

## Teaching soft skills to students through artificial intelligence

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### **Abstract:**

**Background:** Artificial intelligence (AI) is revolutionizing education by promoting soft skills such as critical thinking, creativity, collaboration and problem-solving. Through personalised learning environments and interactive tools, it enhances student participation and promotes imagination and innovation. At the same time, it facilitates collaboration in digital environments, cultivating communication and responsibility skills. Its success requires ethics management, educational support and adaptation to students' needs. With proper planning, it can be a foundation for their preparation for modern challenges.

**Materials and methods:** This empirical study aims to capture the current situation in the field of Primary and Secondary Education by exploring teachers' perceptions of developing soft skills in students through the introduction and use of artificial intelligence. To our research, we applied the quantitative strategy and administered a structured anonymous e-questionnaire. The questionnaire was sent to all school units in Greece through the Directorates of Primary and Secondary Education in the country in December 2023. Data were collected via the Google Form platform and subjected to statistical processing with SPSS v 29 software. The sample of the survey was initially formed by the voluntary participation of N=1736 teachers. A specificity of our research was the fact that during the completion of the questionnaire, the first section containing the demographic data were followed by question AI: "How well do you know what AI is?". Participants who answered 'Not at all' to this question were asked not to continue completing the questionnaire. Thus, early data showed that 51% of participating teachers knew nothing about artificial intelligence, while 49% knew little, much or too much. The follow-up survey was based on participants (49%) who had declared partial or total knowledge of AI. The final sample formed was 862 participants and the processing of the data was based on this.

**Results:** The present research aimed to investigate teachers' perceptions regarding the development of soft skills in students with the use of AI in education. In the current literature, the introduction of artificial intelligence (AI) in the educational process emerges as a revolutionary development, offering new possibilities for the development of soft skills to students. These skills, such as critical thinking, creativity, collaboration, communication and problem-solving ability, are considered vital for adapting to the demands of the 21st century. AI as a powerful teaching tool may contribute to the development of these skills through personalized and dynamic learning environments, which allow students to gain hands-on experiences and develop new approaches to learning. Specific tools, such as simulations and interactive platforms, enhance critical thinking, analysis and decision-making, while promoting creativity through activities that encourage innovation and imagination. At the same time, its use enhances collaboration and communication, creating opportunities for students to collaborate in real time through common digital environments. This collaborative learning strengthens the ability to manage conflict and exchange ideas effectively. In addition, education in the safe and ethical use of AI enhances digital literacy by fostering responsibility and a critical approach to the use of technology. Its successful integration into the educational process requires careful planning, strong support from teachers and alignment with the human aspects of learning. With proper implementation, AI can significantly enhance students' preparation for the challenges and opportunities of modern times. According to the findings of this survey, participating teachers assessed the role of artificial intelligence (AI) in developing student skills with generally positive attitudes, particularly in the areas of creativity, innovation and safe use. Problem solving was also recorded as a skill with significant acceptance. However, opinions are divided on critical thinking and collaboration, indicating uncertainty about how AI can enhance these skills. Despite

*overall positive acceptance, the data highlight the need for additional guidelines and educational interventions to better understand and integrate AI into educational practices.*

**Conclusions:** *Artificial intelligence is emerging as a powerful enabler for education, expanding the possibilities for developing critical skills such as creativity, innovation, collaboration and problem-solving. While its contribution to enhancing the learning experience is recognized, there are variations in perceptions, particularly for skills such as critical thinking and social interaction. Its safe use is the most acceptable, reflecting the need for responsible integration into the educational context. It can completely transform the learning process, making it more interactive and adaptive. Its success depends on ethical management, targeted interventions and cooperation between educational and political actors, aiming at the holistic preparation of students for the demands of the modern world.*

**Key Word:** *SoftSkills, Students, ArtificialIntelligence, Learning, Teachers.*

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## I. Introduction

Artificial intelligence (AI) is one of the most important drivers of innovation and transformation in many sectors, with education being no exception. It offers personalized learning experiences through adaptive systems that analyze student performance data, tailoring content and assessments to their needs, thereby enhancing understanding and academic success<sup>5,28</sup>. In addition, interactive learning environments, such as virtual teachers to provide educational services, coaching or training from digital platforms and simulated environments, enhance critical thinking and creativity, while tools such as chatbots provide direct support and promote deeper understanding<sup>8</sup>. Automating processes, such as grading and data management, save teachers time, allowing them to focus on creative teaching<sup>7</sup>. However, the use of AI is accompanied by issues such as data protection, algorithmic bias and the digital divide, which require a strategic response to ensure a fair and inclusive learning environment<sup>23</sup>. Successfully integrating AI into education requires technological adoption combined with ethical stewardship, shaping an education model that fosters innovation and inclusion.

