ATRAS Volume 5 (Special Issue on AI and Education, Online Learning and Education), pp. 303-320 30/09/ 2024 | ISSN: 2710-8759/ EISSN: 2992-1376

Is Artificial Intelligence Making Us Smarter or Dumber? A Comprehensive Look at the Impact of AI on 21st Century Skills in Education

Meriem OTHMANE[1]
[1]University Center Barika, Algeria

Received: 25 / 07 / 2024 **Accepted**: 16 / 08 / 2024 **Published**: 30 / 09 / 2024

Abstract

The study investigates the impact of artificial intelligence on the 21st-century skills of teachers and learners in higher education during the rapid shift towards online and blended learning models accelerated by the COVID-19 pandemic. The paper aims to guide the development of better frameworks and strategies to help teachers successfully navigate this new AI-hastened world of higher education. Using an online questionnaire, the study surveyed 30 higher education teachers from several universities in Algeria (Biskra, Tebessa, Chlef, Khenchela, Tiaret, Skikda, Batna, Relizane, Bechar, Mascara, and Constantine). The findings reveal a concerning trend: most teachers believe AI harms the development of essential 21st-century skills in their students, including collaboration, communication, and critical thinking. The study also found that many lack the required digital skills and feel uncomfortable implementing AI tools in their classrooms.

Keywords: AI skills, digital skills, online learning, teacher resistance, and twenty-first-century skills

الملخص

خلال التحول السريع نحو نماذج التعلم عبر الإنترنت والمختلط، الذي تسارع بفعل جائحة كوفيد-19. تهدف الورقة إلى توجيه تطوير أطر واستراتيجيات أفضل لمساعدة المعلمين على التنقل بنجاح في هذا العالم الجديد المعجل بالذكاء الاصطناعي في التعليم العالي. من خلال استخدام استبيان عبر الإنترنت، قامت الدراسة بمسح 30 معلمًا في التعليم العالي من عدة جامعات في الجزائر (بسكرة، تبسة، الشلف، خنشلة، تيارت، سكيكدة، باتنة، غليزان، بشار، معسكر، وقسنطينة). تكشف النتائج عن اتجاه مقلق: حيث يعتقد معظم المعلمين أن الذكاء الاصطناعي يضر بتطوير المهارات الأساسية للقرن الواحد والعشرين لدى طلابهم، بما في ذلك التعاون، والتواصل، والتفكير النقدي. كما وجدت الدراسة أن العديد منهم يفتقرون إلى المهارات الرقمية المطلوبة ويشعرون بعدم الارتياح في تنفيذ أدوات الذكاء الاصطناعي في فصولهم الدراسية.

الكلمات المفتاحية: مهارات الذكاء الاصطناعي، المهارات الرقمية، التعلم عبر الإنترنت، مقاومة المعلمين، ومهارات القرن الواحد والعشرين.

Email:[1] meriem.othmane@cu-barika.dz

Introduction

In today's rapidly evolving world, a degree alone is no longer enough. With rapid technological advancement, job seekers must continually cultivate new skills to stay competitive. This is especially true in Algeria, where the education system must adapt to prepare learners for 21st-century challenges and opportunities. Artificial Intelligence (AI) has rapidly permeated education, presenting exciting possibilities and ethical dilemmas. While some educators resist, millennials have embraced the opportunities of AI-enabled Intelligent Education (AIED) technologies. These digital-native teachers recognize AI's streamlining potential, but the impact on student development remains critical.

As we move towards a technology-driven future, equipping students with 21st-century skills (6C: culture, connectivity, critical thinking, creativity, collaboration, and communication) is paramount. AIED raises questions about balancing innovation and preserving the humanistic aspects of education. Navigating this uncharted territory requires a nuanced understanding of how AIED can support or hinder essential competencies. This calls for embracing transformative potential while safeguarding ethical learning. The COVID-19 crisis has accelerated the shift to online learning, presenting challenges and opportunities for teaching innovation. To leverage this, teachers must adapt and acquire digital skills to effectively use AI and create modern, effective learning environments. This paper will focus on the digital competencies teachers need to master this technology and ensure student success in the new era of education.

Unfortunately, the current educational framework exhibits deficiencies. The one-size-fits-all approach is no longer effective in the era of AI and has never been effective before. The main issue examined in this study is the need to address the gap between traditional education frameworks and the ever-evolving demands of the 21st century. A key limitation of this study is the lack of existing research on how AI impacts the development of 21st-century skills in Algerian universities. This research contributes new insights into an unexplored area in the Algerian educational setting. The overarching aim of this study is to investigate and analyze the impact of artificial intelligence integration on the development and improvement of 21st-century skills among learners in educational settings.

The primary research objectives of this study are to investigate:

- The importance of integrating 21st-century skills into the Algerian education system on time.
- The impact of AI on the 21st-century skills of both teachers and learners.
- The deficiencies of the current Algerian educational system, such as the overreliance on rote learning.
- The transformative potential of AI in education is to better prepare students and teachers for the forthcoming age of automation and digitization.

There is a need for teachers to develop strong digital competencies. The significance of this study lies in its potential to shed light on the role of artificial intelligence in developing the critical competencies required for success in the 21st century. As AI continues to be integrated into educational settings, it is time to evaluate its impact on cultivating skills like communication, collaboration, creativity, and critical thinking among teachers and students. Accordingly, the central research question guiding this investigation is: how does the integration of artificial intelligence impact the development and enhancement of 21st-century

skills among learners? Building on the existing literature, the research hypothesis posits that introducing artificial intelligence into the educational framework will hinder rather than enhance learners' development of 21st-century skills.

Literature Review

Rapid technological advancements are set to drastically transform the workplace and society, particularly artificial intelligence and related fields like robotics, the Internet of things, and quantum computing, are set to transform the workplace and society as we know it. To adapt to these changing dynamics and prepare individuals for a knowledge-based society, the current educational system needs to equip learners with diverse skills, collectively known as 21st-century skills. These skills emphasize collaboration, digital literacy, civic participation, communication, creativity, problem-solving, critical thinking, and productivity.

Understanding the True Meaning of 21st-Century Skills

The world we live in today looks vastly different from even a couple of decades ago. Rapid technological advancements, global connectivity, and evolving workforce demands have fundamentally shifted the skills needed to succeed. According to the National Research Council (2012), these essential "21st-century skills" fall into three key domains: cognitive, intrapersonal, and interpersonal. The cognitive domain involves higher-order thinking abilities like problem-solving, critical reasoning, and adaptable learning. The intrapersonal domain encompasses self-awareness, emotional regulation, and a growth mindset. And the interpersonal domain centers on effective communication, collaboration, and social-emotional intelligence (National Research Council, 2012). According to the "21st-century Skill Handbook" published by the Central Board of Secondary Education in 2024, 21st-century skills are the key competencies that are crucial for individuals to succeed in the modern, globally connected, and rapidly evolving world (Central Board of Secondary Education, 2024).

The main components of 21st-century skills are categorized as the "3Ls": literacy, learning, and life skills. It further elaborates on the "4Cs" (critical thinking, creativity, collaboration, and communication), IMT (information, media, and technology), and FLIPS (flexibility, leadership, initiative, productivity, and social skills) (Central Board of Secondary Education, 2024). These skills are important for several reasons. Firstly, they enable holistic learning and development, empowering students to become responsible citizens and human beings aware of their potential. Secondly, 21st-century skills go beyond just teaching to the test, equipping individuals with the needed competencies to navigate real-life situations and challenges. Thirdly, these skills are especially crucial for students with special needs, facilitating their independence and integration within home, school, and community environments (Central Board of Secondary Education, 2024).

