sciendo

https://doi.org/10.2478/jped-2025-0003 JoP 16(1):42–68

Artificial Intelligence and Students : An Overview from Teaching-Learning, Ethics-Morality, Emotions, Training, Cognition-Creativity, Social Construct, Recreation-Entertainment

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Abstract: This study examines how secondary-school students recognize and relate to artificial intelligence (AI) and the meanings they attribute to it in their everyday lives. Using a quantitative, descriptive, cross-sectional design, we explore the subjectivities of a purposive sample of 576 students from both public and private schools. The analysis focuses on students' use of AI across seven dimensions: teaching–learning, ethics and morality, emotions, personal development, cognition and creativity, social construction, and recreation and entertainment. Data were collected with an ad hoc instrument that showed high internal consistency (α = 0.89). The findings reveal a variety of positions, including emotional ambivalence, ethical uncertainty, autonomous learning, and diverse perceptions of the creative, social, and educational effects of AI. Although students express openness and interest in technology, they also voice doubts about its integration into school practices and its influence on critical thinking and personal initiative. The results underscore the need for educational policies and school practices aligned with Education 5.0 that foster critical, ethical, and humanistic uses of technology.

This research contributes to understanding the configuration of digital youth subjectivities and provides a broad framework for designing meaningful, contextualized, and inclusive pedagogical strategies that develop digital citizenship.

Keywords: artificial intelligence; secondary students; education; technology.

Introduction

In the twenty-first century we are surrounded by multiple digital resources that keep us constantly connected, where large-scale data processing and the growing presence of intelligent systems have become part of our daily lives. International organizations such as UNESCO (2023), the World Economic Forum (2024), and the United Nations (2023) have highlighted that digital transformation is changing the way we learn, teach, communicate, and live in society. In this context, artificial intelligence (AI) has become a disruptive technology that is reshaping economic and productive models, educational systems, our forms of communication, and the formation of our identities, marking the onset of the Fourth Industrial Revolution. UNESCO has introduced the notion of the future of education to underscore the need to rethink our pedagogical practices in the face of the advance of intelligent technologies that are altering learning, assessment, teaching, and knowledge construction. Accordingly, AI should be viewed not merely as a support tool or a technical application, but as a complex, transversal, and dynamic phenomenon with profound ethical, cognitive, social, and emotional implications (Parque, 2022). Educators face the need to develop in students' digital competencies, critical thinking, ethical awareness, and emotional skills that will enable them to navigate a hyper-connected, algorithm-driven world.

In the educational field, many countries have begun to implement strategies to incorporate artificial intelligence into their school systems; however, significant gaps remain in digital access, critical use, and literacy. In Latin America, and especially in Mexico, adolescents tend to use AI in spontaneous, informal, and fragmented ways; moreover, its use has been found to be strongly influenced by self-motivation and perceptions of relevance rather than by formal literacy in an academic context (Reza et al., 2025, p. 85). The lack of a critical and in-depth understanding of AI and its implications underscores the urgency of conducting empirical research that can illuminate how secondary-school students experience, perceive, and relate emotionally to artificial intelligence.

Within this context, the Education 5.0 proposal, inspired by Japan's Society 5.0 model and adopted by several countries, offers an integrative and humanistic vision that seeks to harmonize technological development with social well-being (Arevalo et al., 2023). This approach considers the student as an active, creative, ethical, and emotional individual who interacts with complex digital environments. Education 5.0 not only focuses on teaching the use of digital tools but also promotes the integral development of the human being in an environment where the physical and the digital, the human and the artificial, the rational and the emotional intertwine. Adolescence is a stage in which identity is defined, abstract thinking is consolidated, emotional frameworks are established, and social relationships are built (Crews & Hodge, 2007). This period therefore offers valuable information about how new generations interpret and appropriate emerging technologies.

Far from being an external factor, AI has become interwoven with our daily routines and school dynamics and has influenced the definition of young people's identities. In this scenario, it is necessary to study these phenomena through a multidimensional analytical lens that encompasses teaching-learning, ethics, emotions, holistic development, cognitive processes and creativity, social construction, and leisure. In attempting to understand AI's effects on student life, we focus on the complexity of interactions with self-generative technologies, which involve deep emotional responses, ethical dilemmas, complex reflective processes, and significant cognitive challenges. Consequently, the study of AI in the school context must transcend mere technological literacy and move toward a critical, ethical, and contextualized understanding (Restrepo, 2024).

For these reasons, it is essential to investigate the subjectivities that emerge among young people from their daily use of AI: the ways students employ the technology, the experiences it generates, the emotions it elicits, how they interpret it, and the implications they perceive in their personal, school, and social lives. These subjectivities are influenced by a variety of social, cultural, economic, school, and affective factors that shape their interactions with AI and, in turn, create new ways of being, acting, and learning in the world.

This article is based on a rigorous quantitative approach that examines the relationship between selected secondary-school students in Mexico City relate to artificial intelligence. Using a diagnostic instrument designed specifically for this reveals that the school life of secondary, we explore seven interconnected dimensions: teaching-learning, ethics-morality, emotions,

personal development, cognition-creativity, society, and recreation-entertainment. These dimensions serve as gateways to understanding how students perceive and interpret AI from multiple facets of their human development. The purpose of this study is to obtain an overview of certain Mexico City's secondary-school students regarding the use and meaning of artificial intelligence in their lives, through an integrative multidimensional worldview, to identify certain experiences, subjectivities, and achievements of these educational actors in line with the Society 5.0 and Education 5.0 contexts.

Methodology

Methodological approach

Following the systematic process that structures this study, we adopted a quantitative, descriptive, cross-sectional approach, which seeks to quantify attitudes, opinions, behaviors, and other predefined variables to report the results of a population sample in the social sciences (Mahoajan, 2020). As noted above, cross-sectional studies make it possible to describe experiences and life narratives captured at a single moment in time, lend transparency and credibility to the sampling method used, are suitable under standardized conditions of data collection, and can yield data with good internal consistency (Maier et al., 2023).

Sample

Sampling is a specialized technique that selects a segment of a specific population with the aim of studying and characterizing it (Hiebl, 2023); it is therefore essential to choose study participants carefully to obtain valuable information. In this study we used the maximum-variation purposive sampling criterion because it allows researchers to view participants from multiple angles across a broad spectrum in relation to the phenomenon under analysis (Etikan et al., 2016). From a statistical standpoint the study is not representative; however, several scholars have shown that representativeness is not the only avenue for obtaining highly valuable research results (Vehovar et al., 2016).

The research protocol was designed, reviewed, and approved by an institutional ethics committee. Informed consent was obtained prior to data collection (from the study subject); participation was voluntary. It should be

noted that all responses were anonymized to protect participant confidentiality.

The sample consisted of students attending public and private lower-secondary schools in Mexico City's metropolitan area (table 1). First, the table presents the sample's general characteristics—age, gender, and sector.

Table 1: General characteristics of the sample population.

Variable	Indicator	Frequency	Percentage
Sector	Public	385	66.8%
	Private	191	33.2%
Gender	Female	364	63.2%
	Male	212	36.8%
Age	12 years old	71	12.3%
	13 years old	367	63.7%
	14 years old	138	24.0%

Source: Own elaboration.

Second, table 2 shows the types of devices through which respondents access AI. Desktop or laptop computers are not common resources in public schools—although they can be borrowed (178; 46.2%)—whereas in private schools they are usually available and for the student's exclusive use (113; 59.2%). Regarding tablets, the public-sector majority report that they neither have one nor can borrow one (224; 58.2%); in the private sector, half of the students have their own tablet (97; 50.8%). For mobile phones, most students in public schools have one for personal use (201; 52.2%), while in private schools this figure rises to 90.6% (173).