Soft skills, such as communication, collaboration, problem-solving, and emotional intelligence, are critical to adapting to the demands of the 21st century. In a world of rapid technological evolution, these skills enhance collaboration, flexibility, and personal growth<sup>26,33</sup>. Research suggests that skills such as leadership, adaptability, and conflict resolution contribute to students' overall success, while educational approaches that integrate collaborative projects and experiential learning support their development<sup>24,18</sup>. Five skill categories are pillars for developing innovative learners: critical thinking, problem-solving, creativity and innovation, collaboration and communication, and safe use of AI. Critical thinking, which includes analyzing information and making sound decisions, is enhanced through strategic approaches<sup>16,32</sup>. Problem solving, combining critical and creative thinking, is supported by methods such as problem-based learning (PBL)<sup>35</sup>. Creativity is enhanced through activities such as Design Jams, which promote teamwork<sup>37</sup>. Collaboration and communication, based on effective interaction, are cultivated through collaborative learning<sup>9</sup>. Finally, the safe use of AI, involving responsible use of tools and understanding of ethical issues, is a critical skill for the future<sup>29</sup>.

The integration of these skills into educational programmes, with the collaboration of teachers, parents and policy makers, creates a strong foundation for preparing students capable of meeting the challenges of the 21st century. The introduction of AI technologies into educational practices has opened new avenues for creating personalised, efficient and adaptive learning environments. It has been implemented in a variety of applications in education, such as:

- *Intelligent Tutoring Systems (ITS):* These systems provide tailored guidance to students, improving learning experience and understanding through interactive approaches<sup>8</sup>.
- *Automated Assessment:* AI makes it easier to score and analyze learning outcomes accurately, saving teachers time and enhancing transparency.
- *Personalized Learning:* AI algorithms tailor content based on each student's individual needs and abilities, promoting participation and knowledge retention.
- The advantages of AI include:
- *Increased Effectiveness:* Integrating intelligent tools for organizing and administering education, saving resources<sup>40</sup>.
- *Improved Access:* AI technologies, such as educational chatbots and remote learning platforms, provide access to education even in remote areas<sup>12</sup>.
- *Teacher Support:* Automating tasks enables teachers to focus on creative and pedagogical aspects of teaching.

Despite the benefits, the implementation of AI in education comes with challenges, such as:

- *Ethical Issues:* Data privacy concerns and bias in algorithms are critical<sup>6</sup>.
- *Teacher Adaptation:* The need to train teachers to use AI tools effectively is crucial.

AI is a catalytic tool for developing soft skills necessary for success in the 21st century. Skills such as critical thinking, creativity, collaboration and communication are now considered central to educational and professional life. AI technologies, such as intelligent teaching platforms and Design Jams, enhance participatory learning, student autonomy and complex problem solving through data analysis and decision-making. Design Jams, in particular, leverage design methodologies to promote collaborative creativity and collaboration, offering increased engagement and satisfaction to participants<sup>37</sup>. In addition, AI contributes to creativity by providing tools that enhance imagination and innovation. Researchers have shown that collaborative and creative problem-solving platforms improve students' ability to develop original ideas<sup>39</sup>. Collaboration and communication are also enhanced through tools such as chatbots and intelligent training boards, which facilitate instant feedback and collaborative work<sup>19</sup>. The use of AI tools is not limited to academic activities but extends to professional skills such as communication and collaboration in organisational environments. Skills such as emotional intelligence, conflict resolution, and working with machines emerge as critical to workgroup success<sup>22</sup>. Despite the opportunities, the introduction of AI comes with ethical challenges and privacy issues. Researchers point to the need to develop an ethical culture that promotes human-machine collaboration, beyond technical education<sup>3</sup>. Despite the challenges, continuous exploration and focus on the sustainable and ethical use of AI can lead to profound changes in the learning experience. Theoretical approaches to integrating AI into education draw on the intersection of educational technology, psychology, cognitive science and computational intelligence, while research approaches focus on applications such as intelligent teaching systems, adaptive learning environments and educational data analysis tools. An important theoretical framework that has been proposed is the "Technology-Organization-Environment" (TOE) model, which focuses on systematically investigating how organizations can integrate AI into the educational process<sup>38</sup>. Furthermore, the "Technological Pedagogical Content Knowledge" (TPACK) approach attempts to link teaching, technology and content knowledge, offering a framework for leveraging AI in the development of educational practices<sup>25</sup>. Research approaches have focused on a variety of applications, such as intelligent teaching systems and adaptive learning tools. For example, studies demonstrate the effectiveness of AI in personalizing content and improving student engagement by providing tailored solutions for different learning needs<sup>8</sup>. In addition, Learning Analytics uses data mining techniques to predict learning outcomes and provide insights into teaching effectiveness<sup>6</sup>. It is also important to focus on the social and ethical aspects of AI in education. Researchers argue for the need to develop approaches that balance technological innovation with human values, promoting systems that enhance collaboration between humans and machines, rather than replacing them<sup>14</sup>. In addition, contemporary studies examine the potential of AI to shape new forms of learning, such as participatory knowledge and location-centered learning, i.e. the educational approach that focuses on using students' immediate physical, social and cultural environment as a key source of knowledge, promoting deeper engagement and understanding of students<sup>10</sup>. At the same time, ethical management of AI, including issues such as data protection and algorithmic bias, remains critical to the successful integration of these technologies into the educational process<sup>40</sup>.

