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ORIGINAL

Ethics, generative artificial intelligence, and educational assessment: An analysis of university students' perceptions

Ética, inteligencia artificial generativa y evaluación educativa: Análisis de las percepciones estudiantiles universitarias

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ABSTRACT

Introduction: the ethical use of generative artificial intelligence (GAI) in Education, particularly in learning assessment, is an issue of growing importance in higher Education due to its impact on values and academic integrity.
Objective: this research aimed to examine university students' perceptions regarding the ethical use of GAI in evaluative practices, based on five pre-established ethical dimensions.
Method: a quantitative, non-experimental and cross-sectional study was conducted. A questionnaire of 16 closed-ended Likert- scale items was administered to 2684 students from ten degrees at Santa Elena Peninsula State University, Ecuador. The processing and analysis followed this sequence: item-level descriptive analysis, dimensional scales using measures of central tendency and dispersion, correlations based on Spearman´ Rho to identify relationships, and finally, principal components analysis (PCA) to identify structure and latent factors.
Results: the results revealed a strong consensus on regulations, ethical principles and academic honesty, but also differences in trust, responsibility and formative impact. Two main factors emerged: one highly consistent factor combining norms, responsibility and impact, and another reflecting differences in honesty and trust.
Conclusions: it is concluded that, while ethics in the use of GAI is generally accepted, it's insufficiently understood and applied in assessment practice, revealing discrepancies and diverse positions evident, indicating that this is an area of critical analysis and further educational work.

Keywords: Ethics; Generative Artificial Intelligence; Educational Measurement; Perception.

RESUMEN

Introducción: el uso ético de la inteligencia artificial generativa (IAG) en el ámbito educativo y en particular en la evaluación de aprendizajes, es un tema de importancia creciente en la educación superior por su impacto en los valores y la integridad académica.
Objetivo: esta investigación tuvo por objetivo examinar las percepciones de los estudiantes universitarios acerca del empleo ético de la IAG en la práctica evaluativa, tomando como base teórica cinco dimensiones éticas preestablecidas.
Método: se realizó un estudio cuantitativo, no experimental y transversal. Se aplicó un cuestionario de 16

preguntas cerradas con escala de Likert a 2684 estudiantes de diez carreras de la Universidad Estatal Península de Santa Elena en Ecuador. El procesamiento y análisis siguió la secuencia siguiente: descriptivo por ítems, baremo por dimensiones a partir de medidas de tendencia central y dispersión, correlaciones basadas en el método Spearman Rho, para identificar relaciones entre éstas y finalmente un análisis de componentes principales (PCA) para identificar la estructuración y los factores latentes existentes.
Resultados: los resultados revelaron un alto consenso sobre las normativas, principios éticos y la honestidad académica, pero también diferencias en la confianza, la responsabilidad e impacto formativo. Emergieron dos factores principales, uno normativo-responsabilidad-impacto muy consistente y otro que revela diferencias sobre honestidad y confianza.
Conclusiones: se concluye que la ética en el uso de la IAG suele ser aceptada, pero es insuficientemente comprendida y aplicada en la evaluación, evidenciándose discrepancias y diversas posiciones, lo que indica ser un área de análisis crítico y de trabajo educativo.

Palabras clave: Ética; Inteligencia Artificial Generativa; Evaluación Educacional; Percepción.

INTRODUCTION

Generative artificial intelligence (GAI) is one of the most influential technologies today,[1,2] capable of generating texts, images, models, and other content from complex algorithms and training with large volumes of data. Transformer models, such as ChatGPT, are revolutionizing education by generating information and pedagogical solutions obtained from instructions entered in natural language (Prompt).[3,4]

Their dissemination by companies,[5,6] publications,[1] websites[7], and courses has expanded the possibilities and benefits that AI offers to educational processes, including learning assessment: creation of materials, modeling, support for grading, and the provision of agile and personalized feedback,[8,9] which has increased its appeal and interest.

