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An Exploratory Study on Ethical and Regulatory Perceptions of Gen-AI in Higher Education

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Abstract

Over the last three years, Generative artificial intelligence (Gen-AI) has become a central topic of debate across all areas of higher education. Its growing accessibility to teachers and students poses major challenges for teaching, learning, and research. Through an exploratory study conducted with teachers at the Polytechnic University of Coimbra (IPC), we sought to understand how AI is being adopted at the institution. This paper focuses on teachers' ethical perceptions, namely concerns related to discriminatory bias, data use, and the need for a regulatory framework. The analysis draws on established theoretical frameworks, such as Unified Theory of Acceptance and Use of Technology (UTAUT) and the Technology Readiness Index (TRI), and on constructs related to AI anxiety, allowing the findings to be meaningfully aligned with results from other studies and research contexts. The empirical findings are complemented by institutional context, resulting in a concise, clearly articulated exploratory study. Analysis of participants' responses suggests a greater appreciation of macro-level ethical principles among teachers who express stronger concerns about AI's discriminatory bias. Regarding algorithmic transparency, the data suggest differences in perceptions between frequent and occasional Gen-AI users. Recent research supports these exploratory findings, underscoring the need for transparent and socially responsible regulatory frameworks in this field.

Keywords: *Generative Artificial Intelligence; Higher Education; Ethics and Regulation; Science and Society; Exploratory Study*

1. Introduction

Generative artificial intelligence (Gen-AI) has, in a very short time, become a central and unavoidable theme in higher education. Gen-AI tools have become widely accessible to professors and students, profoundly influencing the teaching-learning process, assessment models, scientific production, and the administrative tasks inherent to the higher education teaching career. However, this rapid technological dissemination occurs in a context where ethical and regulatory frameworks are still being consolidated, raising relevant questions about the relationship between science and society [1].

The unquestionable innovative potential of Gen-AI raises significant challenges for higher education institutions and their professors, directly affecting pedagogical practices, assessment processes, and institutional norms, raising ethical and regulatory issues that go beyond its technical dimension. Among the most common concerns are intellectual property, data protection, understanding how systems work, institutional accountability for AI use, and algorithmic bias. These issues have significant institutional and educational implications, influencing teachers' confidence in technology and the legitimacy of its use in academic contexts [2].,
In this context, teachers are a vital link between technology, students, and higher education institutions. Their perceptions directly influence the adoption, rejection, or critical use of Gen-AI. Recent studies suggest that teachers' attitudes toward AI are related to factors such as digital competence, prior experience, and ethical concerns. However, the specific analysis of their

perceptions regarding regulatory frameworks has received less attention in recent empirical literature. According to recent studies, factors like digital competence, prior experience, and ethical concerns influence teachers' attitudes toward AI [3].
Approved in 2024, the European Union's Artificial Intelligence Act (AI Act) is the first regulatory framework dedicated to AI, establishing principles and obligations that directly influence how these technologies can be adopted by institutions and teachers [2]. The AI Act is not limited to defining legal rules; it also addresses cultural, professional, and ethical dimensions.
This paper aims to present the ethical and regulatory perceptions of professors at the Polytechnic University of Coimbra (IPC) regarding Gen-AI in higher education. Through an exploratory study conducted at this institution, integrated with an international comparative study, the article seeks to contribute to the science-society debate by offering a contextualised and empirically informed analysis of the challenges and implications of Gen-AI at IPC.

2. Ethical and Regulatory Challenges of Gen-AI in Higher Education

2.1 Ethical Concerns Associated with Gen-AI

The integration of Gen-AI in higher education raises ethical dilemmas for teachers and institutions, especially regarding its impact on current educational practices and pedagogical interactions between teachers and students [1] ,[4].