Based on this theoretical framework, a key question examined in this research study concerns teachers' perceptions in developing soft skills in students with the introduction and use of AI in teaching (Module C, area 14, 15, 16, 17, 19). Specifically, this study will outline the research findings:(a) on unit C (area 14): "Can AI applications in your opinion be positive for the development of students' critical thinking?"; b) (area 15): "Can AI applications in your opinion be positive for the development of problem-solving skills in students?", c) (area 16): "Can AI applications in your opinion be positive for promoting students' creativity and innovation?", (d) (area 17): "AI applications can in your opinion be positive for improving collaboration skills and communication of students?" and e) (area 19): "Can the applications of artificial intelligence in your opinion be positive for the development of students' skills for the safe use of artificial intelligence?".

Thus, the research objectives are formulated as follows:

- What are teachers' perceptions about the applications of artificial intelligence in developing, promoting and improving soft skills in students in the learning process?
- Is there a correlation between students' soft development skills and the use of AI?
- What are the predictors of teachers' attitudes to developing soft skills in students with the contribution of AI?
- What factors (knowledge, educational use, applications in education, ethical and ethical issues, fears, ways of dealing with any negative consequences, attitudes, support needs) from the introduction of AI in education, influence, and to what extent, teachers' perceptions of developing soft skills in students through AI in the educational process?

## II. Material And Methods

This study is an exploratory survey and aims to capture the current situation regarding artificial intelligence among primary and secondary school teachers. It was conducted using data collection through an anonymous self-report questionnaire. The questionnaire was distributed via email to all schools in the country through the Directorates of Primary and Secondary Education in Greece, in December 2023. The data collection was done with the Google Forms platform and the statistical analysis and processing was carried out with the IBM SPSS v29 statistical software package.

**Sample:** The research sample of the study included a total of 1736 teachers of Primary and Secondary Education from all over Greece, who participated voluntarily. A notable aspect of the methodology was the instruction given to participants, which asked them to refrain from completing the questionnaire if they answered "Not at all" to question A1, which concerned their level of knowledge about AI. This process revealed that 51% of teachers had no knowledge of AI, while 49% said they had little to very good understanding of the subject. After excluding the incomplete questionnaires, the final sample was limited to 862 participants, which formed the basis for further analysis of the data.

**The questionnaire:** The questions included in the survey questionnaire are part of a larger study<sup>17,41,42,43</sup>. They consist of five (5) closed-ended questions from unit C (area 14, 15, 16, 17 and 19), which concern teachers' perceptions regarding the development of soft skills in students with the introduction and use of AI in the learning process.

**Statistical analysis:** The data was processed using descriptive and inferential statistics, utilizing IBM SPSS v29 software. Frequencies and percentages were calculated, with the findings presented in the form of tables and graphs. The regularity check of variables was carried out through the Kolmogorov-Smirnov test, proving that variables follow a normal distribution ( $p > 0.05$ ). Parametric methods were applied to analyze the correlations (Pearson, Multiple Linear Regression and Factorial Analysis). In addition, factorial analysis was used to highlight the effects and contribution factors (knowledge, educational use, applications in education, ethical and ethical issues, fears of negative consequences, ways to deal with any negative consequences, teacher attitudes and support needs for the introduction of AI in education). It was carried out via the main component method, with rectangular rotation Varimax, again using the SPSS v.29 software. The factorial analysis was done for the categories of answers "Not at all-little" and "Very-Very Much".

## III. Results

Table 1 *Percentage distribution of Students' Skills using AI in Education*. The surveyed teachers assessed the role of AI in developing students' skills in various fields. Specifically:

- Development of critical thinking (55.7% not at all-little, 44.3% very-very much): Critical thinking emerges as an area where teachers' opinions are relatively divided. Despite the enhancement of critical thinking through AI, it seems that a large proportion of teachers remain sceptical.
- Problem solving (42.7% not at all-little, 57.3% very-very much): There is a positive attitude towards enhancing problem solving through AI, with over half of teachers evaluating the effect positively.
- Creativity and Innovation (41.8% Not at all-little, 58.2% Very-Very much): The promotion of creativity and innovation is highly accepted, suggesting that teachers see a strong role of AI in these skills.
- Collaboration and Communication (52.7% Not at All-Little, 47.3% Very-Very Much): Similar to critical thinking, opinions are shared here, indicating concerns about how AI affects social skills.
- Safe use of AI (32.3% not at all-little, 67.7% very-very much): The safe use of AI is recorded as the area with the greatest positive acceptance, reflecting concern about the ethical and safe integration of AI into education.

The overall acceptance of skills using AI is 54.96% (Very-Very Much) versus 45.04% (None-Little). This suggests that teachers tend to recognise the positive contribution of AI to skills development, albeit with some concerns.