The rapid pace of economic and social change demands that schools prepare students for jobs and technologies that do not yet exist and equip them with the skills to adapt and contribute to an evolving world (Central Board of Secondary Education, 2024). Thus, 21st-century skills are essential in empowering individuals to thrive in the complex, interconnected, and dynamic landscape of the 21st century. So, how are 21st-century skills interrelated? 21st-century skills are interlinked and interdependent. For instance, problem-solving requires critical thinking and creativity, while communication skills, such as public speaking and negotiation, are vital for working successfully in teams. Additionally, being digitally literate and proficient in cybersecurity and data analysis is crucial. These skills support and enhance each other, helping individuals develop a well-rounded and versatile skill set that prepares them for success

in the 21st century.

The Cornerstone of Thriving in Today's World

These 21st-century skills have profound implications across all spheres of life. They empower students to excel academically and develop into well-rounded, adaptable learners. They enable employees to navigate rapid change, work cohesively in teams, and add unique value. And in our personal lives and civic engagement, these skills foster stronger relationships, healthier communities, and more meaningful contributions. As the National Research Council underscored (2012), equipping today's students with 21st-century skills is not just important; it's essential. Our education systems must evolve to intentionally cultivate these vital capabilities, empowering the next generation to thrive in an increasingly complex world.

Artificial Intelligence's Visionary Path to a Remarkable Tomorrow

AI is reshaping education by reducing teachers' workload by automating non-teaching-related tasks, enhancing data analysis, and optimizing online teaching (Kexin et al., 2020). AI-driven tools have become more teacher-focused and help teachers identify effective pedagogies based on students' learning data, automate operational tasks, generate assessments, and automate grading and feedback, which greatly saves teachers' time and enhances efficiencies (Chaudhry et al., 2022). Furthermore, AI technology can effectively promote students' personalized learning (Ahmad et al., 2022), advance their knowledge acquisition, and motivate students' learning using intelligent agents (Chen et al., 2020a, 2020b; Hwang et al., 2020). AI technologies provide students with learning opportunities that facilitate teachers and students with interactive, personalized, and just-in-time feedback (Dizon, 2017).

Artificial Intelligence at the Crossroads

The COVID-19 pandemic has catalyzed a significant shift to online/blended teaching and learning, where teachers have incorporated new technologies in their classrooms (Ng et al., 2023). Among these, artificial intelligence in education technology (AIED) has gained popularity during the pandemic. Studies have discussed how AI can reshape education to reduce teachers' workload by automating non-teaching tasks, enhancing data analysis, and optimizing online teaching (Ng et al., 2023). However, many of these AI tools are new to teachers, who may lack the technical knowledge to use AI educational applications effectively (Ng et al., 2023). Challenges such as AI-based misunderstanding, misleadingness, limitations, and hidden ethical issues behind different platforms have been identified (Ng et al., 2023).

Teachers must equip themselves with adequate digital competencies to use and teach AI in their teaching environments (Ng et al., 2023). Existing frameworks, such as the DigCompEdu framework and P21's framework for twenty-first-century learning, can be adapted and revised to accommodate AI technologies (Ng et al., 2023). Recommendations are proposed to support educators and researchers in promoting AI education in their classrooms and academia (Ng et al., 2023).Towards Artificial Intelligence Ready teachers and learners

Developing Digital Competency and Literacy

In today's AI-driven world, educators must ensure students develop well-rounded AI literacy, from technical understanding to ethical considerations. Otherwise, students risk being passive AI users rather than empowered, responsible citizens. Educators are vital in equipping the next generation with the knowledge and skills to leverage AI effectively and ethically. According to Ng et al., AI literacy is one of the most important concepts of our time and consists of several elements. People should know how AI functions, including its fundamental capabilities and limitations. Secondly, they should apply this knowledge and be able to use

applications that operate based on AI. Thirdly, they should assess available AI applications and their consequences; in other words, be critical. Finally, AI literacy requires being conscious of the ethical issues regarding AI, such as privacy, fairness, and transparency.

Xu (2020) proposed that developing AI digital competency is important for educators. Teachers who know how to use AI may replace the teachers who do not know how because AI can empower teachers and promote their role transformation, which greatly improves the efficiency of management and the level of decision-making (Ng et al., 2022b; Vazhayil et al., 2019). Markauskaite et al. (2022) suggested that educators must integrate new digital technologies, support learning to meet educational standards through digital technologies and engage in professional learning to build competencies and gain experience using AI-enabled tools. Moreover, they should learn how to use appropriate AI-driven technologies, such as adaptive learning systems and intelligent agents, to facilitate their daily teaching management and practices with different parties (e.g., parents and colleagues).In addition to enhancing personalized learning to understand students' learning progress and needs, conduct various tasks such as offering automatic feedback, self-diagnosing, and promoting online collaboration among learners (Cavalcanti et al., 2021). On top of using AIED technologies, they also need to update their pedagogical and content knowledge on AI and learn how to develop suitable pedagogies (e.g., collaborative learning, problem-based learning) and digital resources and learning materials.

Navigating the Exciting New World of Artificial Intelligence in Education

A recent study by Trisnawati and a team (2023) looked at how artificial intelligence (AI) is transforming education. On the plus side, they found that AI is helping foster key 21st-century skills in students. Things like personalized learning, enhanced interactivity, and smarter feedback are just a few ways AI is changing classrooms.

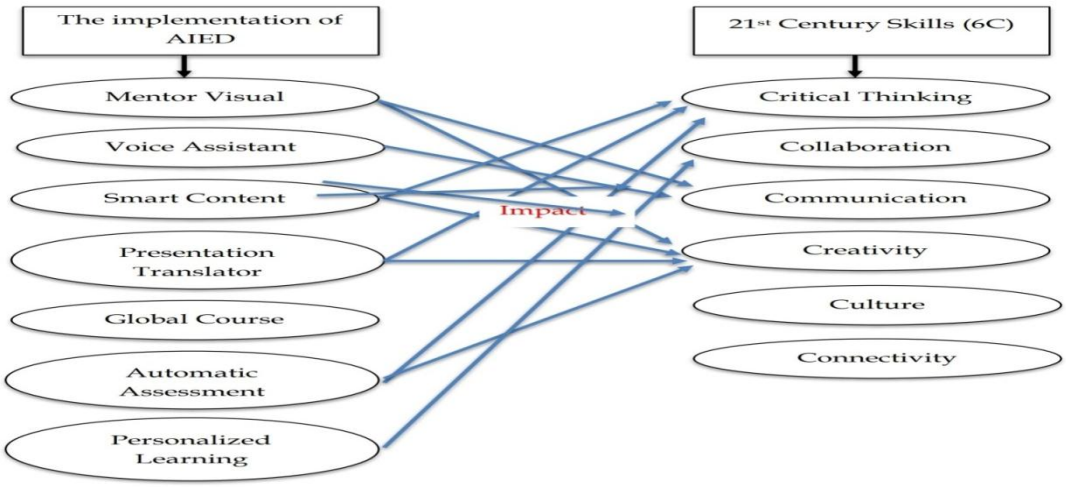

Figure 1. AIED impacts 21st-century skills (adopted from Trisnawati et al., 2023, p. 508)

But researchers also sounded a note of caution. They warn that over-reliance on AI could create a culture of over-automation and intellectual laziness. There are also concerns about data vulnerabilities and the limitations of AI compared to human intelligence. The takeaway is one of tempered optimism. AI can improve education, but we have to approach it thoughtfully. By

focusing on building students' critical thinking, collaboration, and other essential skills, we can harness the power of AI while avoiding the pitfalls. It is an exciting new frontier, but one that requires careful navigation. With the right approach, the benefits of AI in education can be truly radical.