Third, table 3 indicates that students know and use AI tools in line with current global trends (Agarwal et al., 2022; Alonso & Quinde, 2023; Amoretti & Valero, 2024; Gubareva & Lopes, 2020). In public schools most students recognize nearly all tools except those for music-sound processing and generation (56; 14.5%); private-school students show higher awareness across all tools. Regarding actual use, students in both sectors employ almost all AI tools, with lower figures for music-sound (public 8.8%; private 39.8%) and for image-video processing in public schools (45.2%).

Table 2: Student access to AI-capable devices.

Device	School	Accessibility	F (Frequency)	P (%) (Percentage)
PC and/or Laptop	Public	Yes, and only I use it	57	14.8
		Yes, but I share it	91	23.6
		No, but I can borrow one	178	46.2
		No, and I cannot borrow one	59	15.3
		Total	385	100.0
	Private	Yes, and only I use it	113	59.2
		Yes, but I share it	57	29.8
		No, but I can borrow one	21	11.0
		No, and I cannot borrow one	0	0.0
		Total	191	100.0
Tablet	Public	Yes, and only I use it	38	9.9
		Yes, but I share it	21	5.5
		No, but I can borrow one	102	26.5
		No, and I cannot borrow one	224	58.2
		Total	385	100.0
	Private	Yes, and only I use it	97	50.8
		Yes, but I share it	35	18.3
		No, but I can borrow one	51	26.7
		No, and I cannot borrow one	8	4.2
		Total	191	100.0
Smartphone	Public	Yes, and only I use it	201	52.2
		Yes, but I share it	35	9.1
		No, but I can borrow one	95	24.7
		No, and I cannot borrow one	54	14.0
		Total	385	100.0
	Private	Yes, and only I use it	173	90.6
		Yes, but I share it	3	1.6
		No, but I can borrow one	15	7.9
		No, and I cannot borrow one	0	0.0
		Total	191	100.0

Source: Own elaboration.

Table 3: Student knowledge and use of AI tools.

Category	School	AI Tools	F (Frequency)	P (%) (Percentage)
Knowledge	Public	Chatbots	327	84.9
		Virtual Assistant	270	70.1
		Music and Sound Processing	56	14.5
		Tasks – Teaching and Learning	282	73.2
		Text Processing and Generation	319	82.9
		Image and Video Processing	215	55.8
	Private	Chatbots	191	100
		Virtual Assistant	145	75.9
		Music and Sound Processing	81	42.4
		Tasks – Teaching and Learning	143	74.9
		Text Processing and Generation	191	100
		Image and Video Processing	156	81.7
Use	Public	Chatbots	314	81.6
		Virtual Assistant	213	55.3
		Music and Sound Processing	34	8.8
		Tasks – Teaching and Learning	241	62.6
		Text Processing and Generation	298	77.4
		Image and Video Processing	174	45.2
	Private	Chatbots	191	100
		Virtual Assistant	137	71.7
		Music and Sound Processing	76	39.8
		Tasks – Teaching and Learning	135	70.7
		Text Processing and Generation	187	97.9
		Image and Video Processing	149	78.0

Source: Own elaboration.

Analytical dimensions

1. Teaching and Learning – The emergence of AI with artificial neural architectures has prompted significant changes in educational practices, although its full integration remains an ongoing process. It is therefore pertinent to explore whether students perceive that teachers use AI in teaching to enhance learning experiences and consolidate knowledge (U.S. Department of Education, 2023).
2. Ethics and Morality – It is essential to analyze the social responsibility entailed in students' use of AI; as Burton et al. (2017) ask, "How do their responsibilities for these tasks relate to other ethical responsibilities to society in general?" (p. 24).
3. Emotions – Human beings generate multiple emotions when interacting with stimuli; students are no exception when using AI, navigating psychophysiological reactions that influence decisions and actions (Reindl, 2021). Identifying these emotions enriches our understanding of their AI experience.
4. Training – AI literacy can shape the digital competencies students need to meet academic, everyday, and social challenges (Stolpe & Hallström, 2024), aligning with the profile of twenty-first-century digital citizenship. Hence, we examine how students become literate in AI use.
5. Cognition and Creativity – In the new digital landscape, artificial neural networks emulate aspects of human cognition and are used to perform various tasks. It is relevant to gauge the challenges students face to their critical and creative thinking when using AI (Trisnawati et al., 2023).
6. Social Construct – Human interaction evolves with new techno-digital attributes. Given AI's rapid permeation of students' daily lives, it is valuable to study its impact on their social connections (Guzman & Lewis, 2019).
7. Recreation and Entertainment – People need spaces for recreation, leisure, and entertainment; AI can generate immersive experiences in this realm (AP LBC, 2020). We therefore explore how students use technology recreationally, revealing particular attributes and challenges.

Data-collection instrument

A key element of this study was the design of an ad hoc instrument to probe the analytical dimensions through targeted questions. Most items employed a Likert scale because it yields reliable statistical indicators (Canto et al., 2020); response options were: Strongly Agree (SA) = 5, Agree (A) = 4, Undecided (U) = 3, Disagree (D) = 2, and Strongly Disagree (SD) = 1. Several polytomous items were also included, as they provide insight into each trait level (Asún, 2008, p. 113). Finally, certain multiple-choice questions were added because they furnish more precise feedback on a spectrum of subjectivities and enhance the reliability of the information (Petersen et al., 2016).

It is important to note that the diagnostic tool was designed by an interdisciplinary team comprised of professionals in neuroeducation, pedagogy, psychology, educational technology, artificial intelligence in education, and sociology.

Data analysis

To process the quantitative data, various statistical tests are indispensable for summarizing and simplifying information—often voluminous and complex—detecting patterns and trends, comparing and analyzing variables, generalizing results, and lending precision and credibility to findings in the social-science constructs (Rahman & Muktadir, 2021). We therefore used SPSS Statistics v. 25 to manage the data collected with the instrument. Tests of internal consistency and normality were applied, leading us to employ non-parametric procedures.

Results

The data-collection instrument, evaluated with Cronbach's alpha, showed overall excellent internal consistency (0.89) and acceptable values for each analytical dimension (0.68 – 0.79). In social-science research, coefficients above 0.60 and up to slightly over 0.90 are deemed adequate (DeVellis & Thorpe, 2021). A Kolmogorov–Smirnov test was also applied to verify normality and confirmed that the data required non-parametric treatment ($p = 0.000$).

Only the Emotions dimension was exempted from reliability, normality, and significance testing. Because it captures affective neurophysiological

reactions—responses located at the highest cognitive level of human functioning (self-regulation and the internal system)—its complexity and heterogeneity could lead to misinterpretation if such tests were applied (Zheng et al., 2023; Tavakol & Dennick, 2011).

Table 4: Reliability and normality indices of the diagnostic instrument.

Variable	Items	Cronbach's α	Kolmogorov-Smirnov (p)
In general	43	0.89	0.000
Teaching and Learning	10	0.79	0.000
Ethics and Morality	8	0.77	0.000
Emotions	8	–	–
Training	7	0.72	0.000
Cognition and Creativity	7	0.69	0.000
Social Construct	5	0.71	0.000
Recreation and Entertainment	6	0.68	0.000

Note: The instrument had 55 items; however, only 43 were considered for these statistical tests. Source: Own elaboration.

Next, relationships between categorical variables were examined with Pearson's chi-square test, and differences in distributions between independent groups were assessed with the Mann–Whitney U test to detect significant differences across all analytical dimensions (figure 1). Significant differences emerged only in the Teaching and Learning and Ethics and Morality dimensions; no significant differences were found in the others.