The data show a generally positive attitude towards the use of AI for skills development, particularly in the areas of creativity, innovation and safe use. However, variations in skills such as critical thinking and collaboration indicate the need for additional training and guidelines.

**Table 1: Percentage distribution of Student Skills by useAI in Education**

Question C1: In which of the following areas can the applications of artificial intelligence in your opinion be positive for Education?		
Statements	Notatall-little	Very-Verymuch
14. Development of students' critical thinking	55.7	44.3
15. Develop skills in students to solve problems	42.7	57.3
16. Promoting students' creativity and innovation	41,8	58.2
17. Improve students' collaboration and communication skills	52.7	47.3
19. Develop students' skills for the safe use of artificial intelligence	32.3	67.7
OverallStudentSkills	45.04	54.96

**Correlation test of soft skills of students**

A correlation Pearson between students' soft skills (critical thinking, problem solving, creativity and innovation, collaboration and communication, safe use of AI) was checked.

Table 2 *Correlation check*. The results show significant links between critical skills. The correlation between the development of critical thinking and problem solving is high (Pearson Correlation=0.600,  $p < 0.001$ ). This shows that critical thinking is a foundation for making informed decisions and effectively addressing problems. Educational approaches that promote participatory and analytical learning can enhance both of these skills simultaneously. The correlation between creativity and other skills, such as problem-solving (0.620) and critical thinking (0.538), shows that creative processes are fueled by analytical thinking and problem-solving practices. Fostering creativity through educational tools, such as the use of AI, can lead to innovative approaches to learning. Improving collaboration and communication skills shows a moderate to high correlation with other skills, such as creativity (0.577) and problem-solving (0.565). This demonstrates the importance of collaboration for the successful implementation of creative and innovative solutions. Enhancing these skills through group activities can empower students on multiple levels. The lower correlation between the ability to use AI safely and other skills (e.g., critical thinking: 0.346, creativity: 0.442) shows that while important, the safe use of AI remains a more independent skill. This suggests the need for targeted educational programs that teach ethical and responsible use of technologies.

**Table 2:Correlationcheck**

		14	15	16	17	19
14. Development of students' critical thinking	PearsonCorrelation	1				
	Sig. (2-tailed)					
	N	862				
15. Develop skills in students to solve problems	PearsonCorrelation	.600**	1			
	Sig. (2-tailed)	<.001				
	N	862	862			
16. Promotion of creativity and innovation of students.	PearsonCorrelation	.538**	.620**	1		
	Sig. (2-tailed)	<.001	<.001			
	N	862	862	862		
17. Improving students' collaboration and communication skills	PearsonCorrelation	.520**	.565**	.577**	1	
	Sig. (2-tailed)	<.001	<.001	<.001		
	N	862	862	862	862	
19. Develop students' skills for the safe use of artificialintelligence	PearsonCorrelation	.346**	.418**	.442**	.445**	1
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	
	N	862	862	862	862	862

\*\* Correlation is significant at the 0.01 level (2-tailed)

**Factor prediction model for soft skills and artificial intelligence**

Table 3 *Entered Variables*. To create a predictive model of the independent variables related to AI and education in relation to the dependent variable (Soft skills of students using AI), Stepwise Multiple Regression identified 21 variables. With the inclusion of these 21 variables, the final model was formed, where R Square=0.626, predicting 62.6% of the total variation in the development of soft skills of students with AI. The contribution of individual independent variables, except for Augmented Learning Applications, is consistently minimal. In addition, model validation using ANOVA demonstrates statistical significance ( $p < 0.05$ ) for all 21 variables. The equation of the regression model resulting from the final step of the 21st model is:

$$Y=b_0+b_1x_1+b_2x_2+b_3x_3+...+b_{21}x_{21}$$

**Table 3: Entered Variables<sup>a</sup>**

Model	Variables Entered	Method
1	A6. ChatGPT can make decisions	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	B2. Can AI track a student's individual progress?	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
3	B3. Can AI support teachers in remedial teaching?	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
4	B10. Can AI support collaborative learning with student-machine communication?	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
5	B11. Can virtual reality with the use of artificial intelligence support the learning process?	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
6	C1_2. Automatic Teaching Scheduling Applications	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
7	C1_3. Machine Learning Applications	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
8	C1_5. Applications Smart Education Systems	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
9	C1_7. Applications for the Promotion of Student Inclusion	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
10	C1_11. Applications to assist teachers and free them from large volumes of work	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
11	C1_13. Student literacy development applications	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
12	C1_18. Applications for adapting the learning process to the specific needs of each student	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
13	C1_21. Applications to assist education executives in data analysis and decision making	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
14	D2. There is an ethical question of students' autonomy	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
15	D3. There is an ethical issue regarding the development of students' critical thinking	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
16	D4. There is a moral issue of discrimination against pupils on an ethnic or social basis	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
17	Q1. Is there a fear of negative effects on students' critical thinking?	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
18	Q4. There is a fear of the total development of students with a focus on science and the abandonment of humanities	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
19	Q6. Is there a fear of a reduction in students' autonomy?	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
20	Q9_3. Addressing negative characteristics of AI by training teachers in the use of artificial intelligence	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
21	Q9_5. Addressing negative characteristics of AI by banning AI in Education	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: Students skills