However, the incorporation of IAG poses major challenges today, stemming from factors such as the technological divide, low levels of digital literacy, and the lack of experience in applying it among many teachers and students.[10] This reality adds new concerns and resistance to learning assessment;[11,12] an area that has historically been the focus of questioning due to the persistence of traditional, rote-learning approaches that seek the recall and recognition of information[13,14,15] and unethical practices such as plagiarism and copying.[16]

In the process of learning assessment, ethics is a fundamental value and the basis for action based on moral principles and values[17] that confer legitimacy, authenticity, transparency, responsibility, and educational benefit.[18] Neglecting these ethical precepts and formative roots delegitimizes and distorts the educational process.[19] However, several studies warn that ethics is one of the areas of greatest concern, due to manifestations and risks of academic fraud, dishonesty, and irresponsible actions in the use of IAG, which affect academic integrity.[20,21]

Review of previous research

Several sources report risks in the ethical use of AI and worrying developments. In Scottish universities, there has been a 700 % increase in student cheating linked to the use of ChatGPT,[22] which jeopardizes the development of critical thinking among students and affects academic integrity. Such has been the impact and international concern that studies[23] report that in certain educational contexts, teachers have banned the use of AI.

Other research[24] suggests establishing clear ethical guidelines and raising students' technological literacy, which points to the educational work of teachers and the ethical guidance of institutions. Meanwhile, other studies[25] reveal concerns about the responsible use of AI and the preparedness of teachers to deal with these realities.[26]

In Ecuador, there are also concerns about ethics, academic fraud, and student autonomy.[27] There are cases[28] where students even perceive themselves as competent, even though their academic results show the opposite, revealing a lack of awareness and self-criticism about their performance, as well as difficulties in evaluating the quality of their work.[29] According to several authors,[30,31,32] these manifestations highlight the need to adopt clear ethical concepts, guidelines, and standards in assessments, which implies reviewing and adopting a conceptual framework that allows for examining reality and ensuring the responsible use of IAG in educational assessment.

Ethical dimensions, principles, and factors in IAG

The scientific literature consulted on ethics in the use of IAG shows a diversity of terms relating to numerous principles, factors, and dimensions.[33] In one study consulted,[34] 47 dimensions have been identified, which are often similar or overlap. It can be observed that, while some authors[3,3] suggest general ethical dimensions in the

area of research, such as non-maleficence, justice, beneficence, explainability, and autonomy, others[23,25,34,35] make derivations and add others applicable to education and the study of student perceptions, such as information and ethical standards, awareness, criticism, academic honesty, openness to AI, responsibility, self-regulation, the educational value of the tool, applicability, benefit, and adaptability. Some of these have been considered to assess the level of reflection of teacher training students on practice,[35] applying relevant measurements and scales for this purpose. This highlights the plurality of ethical dimensions and terms, which are sometimes similar and closely related.

Following this line of thought, this research aimed to examine student perceptions of the ethical use of generative artificial intelligence in the assessment of learning in different university degree programs, taking pre-established ethical dimensions as a reference, which broadens studies on the subject, helps identify shortcomings, and improves assessment practices.[35,36]

METHOD

A quantitative, non-experimental, cross-sectional research approach was adopted.

Population and sample

From a total population of 13,005 students enrolled in the second semester of the 2024 academic year, belonging to ten different degree programs at the Universidad Estatal Península de Santa Elena (UPSE) in Ecuador, 2,684 participants were surveyed randomly, voluntarily, and anonymously.