Growing consensus in the social sciences, reflected in the present study, urges researchers to move beyond an exclusive reliance on *p*-values and to assign greater weight to study context, participant implications, and real-world impact (McShane et al., 2017). In the same vein, Enrique and Peña (2020) argue:

> *The use of any mathematical model—specifically statistical models—to study the behavior of social phenomena (dynamic, changing, and multifactorial realities) is more complicated than in the natural and exact sciences because of their intrinsic properties and the particularities of the social-science context, where human conduct is present. Numerous influences act jointly and in opposition in society in general and in everyone's life, making it too complex to explain solely through statistical models.*

The peculiar objectives of empirical social-science research have fostered today's need to go beyond statistical significance. This search for alternative approaches is driven by the practical significance that the field demands, given that conventional statistical significance often fails to answer questions about the magnitude of detected effects (pp. 14, 17).

Ítem	X^2	Sig.	U	Sig.	Ítem	X^2	Sig.	U	Sig.	Ítem	X^2	Sig.	U	Sig.
Teaching and Learning					**Emotions**					36	1.557	0.829	35328	0.419
1	3.663	0.452	33477	0.065	19	N/A	N/A	N/A	N/A	37	2.091	0.724	35161.5	0.371
2	1.447	0.845	35989.5	0.663	20	N/A	N/A	N/A	N/A	38	1.878	0.763	35937.5	0.642
3	1.824	0.816	34896.5	0.294	21	N/A	N/A	N/A	N/A	39	0.784	0.944	35834.5	0.601
4	1.2	0.882	36507	0.884	22	N/A	N/A	N/A	N/A	40	6.783	0.147	33764.5	0.093
5	10.824	0.031	32836.5	0.046	23	N/A	N/A	N/A	N/A	**Social Construct**				
6	11.398	0.041	32979.5	0.034	24	N/A	N/A	N/A	N/A	41	2.633	0.621	35566.5	0.506
7	10.791	0.028	31595	0.004	25	N/A	N/A	N/A	N/A	42	6.134	0.19	33571.5	0.074
8	11.068	0.037	33153.5	0.043	26	N/A	N/A	N/A	N/A	43	5.784	0.214	34570	0.218
9	0.699	0.954	35925.5	0.639	**Training**					44	6.211	0.183	35713	0.558
10	4.239	0.379	36034	0.682	27	2.327	0.728	35810.5	0.592	45	7.201	0.124	35837	0.603
Ethics and Morality					28	1.627	0.805	35747.5	0.57	**Recreation and Entertainment**				
11	11.212	0.04	32623	0.037	29	2.605	0.634	35806	0.59	46	2.952	0.128	36305	0.796
12	10.897	0.032	32133.5	0.019	30	1.626	0.805	35681.5	0.55	47	1.977	0.745	34812.5	0.277
13	10.91	0.035	32618	0.02	31	5.478	0.242	35517	0.489	48	2673	0.618	34118.5	0.14
14	4.446	0.354	36204	0.753	32	1.698	0.842	36405.5	0.838	49	3.818	0.429	33411.5	0.06
15	0.808	0.944	36269.5	0.78	33	6.873	0.139	35871.5	0.617	50	3.471	0.489	36509	0.886
16	1.331	0.861	36603	0.927	**Cognition and Creativity**					51	1.933	0.925	35485.5	0.473
17	4.087	0.402	34686.5	0.243	34	2.74	0.617	36252.5	0.773	X2= Chi Cuadrada de Pearson				
18	10.813	0.03	31798	0.014	35	2.425	0.666	34481	0.2	U= U de Mann Whitney				

Figure 1: Comparison between independent groups (Pearson Chi Square and Mann-Whitney U).

Based on Teaching and Learning dimension, figure 2 shows the opinions that prevail most strongly among the respondents. The analysis of the relationship between students and the educational use of artificial intelligence reveals significant tensions and contrasts determined by the type of school they attend. For example, in private schools 45.1% of students

believe that AI could improve teaching, whereas in public schools 34.5% are undecided about this idea. Perceptions of teachers' use of AI also diverge: in both the public sector (35.8%) and the private sector (33.0%), a substantial proportion of students deny that their teachers employ it.

Regarding teachers' knowledge of AI, most students in private schools (33.0%) doubt their teachers' competence in this area, while in public schools a higher level of uncertainty prevails (37.7%). Teacher encouragement for students to intensify AI use in school activities is scarce in both sectors: 35.1% of private-school students and 34.7% of public-school students state that they receive no stimulus at all to use AI. Moreover, a similar share of pupils report an explicit ban on using AI for academic purposes: 35.1% in private schools and 33.2% in public schools.

Opinions about the benefits of AI in education are likewise divided. While 38.7% of students in private schools perceive benefits, 33.2% in public schools' express doubts. Uncertainty also surrounds potential disadvantages, reported by 33.5% of public-school and 34.0% of private-school students. The perception of AI as a tool for improving teaching reveals clear gaps: 42.9% of private-school students support the idea, whereas 34.5% of public-school students remain undecided. Belief in AI's usefulness for learning likewise varies: 47.7% of private-school students agree, compared with 31.6% disagreement in public schools. Finally, a noteworthy point of convergence is that students in both sectors rate their own AI skills higher than those of their teachers: 37.7% in private schools and 33.8% in public schools, suggesting a generational gap in AI adoption at school.

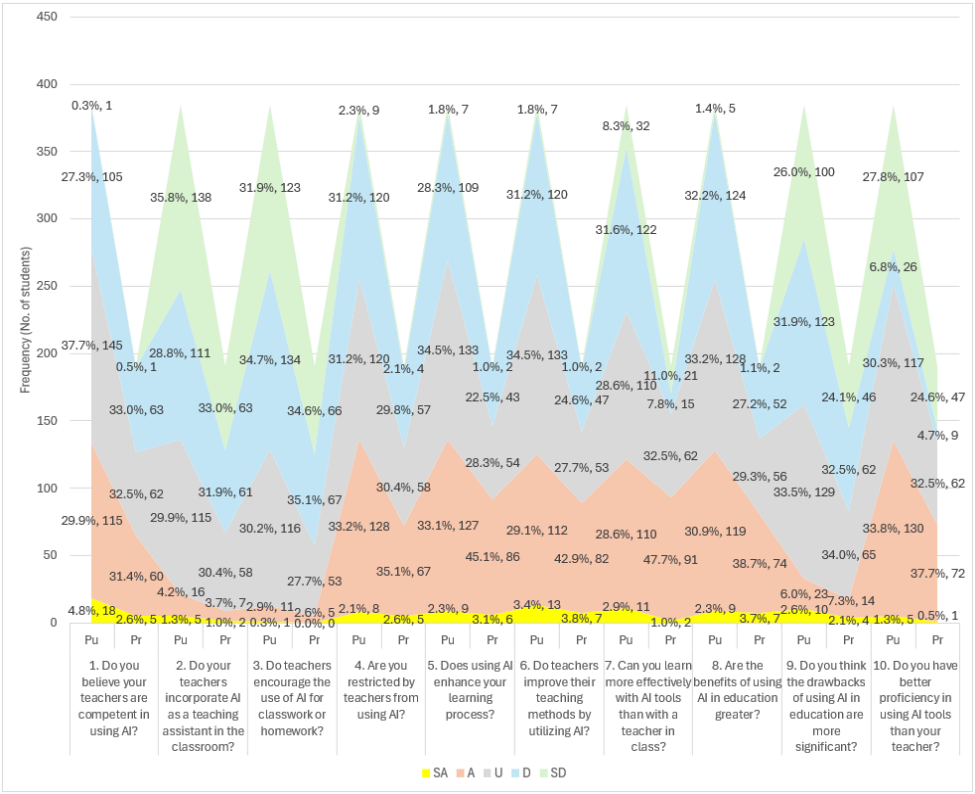

Figure 2: Frequencies and percentages in the Teaching and Learning dimension.