Algorithmic bias is a frequently referenced topic in the literature, as Gen-AI systems are trained on a huge volume of data that may reflect cultural, socioeconomic, and linguistic disparities. In the field of education, this bias may manifest as stereotyped outputs, the marginalisation of minority viewpoints, or the perpetuation of inequalities. These circumstances compromise the fundamental principles of Sustainable Development Goals 4 (Quality Education) and 10 (Reduced Inequalities), which seek to foster inclusion and equitable opportunities in higher education [1],[4].

On the other hand, integrating AI tools into educational environments raises important questions about data use and protection. What type of information is disseminated? Where is the data from the prompts we generate stored? What are their potential applications? These uncertainties hinder and weaken informed and responsible use by teachers and institutions [4].
Other ethical issues often emerge in relation to copyright and "academic authorship". The use of generative AI in content creation (e.g., texts, films) raises questions about the originality of the work and the proper attribution of authorship. In higher education, these challenges affect academic integrity and evaluation methods. Consequently, they require careful consideration of the limits and responsibilities related to the use of AI tools [1], [4].
The opacity of generative AI systems also constitutes a significant ethical concern. The difficulty in understanding how the answers are generated constrains critical assessment and complicates explanations for students. These factors may hinder the integration of AI in an educational environment.

2.2 Regulation and Governance of AI in Education

In addition to ethical issues, the use of Gen-AI in higher education poses very concrete regulatory challenges for institutions, teachers and students. These challenges stem not only from the absence of legislation but, above all, from the difficulty of translating general regulatory principles into clear guidelines for everyday academic practice [4].
At many higher education institutions, including the Polytechnic University of Coimbra, there is still no formal institutional policy that explicitly regulates the use of Gen-AI tools. In practice, this lack of framework leaves the decision to teachers. Some allow the use of these tools, others discourage it, others apply sanctions to their students, and others simply ignore it, as if it were possible nowadays. This diversity of approaches contributes to inconsistent practices and a general sense of uncertainty among teachers and students. These concerns, also highlighted in recent literature [1], [4], are consistently evident in perceptions gathered from IPC teachers.
It is important to clarify the difference between external regulation, institutional regulation, and professional self-regulation. European legislation establishes general principles such as transparency, human oversight, and risk mitigation. However, its application in higher education depends on clear institutional policies and on the faculty's ability to interpret and apply them in their specific context. In

such a scenario, training would be important for building trust and encouraging consistent practices. In the absence of guidelines, AI adoption tends to be informal, fragmented, and uneven across curricular units and institutions.

3. Conceptual Framework

To investigate subjective factors influencing the adoption and use of AI, both newly developed instruments and established, well- validated scales for broader digital technology acceptance are actively employed. Among these, the Technology Acceptance Model (TAM) [5], Matching Person & Technology (MPT) [6], and the Technological Pedagogical Content Knowledge (TPACK) framework [7] have been widely used. In the present study, we combined several scales designed to assess subjective factors related to technology use in general and AI in particular, as has been done in prior research [8].

The Technology Readiness Index (TRI) is a tool for examining individuals' subjective perceptions and attitudes toward the use of digital technologies [9] and other advanced technological products that support human activity. TRI is not tied to any specific type of technology but addresses IT products broadly, focusing on general readiness to adopt new technologies.

Artificial Intelligence Anxiety (AI anxiety) measures the emotional responses and apprehensions users may experience when interacting with AI systems [10]. This instrument captures feelings of discomfort, worry, or uncertainty associated with using or anticipating the use of AI technologies, providing insight into psychological barriers to adoption.

The Unified Theory of Acceptance and Use of Technology (UTAUT) and its extended version, UTAUT2, offer a structured approach to examining the adoption and use of specific technology types [11]. These models explain and predict user behavior by accounting for factors such as social influence, expected performance, emotional responses, and economic considerations. With strong predictive power and adaptability to various technologies, including AI, UTAUT2 is widely applied to identify determinants of user engagement with advanced technological systems. In addition to these instruments, the survey included supplementary questions on the ethical aspects of AI use and respondents' socio-demographic characteristics. This comprehensive approach allowed for the evaluation of both psychological and ethical factors influencing the acceptance and use of AI.