Sample weighting was performed to ensure adequate representation, calculating the basic statistical weight (W_i) for each degree program, as shown in Table 1, where each respondent represents 4,85 individuals from the total population, according to:

- $W_i = N/n$
- N = total population size.
- n = 2,684 sample size.
- $W_i = 13{,}005/2{,}684$
- $W_i = 4{,}85$

Table 1. Number of respondents by degree program, frequency, and basic statistical weight

UPSE majors	Total	F (%)	W_i
Business Administration	305	11,36	0,55
Communication	256	9,54	0,46
Accounting and Auditing	122	4,55	0,22
Economics	108	4,02	0,19
Basic Education	143	5,33	0,26
Early Childhood Education	543	20,23	0,98
Electronics and Automation	228	8,49	0,41
Finance	83	3,09	0,15
Language Education	638	23,77	1,15
Petroleum	258	9,61	0,47
Total	2684	100	4,85

Note: F (%) = relative frequency percentage and W_i= basic statistical weight.

Instrument

The data were collected using a structured survey with a sixteen-item questionnaire (P), administered via Google Forms, based on a five-category or level Likert scale: 1. Strongly disagree; 2. Disagree; 3. Neither agree nor disagree; 4. Agree; and 5. Strongly agree.

In this regard, the items enabled students to assess the ethical use of IAG in the evaluation of learning in terms of: unfair advantages and effortless work (P01), academic dishonesty (P02), need for ethical information (P03), knowledge of current institutional policies (P04), concern about academic fraud (P05), confidence in educational value (P06), personal responsibility shown in assessments (P07), impact on academic integrity (P08), confidence in contribution to learning and assessment (P09), educational possibilities with its correct integration (P10), need to comply with ethical principles (P11), progress in academic results (P12), improvement in critical thinking and other skills (P13), dependence on and excessive use of IAG (P14), interest in clear rules and policies (P15), need for institutional assessment strategies and recommendations (P16).

With an educational approach to the use of IAG and following the contributions of some authors[25,33,37,38], the items were grouped into five ethical dimensions, as shown in table 2.

Table 2. Pre-established ethical dimensions and items included

Dimensions	Items
1. Ethical and institutional regulatory information	P03, P04, P11, P15, P16
2. Ethical awareness, responsibility, and self-regulation	P07, P08
3. Academic honesty and perception of misuse	P01, P02, P05, P06
4. Confidence in the ethical use of AI as an educational value	P09, P10
5. Ethical impact on academic performance and skills	P12, P13, P14

The scale presented in this study had a Cronbach's alpha coefficient of 0,89, which shows a very high internal consistency of the instrument. This result indicates that the items consistently measure the construct being evaluated and that there is adequate homogeneity among them. α values above 0,80 reflect high reliability of the instrument.

Data processing

Statistical data processing was performed using Microsoft Excel (Microsoft 365 version 2016), with support from RStudio 2024.04.2.[40] The first phase was descriptive and was devoted to the descriptive analysis of frequency and percentages to characterize the distribution of responses by items on the Likert scale applied. Subsequently, a scale was applied taking the measures of central tendency and dispersion of the items and the five pre-established dimensions, to reduce the analysis to three levels (1. Low, 2. Medium, and 3. High) and determine which dimensions have greater consistency.

Next, a correlation analysis was performed using Spearman's Rho method[41,42] to determine the degree of correlation between the ethical dimensions (who with whom and strength), given the data from an ordinal scale.[41,42] Finally, a principal component analysis (PCA) was performed based on the variance values and vector loadings resulting from the linear combination of the original variables, in order to identify the deeper structures and latent factors in the dimensions and items.

Ethical aspects

The study was conducted in accordance with the principles expressed in the Declaration of Helsinki. The research entitled: "Educational Integration of AI into Learning Assessment" with code 91870000.0000.389577 was approved by the Ethics Committee of the Universidad Península Santa Elena (Approval Resolution No. 085-CE-2025). The confidentiality of the participants was respected, and they voluntarily agreed to participate in the study by signing an informed consent form.

RESULTS

Distribution of student perceptions

Figure 1 shows the distribution of percentages of responses given by students for each item.