In relation with the Ethics and Morality dimension, students in both school sectors report their weekly frequency and hourly dedication to AI use as follows (figure 3). In the private sector, 43.3% of students say they use technology five times a week, whereas in the public sector only 25.2% report using it four days a week. Time devoted to AI during the week also differs markedly: in public schools 31.7% of students spend three to four hours per week using AI, whereas in private schools 27.3% use it five to six hours per week. These figures reflect not only access to technology but also the ways in which adolescents are incorporating AI into their schoolwork and personal activities. While some use it occasionally, others seem to have integrated it as a regular part of their weekly digital routine, suggesting that factors such as pedagogical support, home connectivity, and institutional attitudes toward these tools may be shaping this pattern.

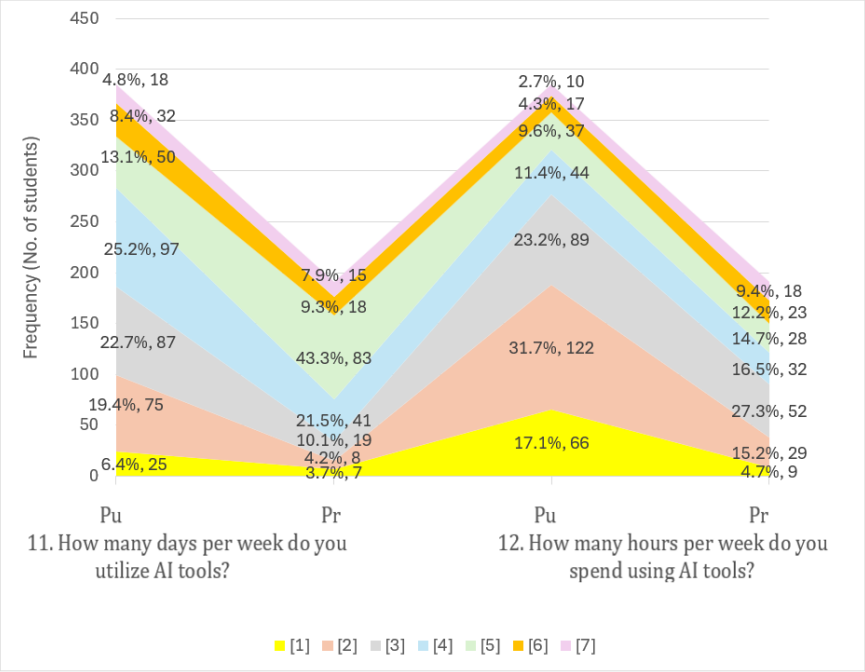

Figure 3: Weekly frequency and hours of AI use in the Ethics and Morality dimension.

Note: In question 11 the values 1–7 indicate the number of days per week on which AI tools are used; in question 12 the values represent weekly hours of AI use as follows: 1 (1–2 hours), 2 (3–4 hours), 3 (5–6 hours), 4 (7–8 hours), 5 (9–10 hours), 6 (11–12 hours), and 7 (13 hours or more).

Also, within the Ethics and Morality dimension (figure 4), students display a spectrum of attitudes that range from genuine interest to personal doubts and clear rejection of certain communicative practices regarding the link between AI use and ethical responsibility. A considerable percentage of public-school students (35.1%) agree on the importance of using AI ethically and responsibly; this commitment is less evident in private schools, where 34.5% are undecided. The same uncertainty appears when students are asked whether they use AI honestly: 35.6% in public schools and 35.1% in private schools cannot define a clear stance. A similar pattern emerges with respect to employing AI for academic advantage: 36.8% in the private sector and 34.7% in the public sector remain undecided.

Ethical contradictions become evident when students are asked whether they are transparent with family, peers, or teachers about using AI to solve school tasks: 33.5% in public schools and 35.5% in private schools' express

indecision. Yet when it comes to telling others that they have used AI, the response is more categorical: 33.8% of public-school and 34.2% of private-school students completely disagree with doing so. Uncertainty also dominates awareness of the risks associated with AI use: 37.1% in the public sector and 35.5% in the private sector say they are unsure they fully understand those risks.

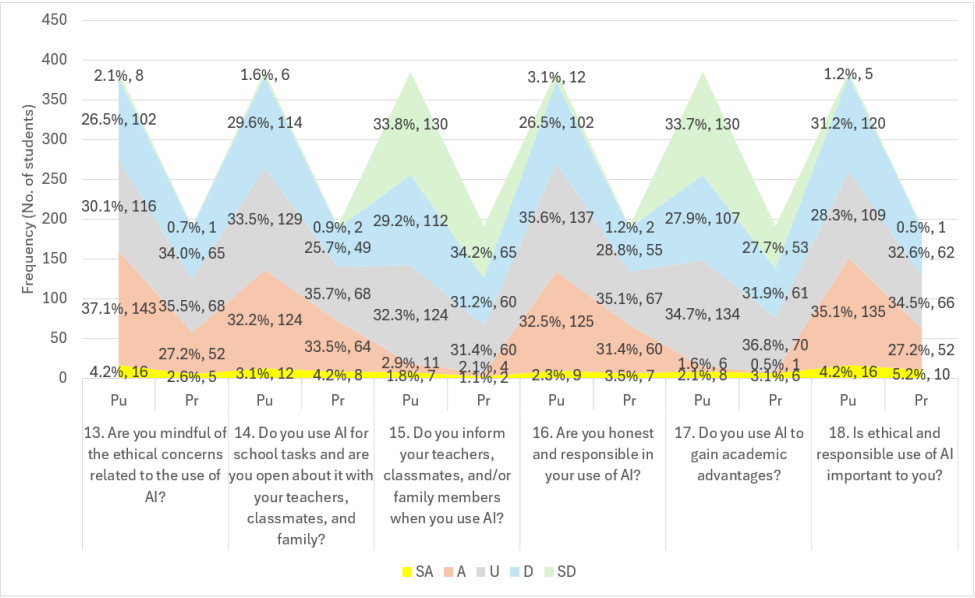

Figure 4: Frequencies and percentages in the Ethics and Morality dimension.

In the Emotions dimension, the complexity of students' affective subjectivities toward AI becomes evident (figure 5). These subjectivities—rooted in projected, physiological, cognitive, and behavioral experiences—manifest in the following predominant emotions by school sector: overall, feelings of well-being prevail when using generative technologies. Happiness is the most common emotion in both sectors (20.9% in public schools, 19.3% in private), followed by excitement (16.5% in both) and interest (15.7% public, 15.3% private). Observing teachers using AI in class also elicits varied emotional reactions. In public schools, 17.1% report feeling excited and 14.9% mention both happiness and surprise; in private schools, 15.8% feel excited, while 10.3% experience happiness and interest. Students likewise notice how technology affects teachers: in private schools 17.4% perceive surprise, 10.4% anger, and 12.7% interest; in public schools 13.4% note surprise, 12.9% anger, and 10.7% frustration.

Regarding what AI provokes in teachers when they themselves use it, public-school students perceive happiness (12.4%), surprise (12.3%), and interest (12.2%); in private schools interest stands at 16.5%, happiness at 12.3%, and surprise at 11.8%. Achievements obtained thanks to AI generate intense emotions: in public schools 20.9% of students feel happy, 16.5% excited, and 14.3% surprised; in private schools the leading emotions are happiness (19.3%), excitement (16.5%), and interest (13.8%). When AI fails to help them reach their goals, the picture changes: in the private sector students report anger (18.9%), frustration (15.1%), and anxiety (11.6%); in the public sector 16.5% express anger, 15.0% frustration, and 13.3% anxiety. Facing the possibility that AI might replace various human professions, reactions are mixed. In public schools 12.5% say they would feel sadness, 12.4% surprise, and 10.3% indifference; in private schools the most mentioned emotions are sadness (11.8%), surprise (11.6%), and happiness (10.8%). When the idea is to replace teachers with AI, feelings are again divided: in public schools 14.1% cite surprise, 10.8% interest, and 10.5% sadness; in private schools 15.8% feel surprise, 14.0% interest, and 12.8% excitement.