Empowering Students for the Future with Artificial Intelligence-Driven Learning

As the 21st century unfolds, the educational landscape faces a pivotal crossroads. Emerging research suggests that the strategic integration of AI in education could be a transformative solution to equipping students with the skills and mindset needed to thrive (Sain, 2024). By harnessing AI-enabled education (AIEd), students can cultivate innovative thinking, disciplined reasoning, and collaborative problem-solving competencies as automation and digitization advance. However, the current educational paradigm, rooted in 19th- and 20th-century practices, fails to prepare learners for the impending changes. A paradigm shift is necessary to empower students for the future (Sain, 2024).

Methods and Materials

The study at hand utilized a mixed-methods approach, combining a questionnaire-based survey with quantitative and qualitative data analysis techniques to explore the impact of AI integration on 21st-century skills development from the perspective of Algerian university teachers. The current research aimed to determine university teachers' perceptions in Algeria regarding the impact of integrating artificial intelligence on 21st-century skills among students. To this end, we employed a questionnaire-based approach.

Participants

The study employed a purposive sampling approach, where the researchers invited 30 Algerian university teachers from various cities (Biskra, Tebessa, Chlef, Khenchela, Tiaret, Skikda, Batna, Relizane, Bechar, Mascara, and Constantine) during the 2014 academic year. The participants included university teachers with different academic ranks, such as MCB (Maître de Conférences B), MCA (Maître de Conférences A), and professors, with varying levels of experience: some were novice teachers, while others had more than ten years of teaching experience.

Research Instruments

As an instrument, we employed a comprehensive survey questionnaire designed to examine the multifaceted impact of artificial intelligence (AI) on developing 21st-century skills. The questionnaire consists of several key sections covering critical thinking, problem-solving, communication, collaboration, creativity, digital literacy, adaptability, cultural awareness, social-emotional intelligence, and ethical awareness. The survey examines both the potential positive and adverse impacts of AI on 21st-century skills and captures any neutral effects, to provide a holistic understanding of how faculty perceive the role of AI in shaping learners' essential abilities in the modern era.

Data Collection

Participants could complete the questionnaire online or in a paper-based format, according to their preference.

Data Analysis

We analyzed the quantitative data using descriptive and inferential statistics to identify patterns and relationships. The qualitative responses were subjected to thematic analysis to gain deeper insights into teachers' perspectives and the contextual factors shaping AI integration in Algerian higher education. By directly engaging university teachers in Algeria, this study aimed

to provide valuable insights into the issues and opportunities surrounding the integration of AI and its influence on developing crucial 21st-century skills among students.

Results

The data collected through this questionnaire highlights the complex perspectives held by university teachers regarding the influence of AI technologies on the cultivation of learners' vital skills for success in the modern world.

Critical Thinking

The data presented in Table One and Figure Two capture university teachers' perceptions of how AI impacts the development of critical thinking skills among students.

Table 1. *Teachers' perceptions of the impact of AI on learners' critical thinking*

Positive Impacts:
- More access to information and resources (16.7%)
- Personalized learning experiences (10%)
Negative Impacts:
- Overreliance on technology for problem-solving (26.7%)
- Inability to think creatively and independently (46.7%)

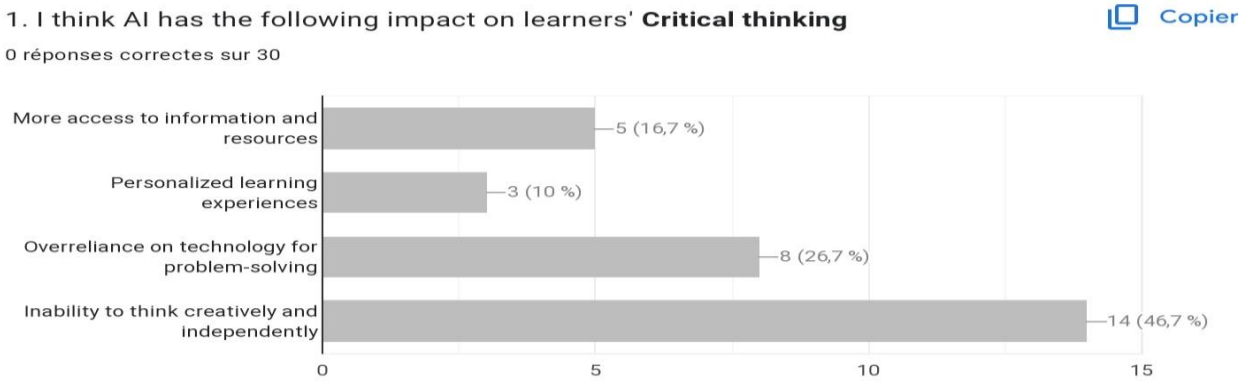

*Figure 2.*Teachers' perceptions of the impact of AI on learners' critical thinking

The responses indicate that while AI can provide more access to information and personalized learning, there are significant concerns about AI leading to a reliance on technology and diminishing critical thinking and creativity. Almost half of the respondents (46.7%) believe AI can hamper independent and creative thinking.

Problem-Solving

The visual representations in Table Two and Figure Three highlight the teachers' concerns about the potential negative effects of AI on student problem-solving skills.

Table 2.Teachers perceptions of the impact of AI on learners' problem-solving

Positive Impacts:
- New and innovative approaches to problem-solving (33.3%)
Negative Impacts:
- Decreased problem-solving skills in traditional formats (60%)

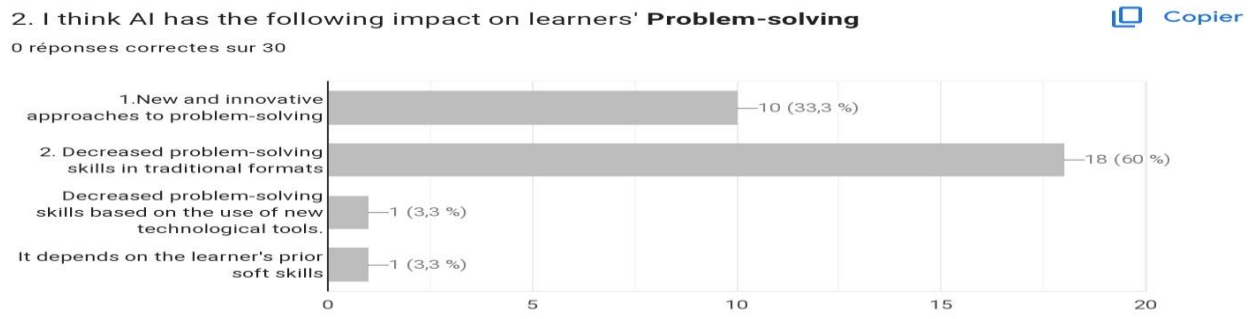

Figure 3. Teachers' perceptions of the impact of AI on learners' problem-solving

The majority of respondents (60%) see a negative impact of AI on problem-solving skills in traditional, non-technological formats. While 33.3% believe AI can enable new and innovative problem-solving approaches, the overall sentiment is that AI may undermine fundamental problem-solving abilities.