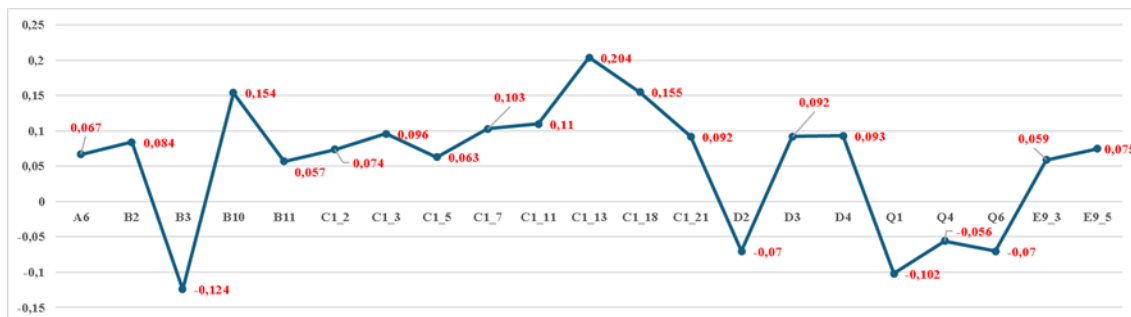
Table 4 Standardized Beta Values of Independent Variables. Figure 1. Standardized Beta Values of Independent Variables. According to the standardized Beta Values of the independent variables in the model that examines the correlation of different factors with the dependent variable "Student skills", positive effects are recorded with applications related to student literacy development (b=0.204), adaptation of the learning process to the needs of each student (b=0.155) and assistance of teachers reducing workload (b=0.110) show higher positive correlations with skills development. Also, supporting collaborative learning through student-machine communication (b=0.154) highlights the contribution of technology to enhancing interpersonal skills. However, concerns about reduced critical thinking (b=-0.102) or students' autonomy (b=-0.070) record a negative correlation, highlighting potential ethical issues from the use of AI. Moreover, the fear of limiting overall growth with an emphasis on science (b=-0.056) remains of little effect, suggesting that it is not a main obstacle. In addition, automatic teaching scheduling (b=0.074) and machine learning (b=0.096) applications enhance students' skills, albeit with a moderately positive effect. Finally, discrimination based on social or

ethnic origin (b=0.093) and ethical issues for the development of critical thinking (b=0.092) are concerns that deserve attention.

**Table 4:** Standardized Beta Values of Independent Variables

Model	IndependentVariable	BetaValue
A6	ChatGPTcanmakedeisions	.067
B2	Can AI track a student's individual progress?	.084
B3	Artificial intelligence can support the teacher in remedial teaching	-.124
B10	Can AI support collaborative learning with student-machine communication?	.154
B11	Can virtual reality with the use of artificial intelligence support the learning process?	.057
C1_2	AutomaticTeachingSchedulingApplications	.074
C1_3	MachineLearningApplications	.096
C1_5	Smart Education Systems Applications	.063
C1_7	Applications for the Promotion of Student Inclusion	.103
C1_11	Applications to assist teachers and free them from large volumes of work	.110
C1_13	Studentliteracydevelopmentapplications	.204
C1_18	Applications for adapting the learning process to the specific needs of each student	.155
C1_21	Applications to assist education executives in data analysis and decision making	.092
D2	There is an ethical question of students' autonomy	-.070
D3	There is an ethical issue regarding the development of students' critical thinking	.092
D4	There is a moral issue of discrimination against pupils on an ethnic or social basis	.093
Q1	There is a fear of negative consequences on students' critical thinking	-.102
Q4	There is a fear of the total development of students with a focus on science and the abandonment of humanities	-.056
Q6	Is there a fear of a reduction in students' autonomy?	-.070
E9_3	Addressing negative characteristics of AI by training teachers in the use of artificial intelligence	.059
E9_5	Addressing negative characteristics of AI by banning AI in Education	.075