The distribution of responses given by students shows that the majority were at levels 3 ("neither agree nor disagree") and 4 ("agree"), with the latter predominating with values ranging from 33 % to 55 %, followed by the former with 26 % to 41 %, revealing a pattern of conformity in relation to the ethical aspects associated with the use of AI in assessment.

The items with the highest frequency and percentages (between 45 % and 55 %) of "agree" responses were P04, P05, P06, P07, P10, P11, P12, P15, and P16, showing greater consensus, while P01, P0, P02, P08, P13, and P14 reflected somewhat more moderate values of 35 % and 41 %, and P03 and P09 revealed a more balanced distribution between neutrality and agreement.

The items with the greatest disagreement were P02, P03, P04, P07, P08, and P09, with a percentage sum at both levels of approximately 10 % to 14 %. The high mean values obtained for "neither agree nor disagree" (866) and "agree" (1265) and their standard deviations: 123,12 and 147,98, confirm the percentage results shown in figure 1.

Results obtained from the scale based on items and dimensions (D)

Figure 2 shows the results of the scale, based on the central tendency data of the items, grouped into the pre-established dimensions that encompass them. Here, they are grouped on a smaller scale (1. High, 2. Medium, and 3. High). It shows a more condensed dimensional structure of blocks, which allows for analysis of the proportionality of the location of the responses.