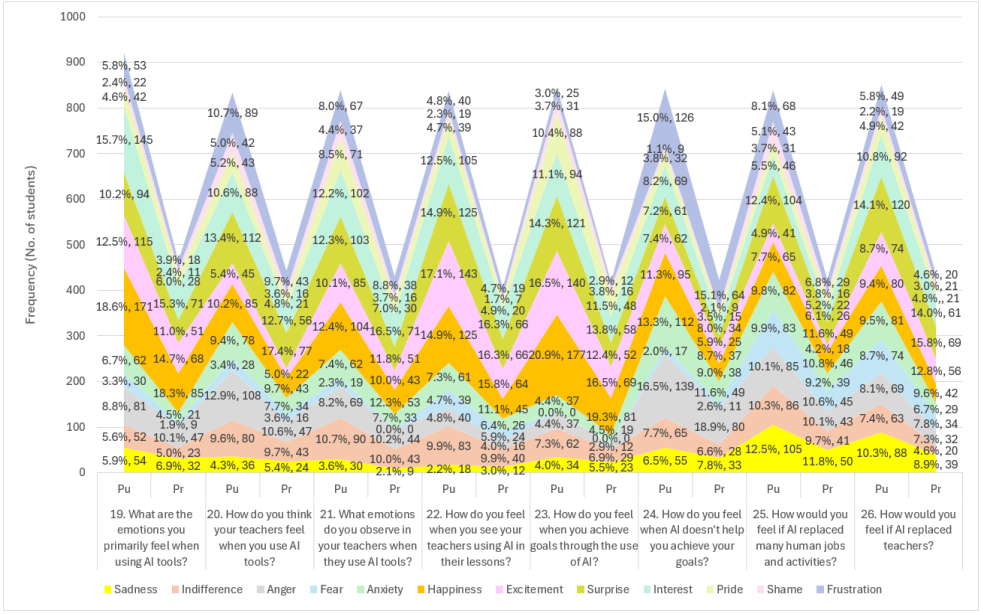

Figure 5: Frequencies and percentages in the Emotions dimension.

Students' responses to the Training dimension (figure 6) show that understanding of AI and its purpose is well established in both sectors:

35.6% of public-school respondents and 33.0% of private-school respondents state that they understand what AI is and what it is for. However, how they have learned to use technology differs. A considerable proportion of public-school students express doubts about receiving formal training at their schools—36.0% are undecided—whereas in private schools 35.2% disagree that their institution has taught them. A significant share of student's report having learned to handle AI autonomously: 32.5% in the public sector and 35.6% in the private sector, indicating self-directed appropriation.

Most students reject the idea that their learning comes from sources other than teachers (32.5% public, 30.4% private). Nevertheless, there is a marked desire for formal digital-literacy training, expressed by 35.8% of public-school and 36.6% of private-school students. This interest aligns with a positive attitude toward applying AI academically: 36.1% in public schools and 31.9% in private schools agree with using AI to plan and achieve goals. The willingness to integrate AI into educational processes is also high, with 32.5% in the public sector and 29.8% in the private sector in full agreement.

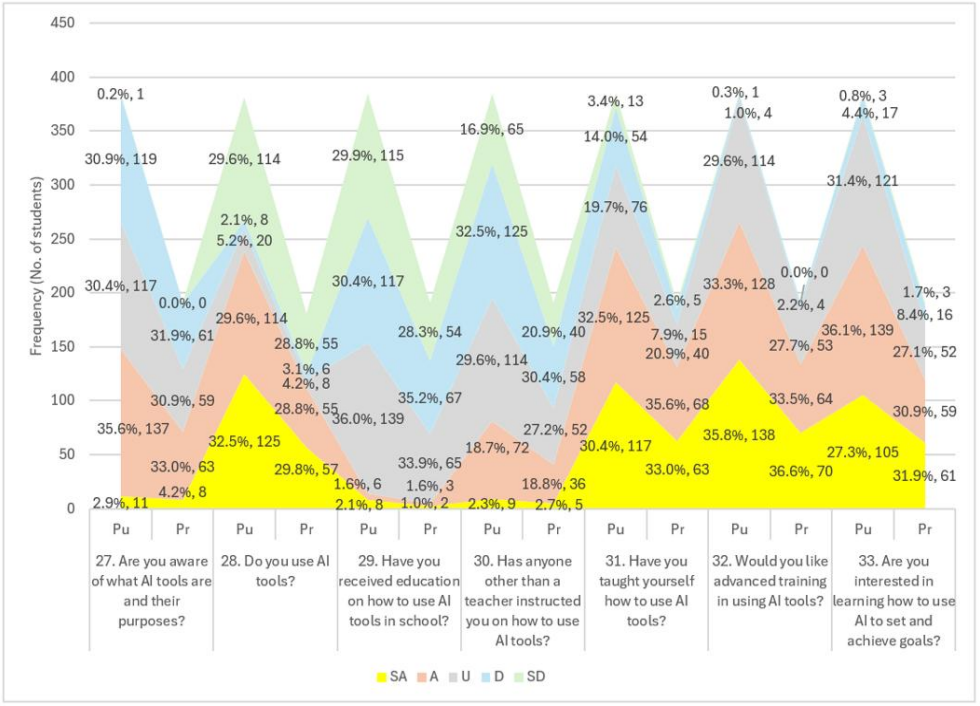

Figure 6: Frequencies and percentages in the Training dimension.

Regarding Cognition and Creativity (figure 7), a significant portion of students perceive AI as a technology that could foster laziness (36.1% in public schools and a similar proportion in private schools). This concern is coupled with uncertainty about whether AI weakens personal initiative (40.1% public, 38.4% private). Conversely, students reject the notion that AI diminishes their thinking and analytical skills (35.3% public, 35.1% private) or their creative potential (32.5% public, 29.8% private). The impact of AI on critical thinking remains ambiguous in both types of schools (35.8% public, 32.5% private). Despite these worries, AI's creative and transformative potential is acknowledged: 34.5% of public-school students and 32.5% of private-school students say it enhances their creativity, and its capacity to broaden horizons of innovation is valued by 32.5% in public schools and 41.0% in private schools.

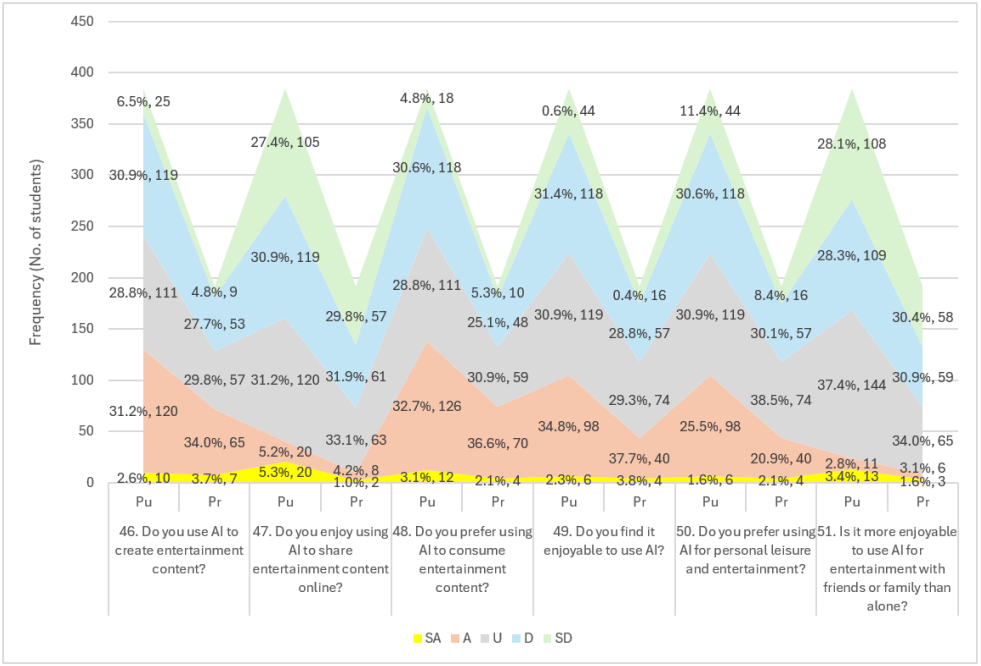

Figure 7: Frequencies and percentages in the Cognition and Creativity dimension.