*a. Dependent Variable: Students skills*



**Figure 1:** Standardized Beta Values of Independent Variables

**Contribution and influence of factors for soft skills and artificial intelligence**

Table 5 *Factor loads*. Figure 2 *Factor loads*. Factor loads in the category ("Not at all-little") reflect a limited impact of AI, indicating either a lack of acceptance or a limited role in learning processes. Specifically, decisions via ChatGPT (0.88), It highlights a concern that AI's decision-making autonomy may not yet be acceptable or functional in educational practice. Individual Progress Monitoring (0.746), despite the possibility of monitoring, it seems that students and teachers do not sufficiently recognise the contribution of AI in this area. Teacher support (0.724) with the contribution of AI to remedial teaching is estimated to be less important, possibly due to limited tools or applications. In Ethical Issues (0.835 - Critical Thinking, 0.802 - Autonomy), concerns are raised about declining autonomy and critical thinking is highly loaded, showing strong reservations. Addressing Negative Impacts through Teacher Training (0.545) is highlighted as a key factor in addressing AI-related problems. The factors in the category (Very-Very much) show increased acceptance and greater recognition of the positive role of AI in learning processes. Personalization of Learning (0.74 - Adapting to student needs), is recognized as one of the most important factors in enhancing student skills. Development Applications (0.826 - Didactic Inclusion), show a strong positive impact, indicating the role of AI in equitable access and learning support. For Ethical and Social Challenges (0.845 - Critical Thinking), although critical thinking is highly charged here as well, the "Very-Very Much" category suggests that some accept AI as a tool that can enhance these skills under certain conditions. In Teacher Support (0.695 - Workload Reduction), there is a positive recognition of the role of AI in relieving teachers of administrative responsibilities. Benchmarking demonstrates:

-Positive Impact: Very-Very much factors focus on personalized applications and adjustments that maximize learning benefits. In contrast, the "Not at all-little" category shows limited recognition, mainly due to a lack of confidence in AI's capabilities.

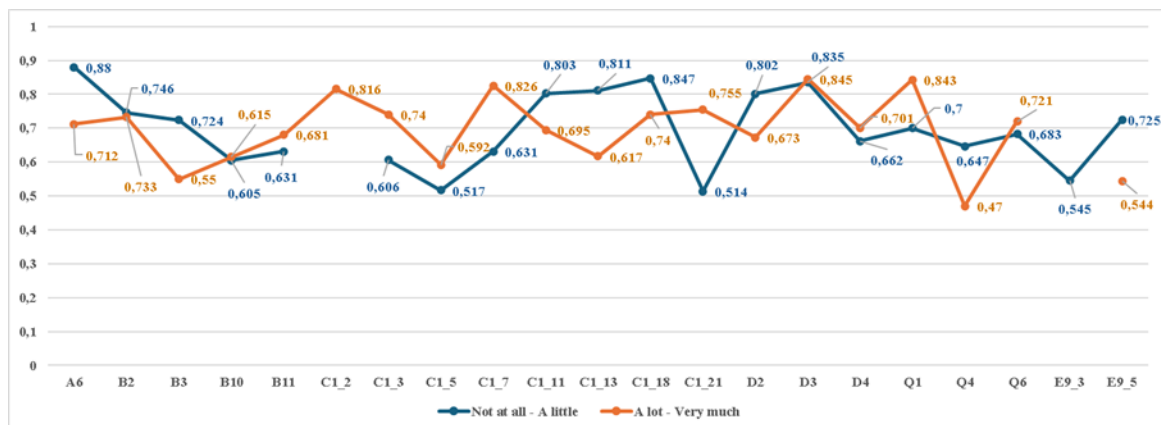
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Ethical Perceptions: In both categories, ethical concerns remain dominant, but the "Very-Very Much" category indicates increased acceptance if managed appropriately.

Collaboration Support: In the "Very-Very Much" category, apps that support collaboration and inclusion are more charged, while in the "Very-Very Little" category, technical inefficiencies and ethical dilemmas are emphasized.

**Table 5: Factorloads**

	Factors	Not at all - A little	A lot - Verymuch
A6	ChatGPTcanmakedeisions	0.88	0.712
B2	Can AI track a student's individual progress?	0.746	0.733
B3	Can AI support teachers in remedial teaching?	0.724	0.55
B10	Can AI support collaborative learning with student-machine communication?	0.605	0.615
B11	Can virtual reality with the use of artificial intelligence support the learning process?	0.631	0.681
C1_2	AutomaticTeachingSchedulingApplications	-	0.816
C1_3	MachineLearningApplications	0.606	0.74
C1_5	Smart Education Systems Applications	0.517	0.592
C1_7	Applications for the Promotion of Student Inclusion	0.631	0.826
C1_11	Applications to assist teachers and free them from large volumes of work	0.803	0.695
C1_13	Studentliteracydevelopmentapplications	0.811	0.617
C1_18	Applications for adapting the learning process to the specific needs of each student	0.847	0.74
C1_21	Applications to assist education executives in data analysis and decision making	0.514	0.755
D 2	There is an ethical question of students' autonomy	0.802	0.673
D 3	There is an ethical issue regarding the development of students' critical thinking	0.835	0.845
D 4	There is a moral issue of discrimination against pupils on an ethnic or social basis	0.662	0.701
E 1	There is a fear of negative consequences on students' critical thinking	0.7	0.843
Q 4	There is a fear of the total development of students with a focus on science and the abandonment of humanities	0.647	0.47
Q 6	Is there a fear of a reduction in students' autonomy?	0.683	0.721
E9_3	Addressing negative characteristics of AI by training teachers in the use of artificial intelligence	0.545	-
E9_5	Addressing negative characteristics of AI by banning AI in Education	0.725	0.544