These models offer a systematic framework for analysing faculty members' ethical and regulatory views on Gen-AI. UTAUT and TRI help us understand why some people are more likely to accept new technology than others and how faculty members evaluate its usefulness, convenience of use, and institutional conditions. The AI anxiety construct allows us to understand the emotional side of fears about algorithmic unfairness, transparency, and the need for rules. In this study, these frameworks are not used to quantify how well people embrace technology on its own. Instead, they are used to help us better understand the ethical views of IPC teachers on the use of Gen-AI in higher education.

4. Methodology

4.1 Study Design and Context

This paper presents an exploratory study focused on understanding teachers' perceptions, collected through a structured questionnaire administered within the context of the IPC, a public higher education institution composed of six organic units spanning very distinct scientific areas.

The adoption of Gen-AI tools at IPC began to emerge informally among teachers and students, without, at the time of data collection, a specific institutional policy regulating their use. On the other hand, IPC is part of an international comparative study, which allows the results to be placed within a broader framework, even though this paper focuses exclusively on IPC.

The study aimed to understand how teachers perceive the ethical and regulatory challenges associated with Gen-AI, with particular attention to concerns related to algorithmic bias, data use, and the need for regulatory frameworks. The exploratory nature of the research aims to identify patterns of perception, differences between usage profiles, and possible explanatory factors in light of the adopted theoretical models.

4.2 Participants and Data Collection

The data were gathered using a structured questionnaire developed on Google Forms to ensure anonymity and confidentiality. The questionnaire was adapted for the IPC context and was based on

instruments previously validated in other higher education institutions, including Xi'an Jiaotong-Liverpool University, the Higher School of Economics, and the University of Naples Parthenope.

The questionnaire included seven-point Likert scales and covered themes such as technological predispositions, acceptance of innovation, and anxiety about AI. It also included specific items on ethical and regulatory perceptions, such as discriminatory bias, data use, algorithmic transparency and the need for a regulatory framework.
Following the preparation phase, the instrument was submitted to the IPC Ethics Committee for assessment of the research's ethical aspects.
The survey was distributed to teachers and researchers by the IPC Office for Professional Development and Pedagogical Innovation (GAVIP). GAVIP is responsible for promoting and supporting training activities at the IPC, and for holding and managing the official, updated list of institutional contacts for all IPC teaching and research staff, through the official mailing list system to IPC teaching and research staff with active contracts on 31 December 2024. That corresponds to 849 teachers and 8 researchers, from 6 different educational institutions: Coimbra Agricultural School, Coimbra Business School, Coimbra Education School, Coimbra Health School, Coimbra Institute of Engineering, Oliveira do Hospital Management and Technology School. Twenty-five responses were obtained (n = 25), all submitted by teachers, therefore, the analysis presented in the next section reflects only the perceptions of the teaching staff.

4.3 Data Analysis

Descriptive statistical techniques were used to analyse the questionnaire data to characterise the sample and explore patterns in the main constructs under study. Measures such as means, modes, ranges, and standard deviations were calculated for the Likert-scale items relating to technology readiness, the conditions that facilitate AI use, the different types of AI use, and the dimensions of anxiety, perceived risk, and behavioural intention.
Due to the small number of valid responses (n = 25), it was not possible to apply the UTAUT2 model in its entirety or conduct robust inferential statistical analyses such as regression modelling or structural equation modelling. The small sample size would compromise the reliability and validity of statistical inferences, particularly regarding the relationships among latent variables. For this reason, the UTAUT2 framework was primarily used as a theoretical reference, and the empirical results were interpreted in an exploratory and cautious manner.
The statistical analysis focused on identifying general trends and variability in respondents' perceptions of discriminatory bias, algorithmic transparency, existential risk anxiety, behavioural intention, and patterns of AI use, rather than testing formal hypotheses.