The results of teachers' perceptions of the impact of AI on learners' communication are visualized in TableThree and Figure Four for easier interpretation:

Communication

Table Three and Figure Five reveal that teachers are more divided on the impact of AI on communication abilities:

Table 3. *Teachers' perceptions of the impact of AI on learners' communication*

Positive Impacts:
- More opportunities for remote and digital communication (43.3%)
- Automation of repetitive tasks (20%)
Negative Impacts:
- Less face-to-face communication (26.7%)
- Potential for technology to be used for miscommunication or cyberbullying (10%)

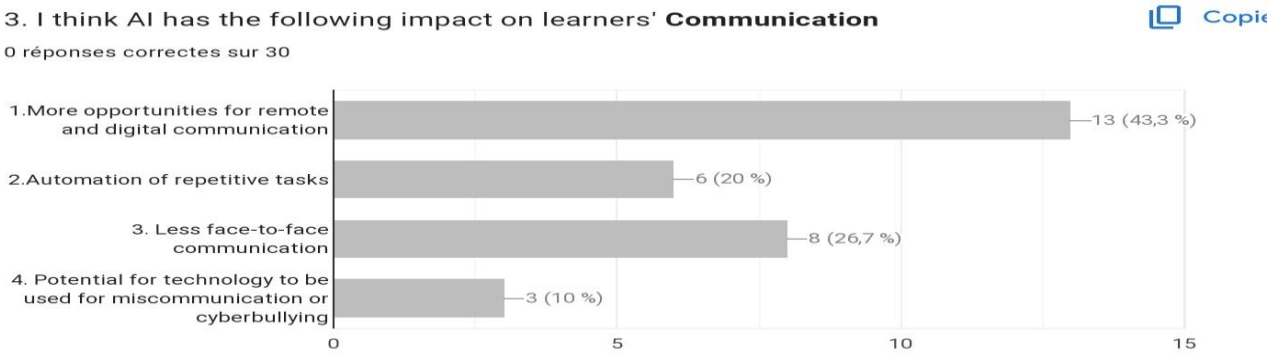

Figure 4. Teachers' perceptions of the impact of AI on learners' communication

Teachers 'answers indicate a mixed view - AI enables more remote/digital communication but also risks reducing face-to-face interaction. There are also concerns about AI leading to miscommunication or cyberbullying, though this is cited by only 10% of respondents.

Collaboration

Table Four and Figure Five outline the participants' perceptions of the impact of AI on learners' collaboration:

Table 4. *Teachers' perceptions of the impact of AI on learners' collaboration*

Positive Impacts:
- Improved access to diverse perspectives and ideas (13.3%)
- Increased ability to work on projects and tasks with people from different backgrounds and locations (33.3%)
Negative Impacts:
- Less social interaction and teamwork skills (53.3%)

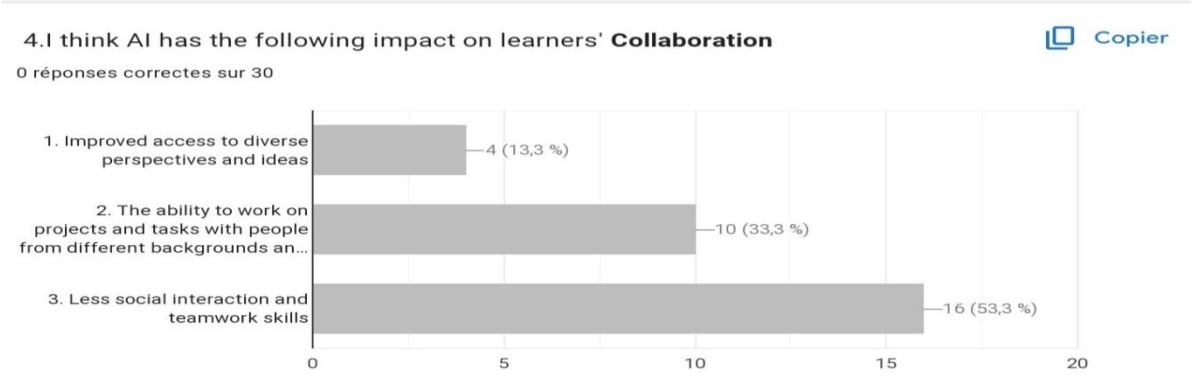

*Figure 5.*Teachers' perceptions of the impact of AI on learners' collaboration

While AI facilitates collaboration across distances and backgrounds, over half the respondents (53.3%) see a negative impact on social interaction and teamwork skills. Positive impacts, such as access to diverse ideas and remote collaboration, are mentioned by fewer respondents.

Creativity and Innovation

Teachers were asked about the impact of AI on learners' collaboration. The data collected has been compiled into Table Five and Figure Six for easy reference.:

Table 5.*Teachers' perceptions of the impact of AI on learners' collaboration*

Positive Impacts
- More opportunities to explore and create new ideas (23.3%)
- Ability to develop original content (10%)
Negative Impacts:
- Low motivation to think outside the box (36.7%)
- Potential for AI to generate unoriginal content (30%)

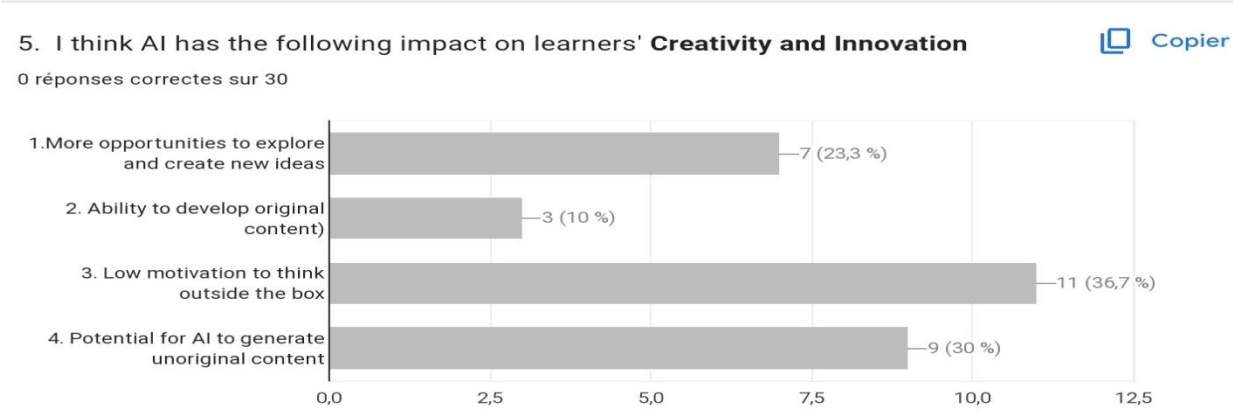

*Figure 6.*Teachers' perceptions of the impact of AI on learners' collaboration

As shown above, teachers' answers suggest significant concerns about AI's impact on creativity and innovation. Over a third of respondents (36.7%) believe AI will reduce motivation for out-of-the-box thinking, and 30% are worried about AI generating unoriginal content. Positive impacts, such as new idea exploration and original content development, are cited by fewer respondents.