In the Social Construct dimension (figure 8), AI is viewed as a technology that can contribute to collective well-being (32.7% in public schools and 35.1% in private). In general, respondents reject the idea that AI dehumanizes social relationships (35.3% public, 36.6% private) or leads to social isolation (34.5% public, 36.1% private). Uncertainty persists, however, about whether AI enables new, harm-free forms of human-digital

interaction (32.5% public, 33.1% private) and about its usefulness for establishing connections with more people (34.0% public, 35.1% private).

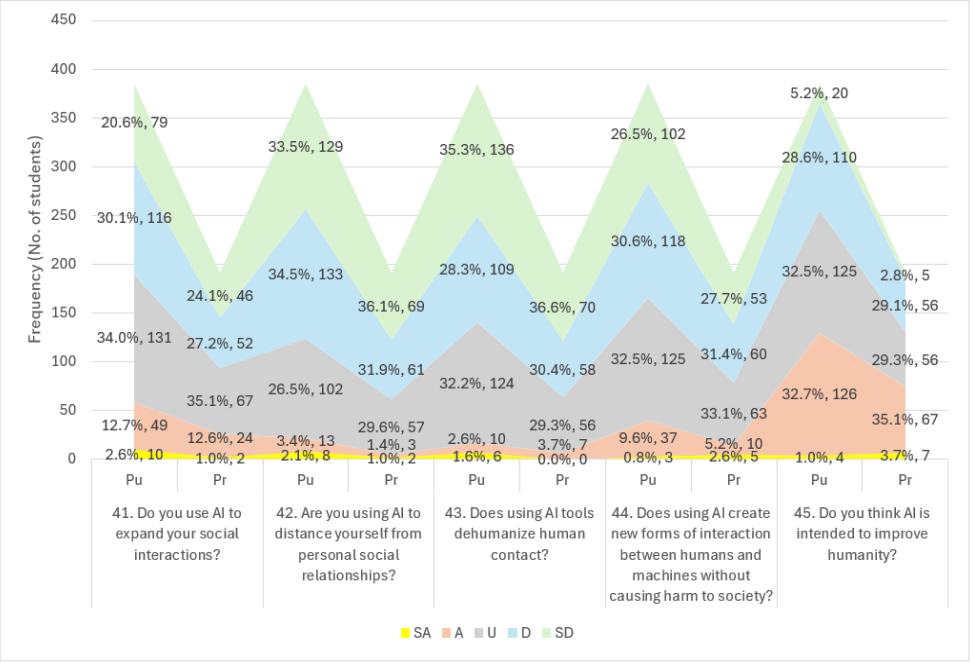

Figure 8: Frequencies and percentages in the Social Construct dimension.

Turning to Recreation and Entertainment (figure 9), a portion of the student body shows a clear preference for receiving leisure content via AI—32.7% agreement in the public sector and 36.6% in the private—indicating a favorable disposition toward AI-mediated recreational experiences. Although not a majority, a positive attitude also appears toward producing recreational content with AI: 31.2% of public-school and 34.0% of private-school students enjoy using AI to create leisure-related materials. This acceptance does not necessarily translate into a fully satisfying experience. When asked whether interacting with artificial neural networks is fun, many students express doubt (34.0% undecided in public schools, 35.1% in private). Similar indecision surrounds using AI to disseminate recreational content on the web (31.2% public, 33.1% private). Preferences regarding mode of use are likewise unclear: students are uncertain whether they prefer to interact with AI individually (30.9% public, 38.5% private) or collectively (37.4% public, 34.0% private).

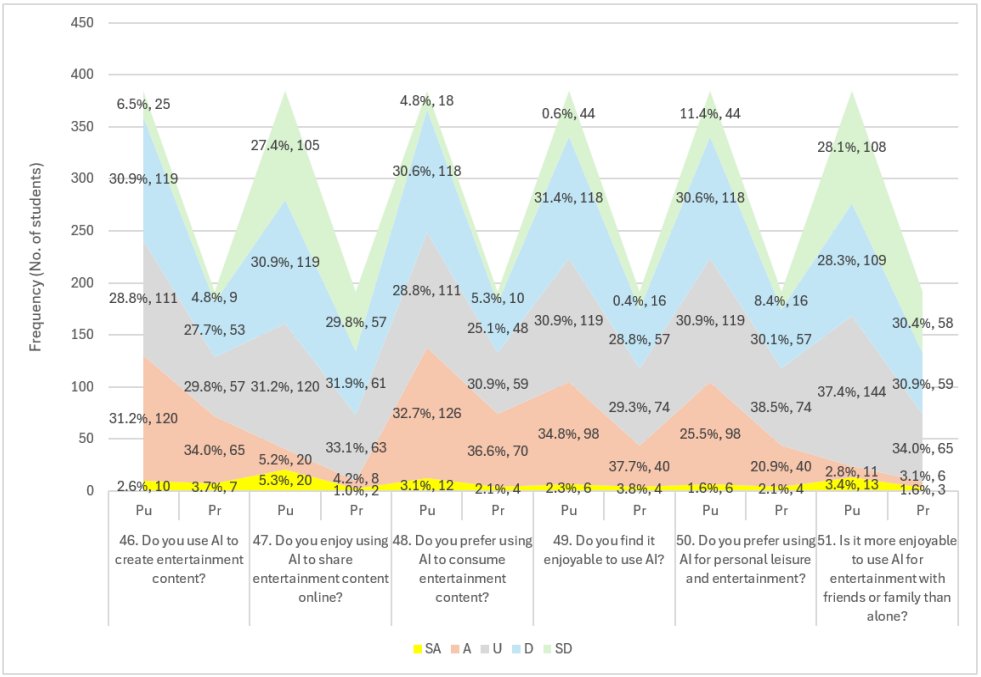

Figure 9: Frequencies and percentages in the Recreation and Entertainment dimension.

Discussion

This research reveals, amid the growing digital hyper-connectivity with AI, the complex perspectives and relationships of secondary-school students with this technological entity, based on analytical dimensions that involve the learning environment, ethics, emotions, and creativity. This will allow us to strengthen the discussion on the challenges that arise from the use of AI—ranging from curricular adaptation and teaching strategies to social effects and the considerations of responsibility it entails.

It was observed that most of the study subjects use AI many days per week and for many hours, through different digital devices (their own or someone else's) such as mobile phones, computers, and so forth. They do so because they find attractive the various purposes AI can serve: schoolwork, entertainment, digital creation and appropriation, and assistance with tasks of different kinds, among others.

In the academic sphere, it is striking how indecision or disagreement about AI's didactic presence prevails in what students perceive inside their

classrooms, even though they are generally interested in using it; this panorama suggests a lack of effective integration of this resource. The main consequence of such a perspective would be that AI would remain merely anecdotal in the classroom, without recoding teaching and learning, stimulating the development of digital citizenship, or advancing educational technological innovation. These findings are consistent with other studies that have shown an incipient adoption of this technology in academic spaces (Faycal et al., 2023).