**Figure 2: Factor loads**

**IV. Discussion**

Regarding the development of students' skills using AI, the participating teachers consider that AI appears as a powerful tool to improve education, but their perceptions of its effectiveness vary depending on the field of application. In the development of critical thinking, 55.7% of teachers consider the contribution to be minimal to little, while 44.3% attribute a very important role to critical thinking. This ambiguity may be due to their concerns because of its ability to cultivate autonomous thinking, a trait traditionally considered a human trait<sup>31</sup>. Teachers, on the other hand, recognize its role in problem solving more strongly, with 57.3% believing



that these technologies can effectively enhance their analysis and solution application skills. This assessment is consistent with research demonstrating the contribution of applications, such as simulations and interactive tools, to critical skills<sup>20</sup>. Also, the promotion of creativity and innovation through AI is significantly recognized, with 58.2% of teachers considering its contribution positive. The result is consistent with findings highlighting the potential of AI technologies to facilitate creative and original activities, such as producing innovative content through algorithms<sup>15</sup>. In the area of collaboration and communication, opinions are more skeptical, with 47.3% of teachers attributing a positive effect of AI. The finding reflects the challenges identified in its use to develop social skills, and enhance human interaction. Similarly, the need for more human-centered approaches to fill the gap is highlighted<sup>6</sup>. The safe use of AI is the area with the highest positive acceptance (67.7%). Teachers express a positive attitude to its ability to contribute to the development of digital literacy skills, while highlighting the need to teach ethical and safety principles in the use of technology. At the same time, the importance of its responsible integration into education is emphasized<sup>8</sup>. Overall, 54.96% of teachers are positively disposed towards the use of AI in education. Despite the general acceptance, there are variations depending on the sector, with the greatest reservations being found in the development of critical thinking and collaboration skills. Researchers suggest targeted interventions and investments in appropriate tools and training to bridge similar gaps<sup>5</sup>. AI can be a crucial means of enhancing high value-added skills, such as creativity and the safe use of technology, if its integration is carefully planned. Balancing technology with the human aspects of the educational process is essential to realize its full potential.

Regarding the correlations between critical skills, the need for holistic and innovative educational strategies is highlighted. In particular, the development of critical thinking, creativity, collaboration, and the safe use of AI technology shows a clear correlation with problem-solving ability, revealing the multidimensional nature of learning in the modern educational environment. Critical thinking is the cornerstone for making informed decisions and solving problems effectively. The high correlation between these skills ( $r=0.600$ ) confirms their strong interdependence. Modern educational approaches, such as participatory and analytical learning, can enhance the parallel development of these skills, facilitating the preparation of students for complex challenges. Creativity also shows a strong correlation with critical thinking ( $r=0.538$ ) and problem-solving ( $r=0.620$ ), indicating that creative expression is enriched by analytical thinking and practical skills. Integrating tools such as AI into the educational process can promote innovative approaches, enhancing the development of these skills and fostering creativity as a driver of innovation. Collaboration and communication skills show a moderate to high correlation with creativity ( $r=0.577$ ) and problem-solving ( $r=0.565$ ). This connection highlights the importance of collaborative work to effectively implement creative and innovative solutions. Promoting these skills through group activities and experiential learning can enhance learning experiences and social cohesion. The safe use of AI shows a lower correlation with other skills, such as critical thinking ( $r = 0.346$ ) and creativity ( $r = 0.442$ ), suggesting the independent nature of this skill. Similar are the findings and theoretical approaches of scholars among the basic skills required for modern education. Critical thinking and problem-solving are highly correlated, confirming that analytical thinking in teachers' perception supports addressing complex issues<sup>8</sup>. Furthermore, creativity is closely correlated with critical thinking and problem-solving, reinforcing the need for learning environments that promote imagination and innovation<sup>40</sup>. Collaboration and communication are linked by teachers to other skills, highlighting their critical role in collaborative learning and implementing innovative solutions. This connection makes it clear that cultivating these skills is essential for students' success in group activities<sup>38</sup>. In contrast, safe use of AI shows a lower correlation with other skills, which highlights the need for targeted training in the use of technologies with an emphasis on ethical and responsible use<sup>10</sup>.

Regarding the factors that can predict the attitude and perceptions of teachers in the contribution of AI to the development of soft skills in students, it appears that factors related to the applications of AI, ethical issues, fears and reservations and support needs in its use (R Square = 0.626), can predict 62.6% of the total variation, teachers' attitudes and perceptions. Of course, there is a trend without the possibility of generalizing the results universally. Specifically, the findings highlight the strong positive impact of applications related to literacy development ( $b=0.204$ ), adaptation of learning to students' needs ( $b=0.155$ ), and reduction of teachers' workload ( $b=0.110$ ). At the same time, the enhancement of collaborative learning ( $b=0.154$ ) and the use of machine learning ( $b=0.096$ ) are supported. However, negative correlations are recognized, such as the potential decline in autonomy ( $b=-0.070$ ) and critical thinking ( $b=-0.102$ ), as well as the need to address ethical and social issues such as discrimination ( $b=0.093$ ) and limited development of humanistic skills ( $b=-0.056$ ). Overall, the data highlights the potentially positive contribution of AI to the learning process, while requiring careful management of ethical and practical challenges. These findings are consistent with studies showing that AI can significantly contribute to improving the learning process by offering personalized learning, support in collaborative education, and automation of administrative functions. In particular, they highlight the effectiveness of tools that personalize content and offer instant feedback, improving student performance and saving teachers time<sup>11</sup>. The use of AI in education facilitates the development of skills such as critical thinking and creativity, while helping to solve social problems by adapting teaching to students' needs<sup>34</sup>. However, over-