5. Results and Discussion

The following sections present the results structured around the central ethical and regulatory concerns explored in this study.
The sampling technique, for convenience, relied on the voluntary participation of 25 teachers from the Polytechnic University of Coimbra (2.92% of responses out of a total of 849 teachers) and 8 researchers. Respondents mentioned the long list of questions in the survey as one of the reasons they didn't complete it. 72.00% of the respondents are female, aged 51-60 (60.00%), with 10 or more years of teaching experience (72.00%), for an average of 19.74 years. The Coimbra Institute of Engineering and Coimbra Education School received 56.00% of responses (28.00% each), and the Assistant Professor/Invited Assistant Professor category was the most represented at 56.00%.

5.1 Discriminatory Bias and Regulatory Preference

This section examines whether teachers who show stronger concern about discriminatory bias also prefer ethical principles defined at a macro level, that is, by legislators or independent experts, rather than at an institutional or departmental level.
The results indicate a moderate to high level of anxiety regarding discriminatory bias (overall mean = 4.73 on a 7-point scale). The item “AI treats people differently, which makes me anxious” reached a particularly high mean (6.08), suggesting strong sensitivity to unequal treatment. Concerns about unfair pricing scored 4.64, while the statement regarding racial discrimination obtained a lower, though

still relevant, mean of 3.48. Taken together, these values reflect a clear awareness of fairness-related risks.

When examining regulatory preference, participants who reported higher levels of concern about discriminatory bias tended to favour macro-level ethical policies. In other words, they showed greater support for principles defined through legislative processes or expert bodies, rather than leaving regulation primarily to individual institutions or departments.
Although the study does not include inferential testing due to the small sample size (n = 25), the descriptive pattern suggests an association between ethical concern and preference for centralised regulatory structures. Teachers who perceive algorithmic discrimination as a significant risk appear to value broader governance mechanisms that ensure fairness, accountability, and transparency.
This finding is particularly relevant. The propensity towards macro-level regulation reflects not only institutional caution but also alignment with wider debates surrounding AI governance, including European regulatory developments. Rather than resisting technological innovation, participants seem to be calling for clearer normative frameworks to accompany it.
These results suggest that anxiety about discriminatory bias is not merely an individual reaction. It may also signal a demand for structured oversight and collective safeguards. In this sense, regulatory preference emerges as a response to perceived ethical vulnerability, a means of seeking stability in the face of rapidly evolving technological systems.

5.2 Algorithmic Transparency and "Black Box" Anxiety

This section addresses the question: "Do teachers who are frequent users of Gen-AI show lower concern regarding algorithmic opacity than occasional users?" The analysis explores the relationship between frequency of use and perceptions of AI's algorithm transparency.
Of the 25 participants, seven indicated regular use of Gen-AI in their professional activities. This indicates that a part of the sample has developed sustained engagement with these tools. However, perceptions of AI's rapid evolution and complexity suggest a heterogeneous landscape. The statement "AI technology updates too quickly and is very difficult to learn" obtained a mean of 3.44 (SD = 1.83) on a 7-point Likert scale, with responses ranging from 1 to 7. This dispersion reflects significant variability in how participants experience technological change.
Despite the dataset's limitations for inferential statistical analysis, descriptive patterns suggest that frequent users tend to report lower levels of discomfort with algorithmic opacity.
The variability observed in perceptions reinforces the need for governance mechanisms that combine training with structured institutional guidance.