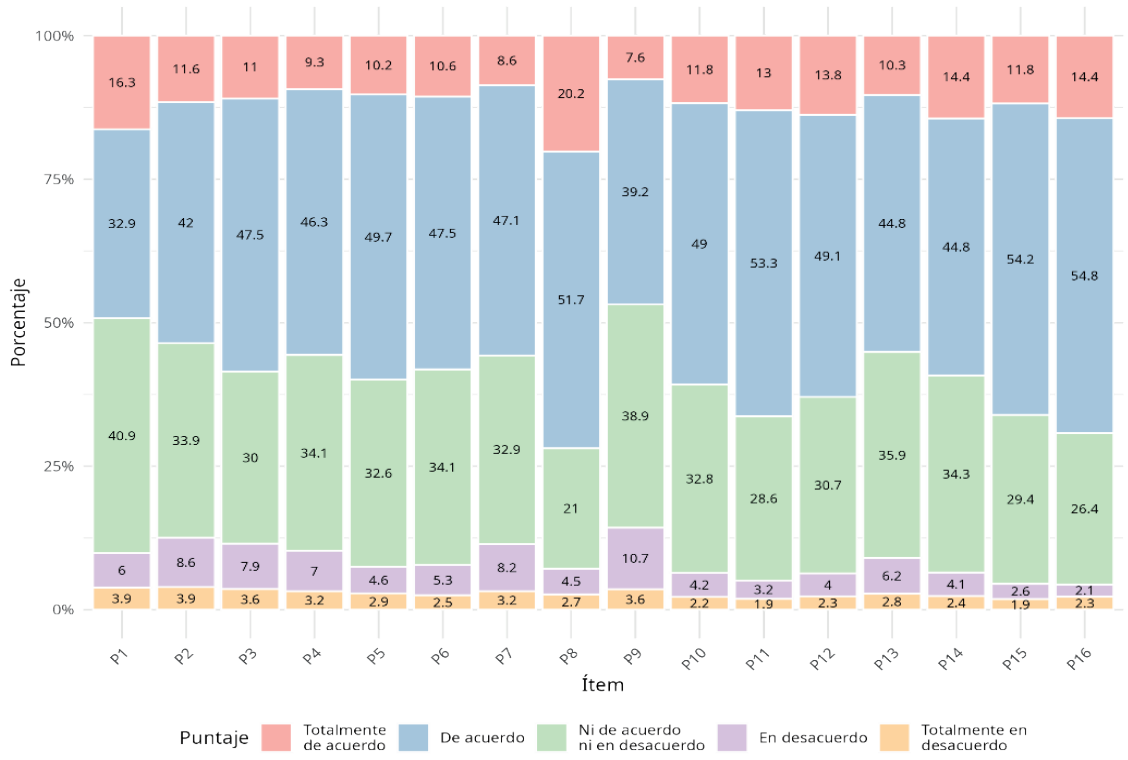

Figure 1. Distribution of percentages by items measured on a Likert scale

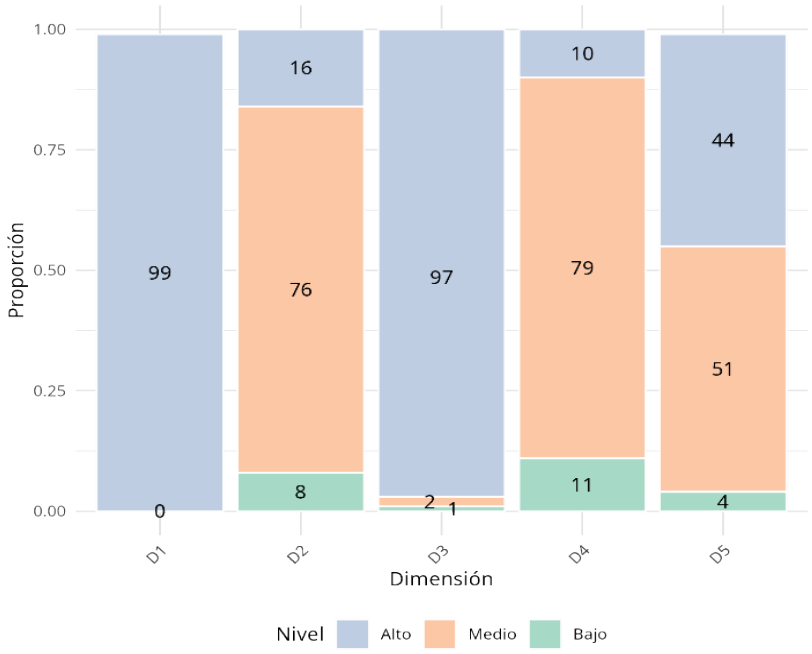

Figure 2. Distribution of values by items and dimensions according to scale data

The results of the scale show that the dimensions with the highest percentages and solidity are D1 (99 %) and D3 (97 %), which reaffirms the consensus observed in the item analysis and consolidates the idea that students recognize and value general ethical principles (D1) and feel the need for ethical standards (D3). In contrast, dimensions D2 (awareness, responsibility, and self-regulation) and D4 (trust in AI and justice) showed a higher percentage at the middle level, revealing a certain degree of indecision and caution, with proportions of disagreement. On the other hand, D5 (ethical impact on performance/skills) turned out to be the most balanced and heterogeneous, indicative of diverse perceptions. These results are consistent with the high (1429) and intermediate (1125) mean values obtained from the measures of central tendency, confirming

internal variability in the dimensions, although with few contrary perceptions.

Results of the correlation matrix obtained from the application of the Spearman Rho method

Figure 3 shows the correlations calculated based on Spearman coefficients that indicate the strength of the interdependence between pairs of the dimensions (D) assessed.

Figure 3. Spearman correlation matrix between dimensions

The highest correlation coefficients are between D5 and D4 (ρ = 0,60) and D1 and D3 (ρ = 0,60), indicating a close relationship between confidence in the use of AI as a training resource and the perceived impact on performance, as well as between the level of ethical information and the perception of misuse (self-regulated academic honesty). Both cases reinforce the idea that those who trust AI also recognize its effects on assessment and that those who are better informed tend to reject the misuse of this tool.

Meanwhile, D1 with D2 and D5, and D12 with D5, show a moderate correlation (ρ = 0,54-0,56). This suggests that ethical information and regulations (D1) act as an organizing axis that links normative knowledge with personal responsibility and with the perceived impact of AI in assessment. This suggests that greater ethical information leads to more responsible behavior and a better assessment of the tool's educational potential.