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reliance on technology can limit autonomy and the development of "resilient skills" such as adaptability and collaboration<sup>13</sup>. It also emphasizes the need to address ethical issues, such as algorithm bias and privacy in order to ensure fair access to education<sup>4</sup>.

Regarding the resulting factorial model, the factors shown in the "Not at all-little" category reflect a limited role of AI in the learning process, reflecting either a lack of acceptance or a reduced recognition of its practical value. Indicatively, AI's autonomy in decision-making through tools such as ChatGPT (load 0.88) often raises concerns about its practical application, possibly due to a lack of confidence in the accuracy and functionality of these systems. Correspondingly, the use of AI to monitor students' individual progress (load 0.746) seems not to be widely recognised as a meaningful contribution, possibly due to limited tools or lack of relevant user training. AI support to teachers, for example, in remedial teaching (load 0.724), also remains at low levels of acceptance, which may reflect an inability to integrate such tools into everyday educational work. In addition, ethical issues, such as student autonomy (load 0.802) and the development of critical thinking (load 0.835), highlight strong reservations, pointing to fears that AI may limit basic skills rather than enhance them. Finally, the need for teacher training (load 0.545) is highlighted as a critical factor for better integration of AI, indicating the need for training in more advanced and adaptive systems. In contrast, factors in the "Very-Very Much" category demonstrate a clear recognition of the positive impact of AI. Indicatively, personalized learning applications that are tailored to the specific needs of each student (load 0.74) are considered among the most critical factors for improving learning skills. Also, applications that promote didactic inclusion (load 0.826) and equitable access to learning opportunities are highlighted as central to educational practice. Even critical thinking, despite presenting ethical challenges (load 0.845), is thought to be able to be enhanced by AI under appropriate conditions. The support AI offers teachers, such as reducing workload (load 0.695), is recognised as important, contributing to efficiency and time management. By comparison, factors in the "Not at all-Little" category focus more on concerns about the applicability and ethical implications of AI, while the "Very-Very Much" category highlights practical applications and possibilities to enhance the educational process through personalization and collaboration. Ultimately, while the positive impact of AI is more recognised in adaptive applications and personalised learning, it remains crucial to manage ethical and societal challenges, as well as invest in educational training and retraining, to ensure widespread acceptance and successful integration of AI into the educational process. According to scholars, AI offers the possibility of personalized learning experiences through adaptive systems and intelligent educational teaching platforms. Data shows that personalization boosts student engagement and performance<sup>15</sup>. It can automate administrative tasks, allowing teachers to focus more on teaching and personal interaction with students<sup>1</sup>. Through the use of data analytics, AI can identify learning gaps and adapt content accordingly, contributing to the overall improvement of the quality of education<sup>21</sup>. But the use of AI brings to the fore issues such as transparency, fairness and data protection for students. In particular, AI systems can incorporate biases derived from their education data<sup>30</sup>. Access to AI is not equal for all students, which can widen educational gaps<sup>36</sup>. Over-reliance on AI can reduce the autonomy of both students and teachers, reinforcing their reliance on technological solutions<sup>2</sup>.

## **V. Conclusion**

The teachers of the research sample recognize artificial intelligence as a powerful tool that is recognized as a catalyst for the transformation of education, enhancing both learning processes and educational methods. Teachers appreciate its contribution to the development of skills such as creativity, innovation, problem-solving and safe use of technology, while expressing reservations about its effectiveness in promoting social and autonomous skills, such as critical thinking and collaboration. Despite differences in perceptions, AI is emerging as a powerful tool for personalized learning, data analysis and creativity, offering significant opportunities to enhance the learning experience. The introduction of AI creates efficient and adaptive learning environments that meet the individual needs of each learner, promoting innovation, inclusion and sustainability. However, its successful integration requires strong ethical governance, ensuring fairness and privacy, as well as participatory educational approaches that foster collaboration between teachers, parents and policy makers. Developing soft skills, such as critical thinking, communication and problem-solving, is seen as crucial to preparing students to face the challenges of the 21st century. AI is not limited to providing solutions but has the potential to completely transform the learning process, making it more interactive and sustainable. Its success requires aligning technological innovation with human-centered values and creating a framework that enhances students' adaptability, creativity and social responsibility. With appropriate strategies and partnerships, AI can form the basis for an education system that prepares the next generation for the challenges of the future.

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