The results also showed that digital ethics has become an area for improvement for institutions and teachers, because students oscillate between awareness of the risks in using AI and fascination with accessing it. This generates uncertainty and ethical concern, above all because most have not been educated in how to manage it. In the research of Cheung et al. (2022) on AI use among secondary students, they found that understanding how to handle this digital tool can represent a significant cognitive challenge for them; therefore, adjusting curriculum design to integrate AI may help to remedy that problem.

In short, research suggests incorporating AI as an opportunity to build digital morality through dialogue and reflection. Teachers, a key figure in this transition, are not always prepared to use AI to redefine their role with students who, in many cases, know more about how to use these tools than those trying to teach them. Thus, AI transforms teaching and learning, but not necessarily as a conscious, ethical, and didactic act articulated with the desire to learn.

On an emotional level, AI provokes a wide range of responses and sensations, from interest and joy to anxiety and frustration. The findings show that happiness is the most common emotion among both groups of students, followed by interest. This diversity (framed mainly by the positive emotions associated with using technology) suggests that these motivational drivers should be taken into account to foster new learning environments. It is important to remember that today's students at this educational level belong to the so-called digital-native generation; accordingly, they are drawn to technological tools such as AI.

As Salloum et al. (2025) emphasize, emotions such as joy, interest, anxiety, and frustration significantly influence students' motivation, attention, and learning outcomes, reinforcing the importance of recognizing the emotional dimension of students' interactions with AI. Moreover, Adeyele & Adeyele (2025) likewise observe that digital natives interact with

a wide array of technological and AI tools, which are transforming their experiences and life habits.

Regarding education, there is an interesting paradox: students want to learn about AI, but they don't necessarily expect it to happen in school. According to Chan and Hu (2023), although most students have explored generative AI tools in general contexts, their exposure to these technologies within formal educational settings remains limited, highlighting that much of their learning about AI occurs outside the classroom.

In other words, we can observe that students educate themselves, exploring, experimenting, failing, and sharing. Meanwhile, the school system seems to be a step behind, watching from a distance as students navigate between tutorials, networks, platforms, and applications. This disconnect between the pace of institutions and that of young people raises a question: how can we educate without losing touch with the languages, practices, and sensibilities of this digital generation? Education 5.0 offers an answer: educating for life with technology, without abandoning the human, critical, and transformative dimension of the educational process. A highly relevant result has been the recognition that training in the use of AI is primarily conducted outside the school setting, which raises the need to adapt the education system to the rhythms and languages of the digital generation.

In the social sphere, students do not see AI as a threat to human connections but rather as a tool for establishing new forms of interaction. There is an intuition—perhaps still somewhat vague—that digital technology does not replace human interaction but transforms it. Building on this idea, Marrone et al. (2024) contend that it is crucial to educate for hybrid coexistence, where the value of personal contact is not lost yet it is also recognized that connections can be mediated through various digital environments and tools, such as AI.

In the entertainment field, the use of AI is presented as an ambiguous terrain: students are unclear about how to enjoy it: alone or with others. This ambivalence could indicate that, unlike other digital platforms, AI has not yet been fully embraced as a form of play, expression, or relaxation, perhaps because its functional logic still predominates and we have not been taught to imagine it as a playful, aesthetic, or narrative possibility.

AI can process, prioritize, and assemble information, but that does not necessarily make it a creative entity with critical-thinking skills; it neuro-cognitively imitates human beings yet lacks the lived experience and

generative capacity of the biological brain. Accordingly, secondary-school adolescents can weave together their knowledge, emotions, and creativity, generating new multisensory meanings in both physical and digital spaces; AI can support their creative and innovative efforts and enhance their cognition—especially when they are literate in its use. However, if students rely on AI to carry out all their academic and personal tasks, this could undermine their cognitive development and lead to procrastination. Koivisto & Grassini (2024) note that AI is highly adept at co-creating when provided with specific commands, but the human imagination and creative capacity remain unrivalled.

What this study reveals is not only a diagnosis of the use of AI in school contexts; it seeks to draw a map of youth subjectivities that think, feel, educate, and excite in a world where the artificial and the human are no longer separated by walls, but by permeable thresholds. Understanding these experiences from a pedagogical perspective involves not only recognizing the numbers but listening to the voices that inhabit those numbers. Education 5.0 doesn't demand more technology, but more meaning in its use. And that meaning is built where knowledge intertwines with emotion, technology with ethics, data with experience, and artificial intelligence with human intelligence. It is possible to affirm that education should foster a hybrid coexistence, where digital interactions complement human bonds, not the other way around.

Study Limitations: This study used a cross-sectional design, which precludes inferring causal relationships or evolutionary changes in students' perceptions. The sampling used does not guarantee representativeness of the secondary school population in Mexico City, so the results and conclusions apply to the analyzed group; however, this research may provide guidance to various education professionals at the same educational level.

Finally, we believe it would be prudent for this study to motivate future research in this area with varied methodological approaches (quantitative, qualitative, or mixed) to expand on the findings.

Conclusion

In a scenario where artificial intelligence has ceased to be a mere futuristic promise and has become a daily reality, high school students are emerging as active agents of these technologies, shaping new modes of perception, interaction, and attribution of meaning. This research seeks to

distance itself from an approach focused exclusively on access to or technical mastery of these tools and delves deeper into the exploration of the complex affective, cognitive, ethical, and social dimensions that shape the student experience in their relationship with AI.

The findings reveal that students, far from assuming a passive role in the digital age, educate themselves in the use of these technologies, express a wide range of emotions in their interactions with them, are able to reflect on their impact on education and daily life, and, in many cases, demand pedagogical support that has not yet fully materialized. This reality challenges us to reconsider current pedagogical practices, to reformulate curricular structures, and, fundamentally, to reimagine the ways in which humans and technology coexist.

AI-use disclosure

During the drafting and analysis of this manuscript, generative artificial-intelligence tools (ChatGPT) were used exclusively for spelling and syntax checks, for stylistic polishing, and to explore possible conceptual formulations. All theoretical and methodological decisions, the analysis and discussion, and the article's final structure and content remain entirely the responsibility of the authors. No AI was employed to generate data or to replace academic judgment at any stage of the study. No excerpt suggested by the AI tool was copied verbatim without review, correction, and refinement by the authors of this work.

Acknowledgement

This study was conducted within the project "Artificial Intelligence and Digital Competencies for Teachers in line with Education 5.0," which forms part of the post-doctoral work of Ricardo Alberto Reza Flores under the supervision of Professor Rosa Maria Vicari. The project is housed in the Graduate Program in Informatics in Education (PPGIE), process no. 9771, at the Federal University of Rio Grande do Sul (UFRGS), Porto Alegre, Brazil.

References

Agarwal, S., Agarwal, B., & Gupta, R. (2022). *Chatbots and virtual assistants : A bibliometric analysis.* Library Hi Tech, 40(4), 1013–1030. https://doi.org/10.1108/LHT-09-2021-0330.

Alonso-Arévalo, J., & Quinde-Cordero, M. (2023). ChatGPT : La creación automática de textos académicos con Inteligencia artificial y su impacto en la comunicación académica y educativa. *Desiderata, 6*(22), 136–142. https://gredos.usal.es/handle/10366/152505.

Amoretti, M. L., & Valero, L. P. (2024). Inteligencia artificial para la producción musical (IAPM) : pedagogía y docencia a través de estrategias tecnológicas innovadoras. *YUYAY : Estrategias, Metodologías & Didácticas Educativas, 3*(1), 66–87. https://doi.org/10.59343/yuyay.v3i1.59.

Arevalo Erique, M. A., Luna Alvarez, H. E., Ching Valle, J. X., & Zambrano Vera, A. M. (2023). Educación 5.0 : más que un cambio de tecnología, un paso adelante en la educación. *Revista Conrado, 19*(94), 384–392. https://conrado.ucf.edu.cu/index.php/conrado/article/view/3364.