Digital Literacy

Table Six and Figure Seven provide a summary of the key survey results about the impact of AI on learners' digital literacy:

Table 6.*Teachers' perceptions of the impact of AI on learner digital literacy*

Positive Impacts:
- More access to technology and digital resources (23.3%)
- Improved ability to use technology for education and productivity (30%)
Negative Impacts:
- Low critical thinking and media literacy skills due to overreliance on technology (46.7%)

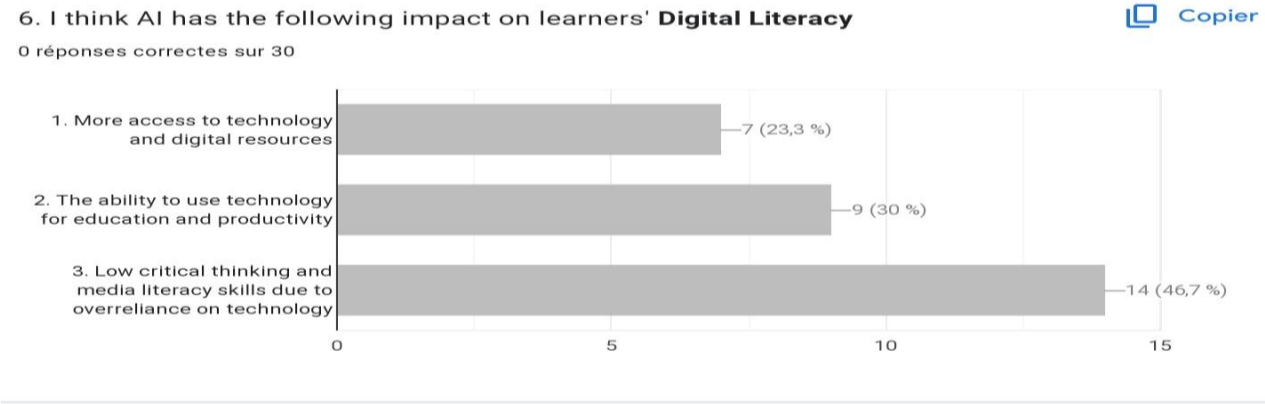

*Figure 7.*Teachers' perceptions of the impact of AI on learner digital literacy

While AI improves access to digital tools and resources and enhances technological skills, almost half the respondents (46.7%) are concerned about AI leading to a reliance on technology that undermines critical thinking and media literacy.

Adaptability and Flexibility

Table Seven and Figure Nine contain relevant statistics about the teachers' perception of the impact of AI on learners' adaptability and flexibility:

Table 7.*Teachers' perceptions of the impact of AI on learners' adaptability and flexibility*

Positive Impacts:
- Ability to quickly adapt to changing technology (23.3%)
- More comfort with change and uncertainty (10%)
Negative Impacts:
- Inability to cope with unexpected changes or problems (20%)
- Heavy reliance on technology for problem-solving (46.7%)

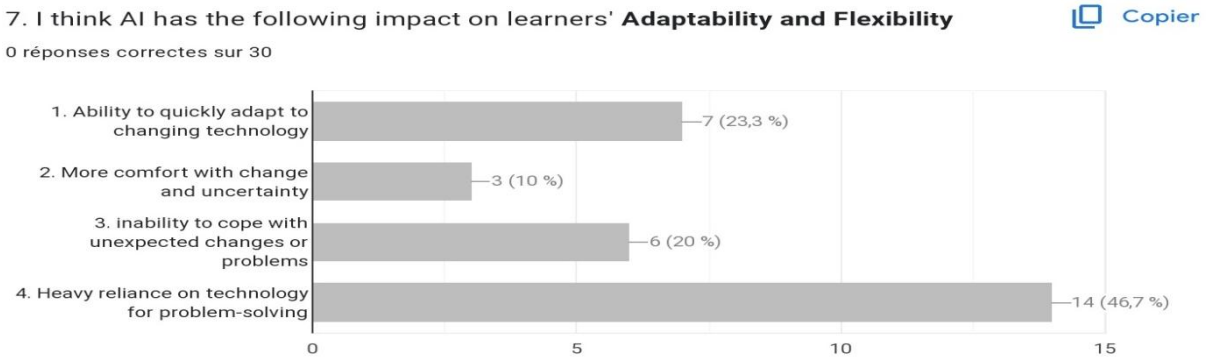

Figure 8. Teachers' perceptions of the impact of AI on learners' adaptability and flexibility

The responses imply a mixed view - AI may enhance adaptability to technological change, but also risks creating an overreliance on technology for problem-solving that reduces the ability to cope with unexpected challenges. Few respondents have a positive impact compared to the rest who have negative ones.

Cultural Awareness and Global Citizenship

Figure Nine and Table Eight illustrate the varying degrees to which teachers feel AI will impact core 21st-century skills like cultural awareness and global citizenship:

Table 8. *Teachers' perceptions of the impact of AI on learners cultural awareness and global citizenship*

Positive Impacts:
- More understanding and appreciation of different cultures (33.3%)
- Improved ability to work with people from different backgrounds (33.3%)
Negative Impacts:
- Inability to understand and appreciate different perspectives and cultures (33.3%)

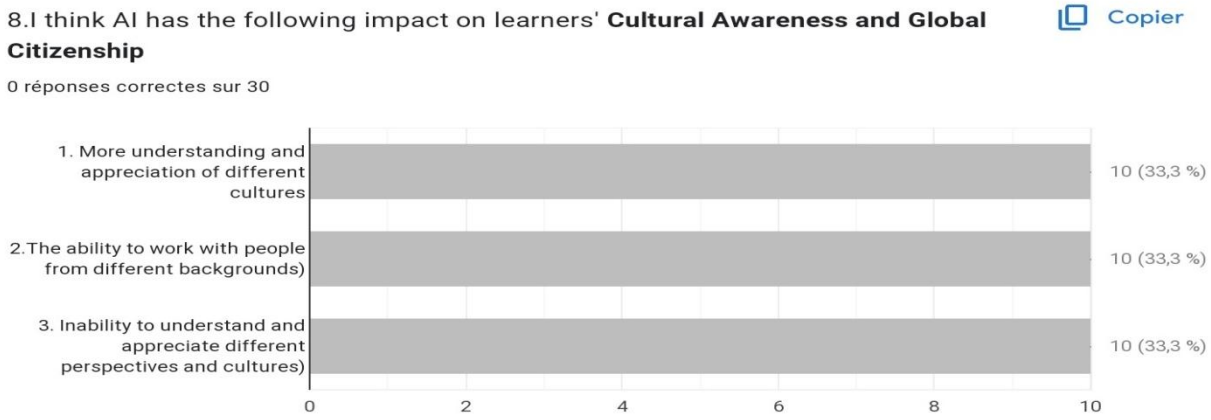

*Figure 9.*Teachers'Perceptionsof the impact of AI on learners' cultural awareness and global citizenship

Figure Eight shows that the responses to the impact of AI on cultural awareness and global citizenship are evenly split between positive and negative. A third of respondents recognize the benefits of cross-cultural understanding and collaboration, while another respondent is concerned about AI hampering the ability to appreciate different perspectives.