5.3 Existential Risk Anxiety and Behavioural Positioning

This section of the study examines whether teachers who report stronger intentions to continue using Gen-AI are less concerned about its wider societal risks. In other words, it explores whether the propensity to engage with the technology is inversely related to existential anxiety or if both dimensions coexist.
The descriptive results suggest a more complex scenario than a simple dichotomy between adoption and concern. On the one hand, behavioural intention to use AI presents moderate to high values. The item "I intend to continue using AI in the future" reached a mean of 5.48 on a 7-point scale. "I plan to continue using AI frequently" received a 4.96, and "I will always try to use AI in my daily life" received a 4.24, resulting in an overall average of 4.89. These figures indicate a clear openness to continued using AI.
At the same time, concern about large-scale or existential risks is also present. The statement "The uncontrolled development of super AI will reduce the time of humanity's existence" reached a mean of 5.08. Concern about concentration of control ("I am concerned that the control of AI by some people introduces major risks") scored 4.60, and the perception that AI may harm humans to achieve a goal obtained 4.36. The overall average for existential risk anxiety was 4.68.
The coexistence of these two patterns — intention to use (4.89) and existential concern (4.68) — suggests that engagement with Gen-AI does not eliminate awareness of its systemic risks. Teachers appear capable of distinguishing between immediate practical utility and long-term societal implications. Familiarity with the technology does not necessarily translate into reduced anxiety. The descriptive data do not support a clear inverse relationship between behavioural intention and existential concern.

From the perspective of technology acceptance models such as UTAUT2, behavioural intention is typically associated with perceived usefulness and facilitating conditions. However, the present findings indicate that risk perception operates alongside, rather than in opposition to, intention. This challenges simplistic assumptions that higher adoption automatically implies lower concern. Instead, teachers seem to occupy a dual position: they recognise the pedagogical and professional value of generative AI while simultaneously expressing caution about its broader consequences.

Given the exploratory nature of the study and the small sample size (n = 25), these observations must be interpreted carefully. Nevertheless, they point to an important insight: existential anxiety may not signal resistance to innovation, but rather a form of critical maturity. Institutional strategies that focus exclusively on technical integration risk overlooking this dimension. Responsible implementation, therefore, requires not only training and infrastructure, but also space for ethical reflection and open discussion about systemic risks.

These results also need to be considered in light of the participants' overall technological profile. The broader analysis of the study, which included the TRI, shows that the teachers in this sample are not particularly resistant to technological change. In fact, their responses suggest a reasonable level of openness and curiosity towards new tools.

This makes the coexistence of use and concern more meaningful. The ethical anxieties identified earlier cannot be explained solely by fear of innovation or a lack of digital confidence. Teachers seem willing to explore Gen-AI in their professional practice while remaining attentive to its potential risks. That tension is visible throughout the data.

Rather than reflecting opposition, this combination of engagement and caution may indicate a balanced stance. Participants appear neither uncritical adopters nor outright sceptics. They walk between opportunity and responsibility, acknowledging the practical value of these tools while still raising questions about their wider implications.

6. Conclusions

This exploratory study sought to understand how higher education teachers perceive the ethical and regulatory challenges associated with generative AI. The results reveal a complex and thoughtful positioning that shows both engagement and caution.

Concerns about discriminatory bias were particularly visible in the data. Teachers who expressed stronger anxiety in this area also tended to prefer ethical principles defined beyond the institutional level. In practical terms, this means greater confidence in rules set by legislators or independent expert bodies rather than relying only on internal guidelines. This position makes sense in the current European context. With the European Union's Artificial Intelligence Act moving towards implementation, questions of responsibility and oversight have become concrete, directly affecting educational institutions.

Many participants indicated that they intend to continue using Gen-AI, but at the same time, they reported moderate to high concern about its broader societal implications. These two positions coexist. Teachers appear willing to work with the technology, but not without reservations.

This study is limited by its small sample and descriptive approach. Still, it offers a snapshot of how these issues are being experienced within the IPC institution. The findings suggest that integrating Gen-AI in higher education cannot be reduced to training sessions or technical support. It is crucial to establish clear rules. In the European setting, where regulatory frameworks are evolving rapidly, institutions are likely to operate within increasingly defined boundaries. How they respond to that framework, and how teachers position themselves within it, will shape the everyday reality of AI in higher education.

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