The weaker correlations observed between D3 and D5 (ρ=0,38) and D3-D4 (ρ=0,32) indicate that students do not always link honesty with performance or the skills they possess, nor do they feel that being ethically informed generates greater confidence in AI.

Results of the PCA analysis

Figure 4 shows the statistical summary of the behavior of the principal components, which group together common patterns obtained from the original data. These are recognized as latent factors determined by most of the variance and their vector loads, and are hidden structures that cannot be measured directly in the questionnaire responses. The dashed line constitutes a methodological criterion which, in this case, exceeds 80 % of the total, endorsing the sufficiency of the first two components to explain the underlying empirical structure.

The measurements of the vector loadings (C) for each component are shown below.

1. Ethical and regulatory information: C1 (-0,487), C2 (0,267), C3 (0,214), C4 (0,174), C5 (0,784)
2. Ethical awareness and self-regulation: C1 (-0,459), C2 (-0,093), C3 (-0,874), C4 (0,120), C5 (-0,041)
3. Academic honesty: C1 (-0,383), C2 (0,721), C3 (0,093), C4 (-0,378), C5 (-0,426)
4. Trust in AI: C1(-0,421), C2(-0,580), C3(0,189), C4(-0,671), C5(0,034)
5. Ethical impact on skills: C1(-0,477), C2(-0,252), C3(0,381), C4(0,602), C5(-0,449)

Component 1, with about 62 % of the cumulative variance, statistically captures all dimensions, with a similar range of loadings (-0,38 and -0,48). This indicates that it is a general factor that integrates and has a hidden impact on all the others to a greater or lesser extent, acting as an organizing core, which consolidates the idea of student consensus on the importance of ethical principles in the use of IAG in assessment. Component 2, on the other hand, raises the variance to almost 80 % (4/5 of the total) and shows a contrast between dimensions D3 (0,72) and D4 (-0,50), suggesting that some respondents' perceptions of honesty and trust in the educational value of IAG have different tendencies.

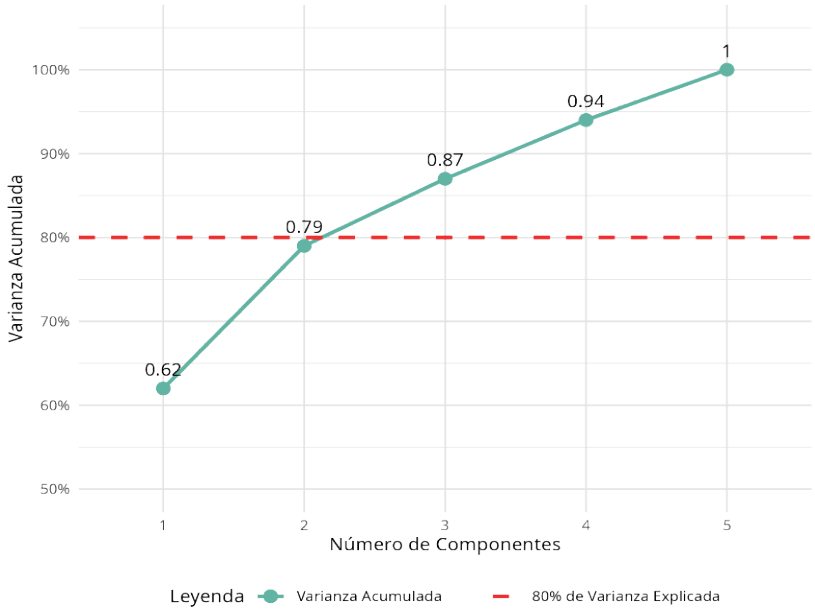

Figure 4. Principal component analysis (PCA)

Component 3 adds 7 % variance, increasing the cumulative variance to 87 %. This, together with the high magnitude of the loading of D2 (−0,874), reveals that ethical self-regulation and awareness manifest themselves as a somewhat independent and more personalized underlying factor. Component 4, on the other hand, combines trust in IAG (D4; -0,671) and the impact of these tools on academic skills (D5; 0,602), but in different directions, indicating that there are students who, although they recognize its benefits, do not necessarily trust this technology. Finally, component 5, with only 3 % variance and a dominant loading on D1 (0,781), reveals that ethical information and regulations are a more isolated or independent factor from the rest.