Social and Emotional Intelligence

The responses from teachers regarding the impact of AI on learners' social and emotional intelligence are summarized in the table and figure below:

Table 9. *Teachers' perceptions of the impact of AI on learners social and emotional intelligence*

Positive Impacts:
- More awareness and understanding of emotions (6.7%)
- Improved ability to empathize with and communicate with others (13.3%)
Negative Impacts:
- Less face-to-face communication and social skills (53.3%)
- Difficulty in understanding and expressing emotions (26.7%)

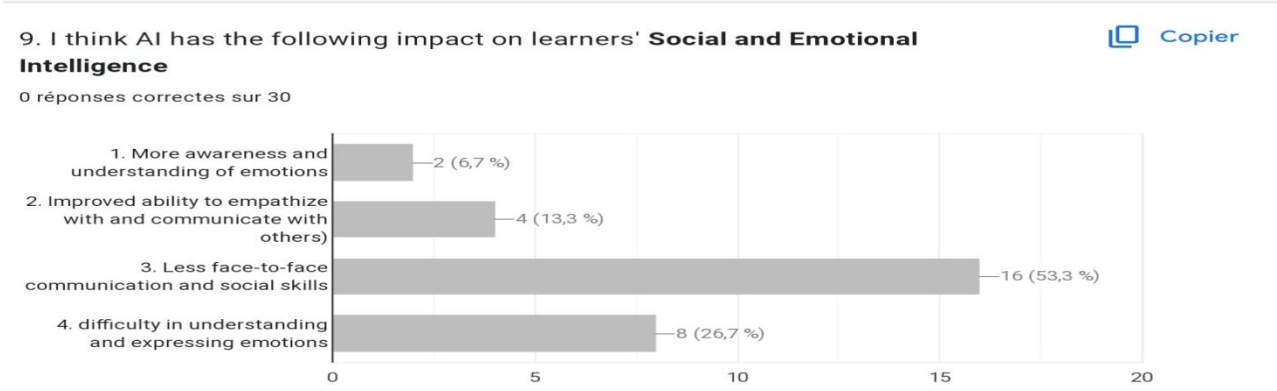

*Figure 10.*Teachers' perceptions of the impact of AI on learners social and emotional intelligence

The responses demonstrate a significant concern that AI will negatively impact social and emotional intelligence by reducing face-to-face interaction and the ability to understand and express emotions. Positive impacts, such as increased emotional awareness and improved empathy, are cited by very few respondents.

Ethical Awareness and Civic Engagement

Tables 10 along with Figure 11 provide a comprehensive overview of the teachers' perspectives on how AI is affecting learners' ethical awareness and engagement.

Table 10.*Teachers perceptions of the impact of AI on learners' ethical awareness and engagement*

Positive Impacts
- Understanding of ethical considerations and responsibilities (26.7%)
- Improved ability to participate in civic life and contribute to the community (13.3%)
Negative Impacts:
- Low sense of responsibility and ethical behavior (60%)

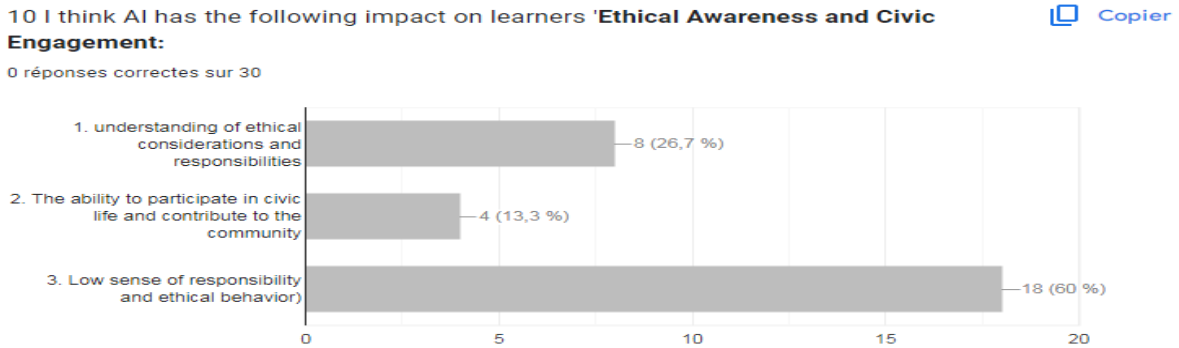

*Figure 11.*Teachers perceptions of the impact of AI on learners' ethical awareness and engagement

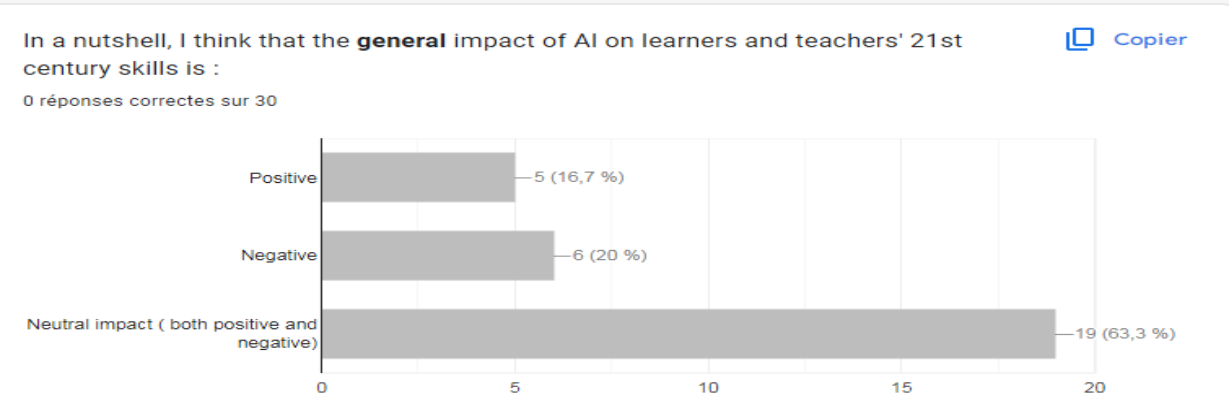

*Figure 12.*Teachers' perceptions of the general impact of AI on 21st-century skills

Most respondents (60%) believe AI will have a negative impact by reducing a sense of ethical responsibility and behavior, while few recognize the benefits of ethical awareness and civic engagement. Beyond the numerical findings, the teachers provided valuable qualitative insights when asked if they had anything further to add about the influence of AI on 21st-century competencies. These supplementary comments are compiled in Table 11 below:

Table 11.*Teachers 'additional remarks*

AI is a two-sided coin. Its efficacy depends on how to use it and for what reasons.
AI is a useful tool for further language development and production. It has proved to be beneficial at various levels. Most of our students use AI not to benefit from it, but rather, to do their chores.
AI will eventually make humans machines with no brains to think.
Al is like a gift for learners.
The effect is more notably harmful because it reduces the natural sense of creativity and hinders the human process of thinking and interacting. On the other hand, it could be beneficial without excessive use!
AI in theory can be very helpful; however, some ethical issues must be considered in the future.
Please be precise in some parts about the type of AI you are referring to.
It is necessary to include classes that help both students and teachers be aware of AI and technology integration standards in teaching, considering the ethical implications.
Of course, the impact of AI depends on the way it is used by learners and teachers. I think it has a negative influence since I found that most of my learners depend on it heavily, which hinders their learning and self-dependence.
We should make AI the yardstick of the new teaching-learning processes in the upcoming years.
As with all innovative soft and hard technologies, AI depicts the good, the bad, and the ugly; it depends on how it should be wisely and appropriately invested in 21st-century boosting.
Nowadays, students refuse to read, which makes them unable to think either objectively or subjectively.
AI has to be used under the guidance of teachers.
Students use AI as a shortcut to avoid thinking.
AI use should be controlled academically and professionally by experts; its outcomes could be negative and unexpected since we notice the overuse of AI technology at all levels.
AI tools provide significant assistance to users, particularly to students and educators. However, there is still a lot of work to be done to fully comprehend the true potential and possible drawbacks of AI.
AI is a threat to education and learning.