AP LBC. (2020). *How can the Leisure Industry Unlock the Power of Artificial Intelligence (AI)?* AP LBC. https://ap-lbc.com/how-can-the-leisure-industry-unlock-the-power-of-artificial-intelligence-ai/.

Burton, E., Goldsmith, J., Koenig, S., Kuipers, B., Mattei, N., & Walsh, T. (2017). Ethical Considerations in Artificial Intelligence Courses. *ArXiv,* abs/1701.07769. https://doi.org/10.1609/aimag.v38i2.2731.

Canto, G. Á. G., Sosa, G. W. E., Bautista, O. J., Escobar, C. J. & Santillán, F. A. (2020). Escala de Likert : Una alternativa para elaborar e interpretar un instrumento de percepción social. Revista de la alta tecnología y sociedad, 12(1), 38–45. https://acortar.link/0RmNSc.

Chan, C. K. Y., Hu, W. (2023). Students' voices on generative AI : perceptions, benefits, and challenges in higher education. *International Journal of Educational Technology in Higher Education, 20*(43), 1–18. https://doi.org/10.1186/s41239-023-00411-8.

Crews, F., He, J., & Hodge, C. (2007). Adolescent cortical development : A critical period of vulnerability for addiction. *Pharmacology Biochemistry and Behavior, 86*(2), 189–199. https://doi.org/10.1016/j.pbb.2006.12.001.

DeVellis, R. F., & Thorpe, C. T. (2021). *Scale development : Theory and applications.* Sage publications.

Enrique Hevia, F. M., & Peña Alvarez, M. (2020). Improcedencias al usar la estadística en las investigaciones sociales. *Varona. Revista Científico Metodológica,* (70), 13–18. http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1992-82382020000100013&lng=es&tlng=es.

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics, 5*(1), 1–4. https://doi.org/10.11648/j.ajtas.20160501.11.

Faycal, F., Riadh, J., Ibtehal, A., Fawzi, F. D., Samer, A., Radouane, S. (2023). Analyzing the students' views, concerns, and perceived ethics about chat GPT usage. *Computers and Education : Artificial Intelligence, 5,* 100180. https://doi.org/10.1016/j.caeai.2023.100180.

Foro Económico Mundial. (2024). *Desbloquear el máximo potencial de la transformación digital a través de la tecnología y el talento.* https://es.weforum.

org/stories/2024/09/desbloquear-el-maximo-potencial-de-la-transformacion-digital-a-traves-de-la-tecnologia-y-el-talento/.

Gubareva, R., & Lopes, R. P. (2020). Virtual Assistants for Learning : A Systematic Literature Review. *CSEDU (1),* 97–103. https://www.scitepress.org/Link.aspx?doi=10.5220/0009417600970103.

Guzman, A., & Lewis, S. (2019). Artificial intelligence and communication : A Human–Machine Communication research agenda. *New Media & Society, 22*(1), 70–86. https://doi.org/10.1177/1461444819858691.

Hiebl, M. R. W. (2023). Sample Selection in Systematic Literature Reviews of Management Research. *Organizational Research Methods, 26*(2), 229–261. https://doi.org/10.1177/1094428120986851.

Maier, C., Thatcher, J. B., Grover, V., & Dwivedi, Y. K. (2023). Cross-sectional research : A critical perspective, use cases, and recommendations for IS research. *International Journal of Information Management, 70,* 102625. https://doi.org/10.1016/j.ijinfomgt.2023.102625.

Marrone, R., Zamecnik, A., Joksimovic, S. et al. (2024). Understanding Student Perceptions of Artificial Intelligence as a Teammate. *Technology, Knowledge and Learning*. https://doi.org/10.1007/s10758-024-09780-z.

McShane, B., Gal, D., Gelman, A., Robert, C., & Tackett, J. (2017). Abandon Statistical Significance. *The American Statistician, 73*(1), 235–245. https://doi.org/10.1080/00031305.2018.1527253.

Mohajan, H. K. (2020). Quantitative research : A successful investigation in natural and social sciences. *Journal of Economic Development, Environment and People, 9*(4), 50–79. https://www.ceeol.com/search/article-detail?id=939590.

Organización de las Naciones Unidas. (2023). *Pacto Digital Global.* https://www.un.org/es/summit-of-the-future/global-digital-compact.

Parque Gyunyeol, M. B. (2022). Un estudio de caso sobre problemas actuales en inteligencia artificial y sus implicaciones éticas. *Ética de la robótica y la IA, 7*(2), 47–56. https://doi.org/10.22471/ai.2022.7.2.47.

Petersen, A., Craig, M., & Denny, P. (2016). Employing Multiple-Answer Multiple Choice Questions. *Proceedings of the 2016 ACM Conference on Innovation and Technology in Computer Science Education.* https://doi.org/10.1145/2899415.2925503.

Rahman, A., & Muktadir, M. (2021). SPSS : An Imperative Quantitative Data Analysis Tool for Social Science Research. *International Journal of Research and Innovation in Social Science, 5*(10), 300–302. https://doi.org/10.47772/ijriss.2021.51012.

Reindl, S. (2021). *Emotion AI in Education : A Literature Review. International Journal of Learning Technology, 16*(4), 288–302. https://doi.org/10.1504/IJLT.2021.121366.

Restrepo Pineda, A. F. (2024). Conectando mentes y máquinas : neuroeducación e IA en la era del pensamiento computacional. *Plumilla Educativa, 33*(1), 1–15. https://doi.org/10.30554/p.e.1.5090.2024.

Reza Flores, R. A., Reza Flores, C. M., & Zamudio Palomar, A. (2025). High School Students and Artificial Intelligence : A neuroeducational perspective on literacy

and self-improvement, thinking and creativity. *Journal of Neuroeducation, 5*(2), 77–88. https://doi.org/10.1344/joned.v5i2.49030.

Salloum, S. A., Alomari, K. M., Alfaisal, A. M. et al. (2025). Emotion recognition for enhanced learning : using AI to detect students' emotions and adjust teaching methods. *Smart Learning Environments, 12*(21), 1–17. https://doi.org/10.1186/s40561-025-00374-5.

Stolpe, K., & Hallström, J. (2024). Artificial intelligence literacy for technology education. *Computers and Education Open, 6,* 1–8. https://doi.org/10.1016/j.caeo.2024.100159.

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education, 2,* 53–55. https://doi.org/10.5116/ijme.4dfb.8dfd.

Trisnawati, W., Putra, R. E., & Balti, L. (2023). The Impact of Artificial Intelligent in Education toward 21st Century Skills : A Literature Review. *PPSDP International Journal of Education, 2*(2), 501–513. https://doi.org/10.59175/pijed.v2i2.152.

UNESCO. (2023). *Informe de Seguimiento de la Educación en el Mundo 2023 : Tecnología en la educación: ¿Una herramienta en términos de quién?* Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura. https://unesdoc.unesco.org/ark:/48223/pf0000388894.

U.S. Department of Education. (2023). *Artificial intelligence and the future of teaching and learning : Insights and recommendations.* Washington, DC : U.S. Department of Education. https://www2.ed.gov/documents/ai-report/ai-report.pdf.

Vehovar, V., Toepoel, V., & Steinmetz, S. (2016) Non-Probability Sampling. In Wolf, C., Joye, D., Smith, T., & Fu, Y. C., Eds., *The SAGE Handbook of Survey Methodology,* SAGE Publications Ltd, New York, 329–345. https://doi.org/10.4135/9781473957893.n22.

Zheng, J., Lajoie, S., & Li, S. (2023). Emotions in self-regulated learning : A critical literature review and meta-analysis. *Frontiers in Psychology, 14,* 1–13. https://doi.org/10.3389/fpsyg.2023.1137010.