DISCUSSION

Regarding the descriptive analysis showing the distribution of students' perceptions, it can be seen that the highest concentration of responses in the "agree" and "neither agree nor disagree" levels reveals a general attitude of moderate acceptance and caution on the part of students. This suggests coexistence between recognition of the ethical use of IAG and evident reserve, reflecting ambivalent positions, possibly due to limited information and practical experience on the subject and with the IAG tool.

The greater coincidence of responses in P04, P05, P06, P07, P10, P11, P12, P15, and P16 suggests that students generally have more favorable perceptions and show more consensus when dealing with general ethical principles, such as responsibility, academic honesty, and integrity, but are more neutral and undecided on other issues, such as trust in IAG and its contribution to their skills. This is consistent with other studies,[19,44] where it was found that students tend to attach importance to ethics, despite having limited knowledge of institutional regulations and policies.

The higher percentages of "strongly agree" shown by P01, P08, P14, and P16 reveal a concern among some respondents about the risks of irresponsible use of IAG, which was also observed in other studies,[44] and about triggering side effects, such as technological dependence and a decline in critical analysis. This result is consistent with the findings of other studies,[23,25,38] which also showed general acceptance among students, combined with uncertainty in specific situations, reaffirming the need to strengthen support and ethical guidance.

The results of the scale show that the dimensions with the highest percentages and strength are D1 (99 %) and D3 (97 %), which reaffirms the consensus observed in the item analysis and consolidates the idea that students recognize and value general ethical principles (D1) and feel the need for ethical standards (D3) to guide their actions, This reveals an information gap that coincides with other studies.[45] This indicates, on the one hand, that in general, students perceive ethics as important in the use of IAG in assessment, but need more guidance and instruction in this regard. In contrast, dimensions D2 (awareness, responsibility, and self-regulation) and D4 (trust in AI and fairness) showed a higher percentage at the middle level, revealing a certain degree of uncertainty and caution, with proportions of disagreement. On the other hand, D5 (ethical impact on performance/skills) turned out to be the most balanced and heterogeneous, indicative of diverse perceptions. These results are consistent with the high (1429) and intermediate (1125) mean values obtained from the measures of central tendency, confirming internal variability in the dimensions, although with few

contrary perceptions.

These findings differ from international research,[46,47] where the use of IAG tends to be more closely linked to autonomy and self-regulation, which appear to be more widely recognized and incorporated into standard practices in these cases. This may suggest that, at UPSE, the tool is often seen more as an option for immediately solving teaching problems and tasks, without becoming an established self-learning mechanism. It may also be that there are somewhat rigid and punitive assessment dynamics[48] that may be negatively impacting motivation and driving high levels of anxiety.

The results of the scale show a somewhat different picture of student perceptions of ethics in learning assessment. The high percentages in D1 (99 %) and D3 (97 %) reflect a strong consensus in recognizing ethical principles and standards. However, the results of the descriptive analysis by item showed considerable neutrality and some disagreement, which qualifies the observed consensus. Ethical principles tend to be more accepted in theory or in the abstract, while in practice there are nuances and doubts.[33] In contrast, the percentages in dimensions D2 (76 %) and D4 (79 %), which are in the middle range, indicate cautious and less committed assessments. This coincides with what has been observed in other studies,[25,47] where students say they recognize the relevance of ethical responsibility and justice, but show caution when it comes to applying them in real and specific situations. This is reaffirmed in D4, where 11 % are at the low level, reinforcing the idea of mistrust regarding fairness, honesty, and justice on the part of the student body. The greater heterogeneity observed in D5, with balanced percentages at the medium (51 %) and high (44 %) levels, reflects the diversity of criteria and positions that may be due to the diversity of experiences, levels of digital literacy, and weak dissemination of ethical policies in some cases.[49,50]