The teachers' answers to the question "Do you have anything to add?" indicate that:

- Significant concerns about diminished critical thinking and creativity: the majority of respondents (46.7%) believe AI can lead to an overreliance on technology, hampering independent and creative thinking.
- Negative impact on problem-solving skills: 60% of respondents see a negative impact of AI on problem-solving skills in traditional, non-technological formats.
- Mixed impact on communication and collaboration: while AI enables more remote or digital communication, there are concerns about reduced face-to-face interaction and diminished social and teamwork skills.
- Worries about stifling creativity and innovation: Over a third of respondents believe AI will reduce motivation for out-of-the-box thinking and may generate unoriginal content.
- Overreliance on technology undermining digital literacy: 46.7% of respondents are concerned about AI leading to an overreliance on technology that undermines critical thinking and media literacy.
- Potential overreliance on technology reduces adaptability: AI may enhance adaptability to technological change, but it also risks creating an overreliance on technology for problem-solving that reduces the ability to cope with unexpected challenges.
- Mixed impact on cultural awareness and global citizenship: responses are evenly split between positive and negative impacts, with concerns about AI hampering the ability to appreciate different perspectives.
- Significant negative impact on social and emotional intelligence: the majority of respondents (53.3%) believe AI will reduce face-to-face interaction and the ability to understand and express emotions.
- Concerns about reduced ethical awareness and civic engagement: 60% of respondents believe AI will have a negative impact by reducing a sense of ethical responsibility and behavior.

Several respondents in Table 11 expressed worries that overreliance on AI could undermine students' communication and collaboration skills if not implemented thoughtfully.

Discussion

The teacher survey data paints a sobering picture of AI's impact on 21st-century skill development. Contrary to the hypothesis that AI would enhance these critical competencies, the overwhelming majority of educators anticipate it will impede students' growth in areas like critical thinking, problem-solving, and creativity. These findings align with emerging research and a literature review on the risks of over-relying on AI in education, where over-automation may undermine the very human faculties that 21st-century learning aims to cultivate.

Interestingly, the teachers did note some potential upsides to AI, such as improved access to resources and remote collaboration. However, their overarching concerns about AI undermining essential skills like ethical reasoning and social-emotional intelligence appear to outweigh these advantages. This balanced perspective underscores the need for a thoughtful, human-centered approach to AI integration. Teachers suggest that the impact of AI on 21st-century skills is more negative than positive. While some positive impacts are noted, such as improved access to information and resources and remote collaboration, the concerns about AI undermining critical thinking, creativity, problem-solving, social skills, and ethical behavior outweigh the potential benefits. The responses indicate a need to carefully consider the educational and ethical implications of AI integration in teaching and learning.

Pedagogical Implications

The rise of AI brings both exciting possibilities and concerning challenges when it comes to 21st-century skills. But there's no one-size-fits-all solution; tackling this will take a diverse group of people coming together.

- We need to get proactive on this front. Educators have a big role to play in integrating critical thinking and media literacy into their curricula. Equipping young minds to thoughtfully navigate the digital landscape is crucial.
- At the same time, policymakers need to step up and establish ethical guidelines around AI development and deployment. Responsible innovation should be the name of the game, not reckless automation.
- Employers also have skin in the game. Rather than let technology replace human interaction, they should double down on encouraging face-to-face collaboration among their teams. The soft skills that come from that are irreplaceable.
- And as individuals, we all have to work on building our adaptability and resilience. Embracing lifelong learning will be the key to thriving amidst the changes ahead.
- This challenge requires a true team effort—students, teachers, executives, lawmakers, and tech innovators all contributing their parts. If we get this right, we can navigate the AI revolution in a way that empowers, rather than displaces, human potential. But it's going to take some thoughtful problem-solving to get there.

Recommendations

As we grapple with the profound impact of artificial intelligence on the essential skills of the 21st century, a thoughtful and multi-faceted approach is crucial.

- Nurture cognitive vitality: Develop AI-powered educational tools and resources that actively promote critical thinking, creativity, and problem-solving, rather than enabling over-reliance on technology. Empower students to wield AI as a collaborative partner, not a crutch.
- Preserve human connections: Integrate AI in a way that complements and enhances face-to-face communication, collaboration, and social-emotional learning. Ensure technology serves to strengthen, not replace, these vital interpersonal abilities.
- Foster digital discernment: Implement AI-driven educational interventions with a focus on developing digital literacy, media literacy, and ethical awareness. Equip learners with the skills to navigate the technology-infused landscape responsibly and with informed judgment.
- Empower educators as guides. Provide comprehensive teacher training and ongoing support to help educators effectively integrate AI into the classroom. Empower them to address the potential negative impacts on 21st-century skills and leverage technology as a transformative tool.
- Embrace an iterative approach: engage in continuous research, evaluation, and dialogue with teachers, students, and stakeholders. Remain nimble and adaptable, making necessary adjustments to policies and practices as we navigate this evolving landscape. Finally, we can say that AI should be integrated into education through a multifaceted lens. We can unlock the true potential of technology to empower the next generation of critical thinkers, creative problem-solvers, and engaged global citizens.

Future research

- In the era of AI, teachers must possess strong digital skills to effectively utilize these new tools. Unfortunately, in Algeria, many teachers are not digitally competent, with some having little to no familiarity with technology. Future research should examine the

specific digital competencies teachers require to integrate AI-powered learning technologies into their pedagogical practices.

- The resistance of teachers to change their methodologies is another challenging issue that can be addressed in future research. Investigating effective strategies to break down this resistance and foster improvement in teachers' willingness to adopt new technologies and teaching approaches is an important line of inquiry.
- Another crucial topic that deserves further emphasis is the impact of prioritizing grammatical accuracy over fluency in oral communication on overall language proficiency in Algerian universities. Examining this delicate balance and its consequences for students' language learning outcomes could yield valuable insights to improve university-level curricula and instructional methods.
- By addressing these key areas: teacher digital competency, resistance to change, and the focus on accuracy over fluency. Future research can provide crucial guidance to help Algerian education systems successfully navigate the era of AI-driven learning and teaching.

