the emotional and social dimensions of education. By limiting the excessive dominance of digital systems, we can ensure that schools remain, above all, places for human interaction and the development of empathy.

Finally, educational institutions should establish scholarship programs dedicated to ethical innovation. This financial support would enable local projects led by teachers or experts to address the specific challenges posed by AI. By encouraging these grassroots initiatives, institutions promote the emergence of pragmatic solutions that reconcile technical efficiency and ethical security, thereby limiting the risks of abuse while stimulating educational dynamism.

7. Conclusion

In the age of intelligent systems, education is undergoing profound change. These technologies, as drivers of transformation, herald a revolution in teaching practices by opening up new and unprecedented personalized perspectives. However, they also raise profound ethical challenges that test our ability to preserve the very essence of teaching from an axiological perspective: human relationships, fairness, and responsibility.

Considered the cornerstone of this transformation, teachers play a central role in the ethical use of these tools. Their expertise and professional judgment are key to ensuring that these technologies remain at the service of students without depriving them of their humanity. However, the survey revealed major obstacles such as a lack of accountability for decisions made by these technologies, the opacity of the systems, and the risk of increasing educational inequalities. The complexity of these challenges does not make them insurmountable, which is why teachers are calling for a collective response that combines the need for training, collaboration, and ethical innovation.

To meet these challenges, it is essential to strengthen teacher training and support by introducing them to the digital skills and knowledge needed to understand and master these tools. In addition, collaboration between key players in the educational community, particularly educators and technology designers, is essential in order to co-design tools that meet the real needs of students and are in line with teachers' perspectives.

Finally, this study opens up exciting prospects for the future. How can intelligent systems become vectors of inclusion rather than exclusion? How are class dynamics evolving in an increasingly digitized world? These questions and many others invite further reflection and exploration of new avenues of research.

In short, integrating smart systems into education is not an end in itself, but a means of rethinking and enriching teaching. By placing teachers at the heart of this evolution, giving them the means to act ethically and thoughtfully, we can build an educational future where technology does not replace humans, but rather accompanies them. A future where every student, regardless of their background, would find their place in an education system that is both intelligent and deeply human.

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