The analysis of Spearman's coefficients confirms that student perceptions of ethics in AI and assessment do not behave in isolation. They may be influenced by personal and sociocultural factors. The strongest correlations observed between D1-D3 and D5-D4 (with $\rho = 0{,}60$) indicate that students with more ethical information tend to value academic honesty more and are more involved in assessment, and that trust in AI is often related to the perception of educational impact. This is consistent with other previous studies,[49,50] which emphasize that ethical conceptions are not formed in isolation and constitute a kind of network of attitudes and values that feed back into practice and reinforce each other. Bianan et al.[51] for example, recognize the relationship between awareness and responsibility; one leads to recognizing the impact of one's own decisions, the other manifests itself in ethically consistent actions. Moderate correlations (D1-D2 and D1-D5), on the other hand, reinforce the idea that knowledge of ethics and regulations acts as a link between responsibility and assessments of the impact of IAG in evaluation. Meanwhile, the weaker link between D3 and D4 ($\rho = 0{,}22$) reveals that there are items that these encompass where there is disparity and disagreement.

The PCA results provide greater depth to the analysis of the structure of students' perceptions of the ethical use of IAG in learning assessment. *Component 1,* for example, becomes a general ethical factor that consistently captures all dimensions, constituting a kind of organizing core, which confirms a global student consensus on ethical principles, in line with what was proposed by[50]. *Component 2* reveals a tension between academic honesty and trust, showing that although students value academic honesty and integrity, they tend to be cautious about trusting AI and consider it necessary to use it well. This coincides with the observations of[25], who point out that recognizing ethical principles does not always translate into consistent application in practice. *Component 3* is shown to be an independent factor, dominated by self-regulation and ethical awareness, suggesting that some students view these from a personal rather than a collective perspective, which is consistent with the results of the scale. *Component 4,* meanwhile, shows that some students recognize the value of personal responsibility and the positive impact of IAG on their learning and performance, without this translating into full confidence in the tool. According to Bianan et al.[51] this may be the result of diverse technological views and experiences, which may be influenced by the different degree programs that the surveyed students belong to. Finally, the independent or isolated nuance of *component 5* reveals that, although students attach importance to information and ethical standards, these are still seen by some of them as a formal framework and not as something applied in practice. This indicates that ethical standards are generally accepted but are not always integrated into real assessment experiences, pointing to the need to strengthen their practical appropriation.

Regarding the limitations and weaknesses of the research, it is important to recognize that the study was conducted in a specific educational community—the Peninsula University of Santa Elena, in Ecuador—which limits the possibility of generalizing the results to other educational institutions or contexts in a broad manner. Furthermore, the use of a perception questionnaire introduces the limitations inherent in self-report instruments, such as possible biases of social desirability, self-perception, or lack of objectivity, which could affect the accuracy of the responses.

CONCLUSIONS

The questionnaire has two factors. One is general, articulating ethical norms and perceptions with

responsibility and practical impact, demonstrating a general consensus of acceptance of ethical principles in assessment as measured by the IAG. The other shows tensions between honesty and trust in the tool.

Students with more ethical information tend to value academic honesty more and better understand its implication in assessment; results consistent with previous studies that emphasize that ethical conceptions are not formed in isolation, but rather within a framework of attitudes and values that feed back into practice.

There is a clear need to provide students with more information about the regulations governing the use of AI and to establish an institutional policy that guides and regulates its use, thereby providing greater security and confidence in the use of this technology in assessment.

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