Conclusion

The research at hand aims to uncover empirical insights into how AI integration influences the cultivation of critical thinking, problem-solving, and other essential competencies among learners. The survey findings present a cautious perspective on the impact of AI integration in education. Teachers expressed significant concerns about AI's potential to undermine critical thinking, problem-solving, creativity, and other essential 21st-century skills. While acknowledging AI's benefits for remote collaboration and resource access, respondents voiced worries that over-reliance on technology could stifle independent, out-of-the-box thinking, reduce social-emotional intelligence, and diminish ethical awareness and civic engagement. The overall picture suggests a need for a thoughtful, human-centric approach to AI implementation that maximizes its benefits while preserving the irreplaceable facets of human learning and development.

Technology is significantly impacting the critical skills needed for the 21st century. Distressingly, teachers report that AI is hindering the development of these vital abilities in students. Moving forward, we must carefully consider this troubling trend and find effective ways to ensure students can continue cultivating these essential skills, even as AI becomes ubiquitous. These technologies have influenced both how educators teach and students learn, to enhance outcomes, achievements, and attitudes. However, challenges have emerged, like teachers' digital readiness and ethical AI-tool issues. To navigate this, instructional frameworks can empower educators to identify necessary AI competencies for effective teaching, helping them leverage the technology optimally.

About the Author

Meriem OTHMANE graduated from the University of Abou Baker Belkaid Tlemcen. She previously worked at the École Normale Supérieure d'Ourgla and is currently a lecturer in Didactics at the University Center of Barika, Algeria. Her field of research includes Teaching English as a Foreign Language (TEFL). ORCID: https://orcid.org/0000-0002-3385-258X.

Declaration of AI Refined

This research paper has undergone language correction using the AI-powered tools Grammarly and Scholar AI Chat to address grammatical, spelling, and stylistic errors. It is acknowledged that the use of such tools may introduce standardised patterns typical of AI-generated content. Consequently, a certain percentage of content may reflect AI-generated language structures. Yet, the intellectual content and the analysis remain entirely the work of the authors.

Statement of Absence of Conflict of Interest

The authors mentioned above hereby solemnly declare that they are not and shall not be in any situation that could give rise to a conflict of interest in what concerns the findings and recommendations contained in this academic article.

References

Ahmad, S. F., Alam, M. M., Rahmat, M. K., Mubarik, M. S., & Hyder, S. I. (2022).Academic and administrative role of artificial intelligence in education. *Sustainability*, *14*(3), 1101

Cavalcanti, A. P. et al. (2021). Automatic feedback in online learning environments: A systematic literature review. Computers and Education: *Artificial Intelligence*, *2*, 100027. https://doi.org/10.1016/j.caeai.2021.100027

Central Board of Secondary Education. (2024). 21st Century SkillHandbook.

Chaudhry, M. A., &Kazim, E. (2022). Artificial Intelligence in Education (AIEd): a high-level academic and industry note 2021. *AI and Ethics*, *2*(1), 157–165. https://doi.org/10.1007/s43681-021-00074-z

Chen, X., Xie, H., Zou, D., & Hwang, G. J. (2020a).Application and theory gaps during the rise of artificial intelligence in education.*Computers and Education: Artificial Intelligence*, *1*, 100002

Chen, L., Chen, P., & Lin, Z. (2020b). Artificial intelligence in education: A review. *Ieee Access*, *8*,75264–75278.

Dizon, G. (2017). Using intelligent personal assistants for second language learning: A case study of Alexa.*TESOL Journal*, *8*(4), 811–830.

Hwang, G. J., Chang, S. C., Chen, P. Y., & Lu, X. (2020).Effects of integrating an active learning-promoting mechanism into location-based real-world learning environments on students' learning performances and behaviors.*Computers & Education*, 104032.

Kexin, L., Yi, Q., Xiaoou, S., & Yan, L. (2020). Future education trend learned from the Covid-19 pandemic: Take artificial intelligence online course as an example. In *2020 International Conference on Artificial Intelligence and Education* (ICAIE) (pp. 108–111).IEEE.

Markauskaite, L. et al. (2022). Rethinking the entwinement between artificial intelligence and human learning: What capabilities do learners need for a world with AI? *Computers and Education: Artificial Intelligence*, *3*, 100056. https://doi. org/10.1016/j.caeai.2022.100056

National Research Council. (2012). *Education for Life and Work: Developing Transferable Knowledge and Skills in the 21st Century.*Committee on Defining Deeper Learning and 21st Century Skills, J.W. Pellegrino and M.L. Hilton, editors Board on Testing and Assessment and Board on Science Education, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

Ng, D. T. K., Chu, S. K. W., Leung, J. K. L., Su, J., & Ng, R. C. W. (2022). Teachers' AI digital competencies and twenty-first-century skills in the post-pandemic world.*Educational Technology Research and Development*, *71*, 137–161. https://doi.org/10.1007/s11423-023-10203-6

Sain, Z. H. (2024). Utilizing Artificial Intelligence in Education to equip Students for the Challenges of the 21st- century. *New Era International Journal of Interdisciplinary Social Researches*, *9*(23), 55–62. https://doi.org/10.5281/zenodo.11079969

Appendices

Appendix A

Teachers' Questionnaire

In this questionnaire, we would like to know the university teachers' opinions on the impact of artificial intelligence (AI) on 21st-century skills. We want to understand both the positive and negative impacts that AI may have on skills such as critical thinking, problem-solving, communication, and collaboration.

1. Critical thinking:
a. More access to information and resources
b. Personalized learning experiences 10%
a. Overreliance on technology for problem-solving
b. Inability to think creatively and independently
2. Problem-solving:
a. New and innovative approaches to problem-solving
a. Decreased problem-solving skills in traditional formats
3. Communication:
a. More opportunities for remote and digital communication
b. Automation of repetitive tasks
a. Less face-to-face communication
b. Potential for technology to be used for miscommunication or cyberbullying
4. Collaboration:
a. Improved access to diverse perspectives and ideas
b. Increased ability to work on projects and tasks with people from different backgrounds and locations
a. Less social interaction and teamwork skills
5. Creativity and Innovation:
a. More opportunities to explore and create new ideas
b. Ability to develop original content)
a. Low motivation to think outside the box
b. Potential for AI to generate unoriginal content
6. Digital Literacy:
a. More access to technology and digital resources
b. Improved ability to use technology for education and productivity
a. Low critical thinking and media literacy skills due to overreliance on technology
7. Adaptability and Flexibility:
a. Ability to quickly adapt to changing technology
b. More comfort with change and uncertainty
a. inability to cope with unexpected changes or problems
b. Heavy reliance on technology for problem-solving
8. Cultural Awareness and Global Citizenship:
a. More understanding and appreciation of different cultures
b. Improved ability to work with people from different backgrounds
a.Inability to understand and appreciate different perspectives and cultures
9. Social and Emotional Intelligence:
a. More awareness and understanding of emotions
b. Improved ability to empathize with and communicate with others
a. Less face-to-face communication and social skills
b. difficulty in understanding and expressing emotions
10. Ethical Awareness and Civic Engagement:
a. understanding of ethical considerations and responsibilities
b. Improved ability to participate in civic life and contribute to the community
a. Low sense of responsibility and ethical behavior
"In a nutshell, I think that the general impact of AI on learners' and teachers' 21st-century skills is

- **Positive**
- **Negative**
- **Neutral**

Do you have anything to add?

Cite as

Othmane, M.(2024). Is AI Making Us Smarter or Dumber? A Comprehensive Look at the Impact of AI on 21st Century Skills in Education. *Atrás Journal*, *5* (Special Issue), 303-320.