Augmented Education and Employability: Skills, Risks, and the Transformation of Human Roles

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ABSTRACT

This research aims to present original perspectives on stakeholders' perceptions of AI integration in higher education and understand how this transition could contribute to enhancing graduates' skills and employability. It adopts an integrative qualitative approach based on semi-structured interviews and focus groups with various stakeholders (teachers, experts, decision-makers, professionals, students) to which we have added contextualized scenarios.

The results indicate that AI promotes personalisation, efficiency and information accessibility, but raises concerns related to the decontextualisation of content, the cognitive dependency, the loss of human interaction and the risks of algorithmic injustice and exclusion, particularly in assessment and recruitment. The findings indicate that AI is deeply transforming teaching practices, competence requirements, and institutional processes. The study calls for stronger regulation and a "human-in-the-loop" approach to ensuring ethical and inclusive integration.

Keywords: AI education, Employability, Higher education, Skills gap, Stakeholders.

INTRODUCTION

The service sector (healthcare, finance, marketing, etc.) revolution started when technology rapidly advanced in terms of intelligence and power, while becoming more compact, lighter, and more affordable (Ivanov et al., 2025; Wirtz & Pitardi, 2023). The education field remains no exception (Alyoussef et al., 2025). The advent of machine learning and adaptive learning technologies, predictive systems, generative models, and conversational agents is redefining the dynamics of learning, teaching (Salas-Pilco et al., 2022; Pillai et al., 2024; McDonald et al., 2025; Yan et al., 2024; Kasneci et al., 2023) and work (Nagy et al., 2024).

On the one hand, these emerging technologies have proven their ability to enhance multi-media learning (Vartainen & Tedre, 2023), understanding feedback (Dai et al, 2023), and exceeding the performance on reflective writing of the average student (Li et al, 2023). They tend to promote the personalisation of academic pathways, pedagogical support, assessment improvement, and the development of data-driven strategies (Zawacki-Richter, 2019; Ifenthaler & Yau, 2020; Mazzoli et al, 2023). On the other hand, concerns regarding the digital divide caused by AI (Pontual Falcao et al, 2020) and its influence on creativity, independence, and critical thinking among students have also been highlighted (Davinshi et al, 2023; Yan et al, 2024). Thus, AI is not merely a lever for technological transformation; it's emerging as a strategic issue impacting institutional policies (Sullivan et al., 2023; Moorhouse et al., 2023; Wang et al., 2023). Similarly, aware of the appeal of this transformational force, 37% of business leaders are looking to develop their employees' skills over the next two to three years. This is supported by recent reports from the World Economic Forum (2024), where executives estimate that 40% of their workforce would need to be re-skilled in the next three years because of implementing Artificial Intelligence (AI)[1].

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[1] World Economic Forum: https://www.weforum.org/stories/2024/01/to-truly-harness-ai-we-must-close-the-ai-skills-gap/

Internationally, the primacy of these digital skills and the necessity of reducing the "AI skills gap" have been put forward by several researchers (Tolan et al, 2021; Jaiswal et al., 2024; Vettori & Warm, 2025) between the skills taught and the expectations of the labor market, which has been profoundly restructured by digitization.

Accordingly, the question of identifying who is responsible for talent acquisition and development has also been widely raised (Makarius & Srinivasan, 2017). Such responsibility seems to extend beyond the human resources department alone, to be shared by the entire organization, as well as by external stakeholders such as governments and educational institutions (Wilson, 2013; Krzywdzinski, 2017). It requires education systems to train "AI-ready" graduates (Luckin et al, 2022; Holmes & Tuomi, 2022) by developing true AI literacy (Cetindamar et al, 2022; Ng, 2022; Vettori & Warm, 2025), aligning their training offerings with real market expectations (Kotler & Fox, 1995), and moving from content-based teaching to skills-based learning (Ngando Black & Zouggar, 2025). Artificial intelligence is revolutionizing skills. In this context, the use of AI brings up a bunch of issues (like roles, exclusion, etc.). A new global survey by UNESCO (2025)[1], shows that almost twothirds of higher education institutions already have guidelines on using artificial intelligence or are working on them. Particularly, institutions in the Tunisian context are engaging in a process of innovation and modernization of higher education, as evidenced by several initiatives (AI Academy, E Novate Technologies, Go My Code, UVT).

Despite this excitement, only a limited number of research studies (Kaddachi, 2017) have focused on analyzing how these initiatives are perceived by stakeholders involved in higher education (teachers, students, labor market professionals, academic decision-makers, AI experts), as well as their expectations and resistance. These factors determine the success of AI integration (Ifenthaler & Yau, 2020), particularly in emerging contexts such as Tunisia, where institutional advances coexist with infrastructure, training, and governance constraints. Indeed, these actors, together with institutional culture and policies, form the social system in higher education that influences the adoption of generative AI, while their roles and responsibilities remain poorly defined (Jin et al., 2025). Given these dilemmas, the various actors involved must develop critical thinking about these emerging technologies, which prompts us to ask the following question:

How can higher education institutions adapt to prepare future professionals for the challenges and opportunities presented by AI technologies?

The scientific and societal challenge of this research lies in assessing the impact of introducing A.I. in Tunisian higher education, the opportunities and dilemmas inherent in it for stakeholders, and understanding how this transition can contribute to improving the quality of education and developing graduates' skills and employability.

It aims to:

1. Analyse current and potential practices for integrating AI technologies into higher education.

2. Identify current and potential applications of AI in employment.

3. Identify the various skills and competencies sought by professionals in an AI-driven market.

4. Assess stakeholders' readiness to adopt these technologies.

5. Propose a strategic framework to support institutions in bringing training closer to market needs.

To provide answers to these questions, the article is divided into three main sections. The first section presents the conceptual framework, highlighting the concepts and transformations resulting from the introduction of AI in higher education and the labor market. The second section explains the methodology adopted. Finally, the last section analyzes the results and puts them into perspective with existing work, before identifying practical implications, limitations, as well as directions for further research.

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[1] https://www.unesco.org/fr/articles/enquete-de-lunesco-deux-tiers-des-etablissements-denseignement-superieur-ont-elaboreou-elaborent?utm_source=chatgpt.com

THEORETICAL FRAMEWORK

AI technologies are driving change in job profiles, the skills required, and learning methods. This framework is designed to understand the interplay and challenges involved in learners' integration and employability, as well as their university education in the era of generative technologies.

1. AI Literacy

This has been defined as the ability of machines to learn, make decisions, and perform tasks usually associated with human intelligence, drawing on disciplines that integrate concepts from computer science, cybernetics, biology, mathematics, and psychology (Kim and Park, 2025). It uses data and algorithms that allow machines to adapt and improve their performance over time without being explicitly configured for each task (Haleem et al, 2022; Mishra, 2024).

As AI becomes increasingly important in the workplace and in everyday life, researchers have increasingly developed the notion of "AI literacy," drawing inspiration from the concept of "literacy" as applied to skills in various fields (Long & Magerko, 2020; Ng et al., 2022). 'Literacy' is widely recognized as a new set of attitudes, skills, and technological competencies that enable individuals to use AI effectively and ethically in their daily lives (Kandlhofer et al., 2016; Long & Magerko, 2020). It is therefore a fundamental skill that goes beyond the simple ability to use digital tools to cover a more complex set of cognitive, technical, and ethical skills that enable understanding and interaction with algorithmic models and systems, and the critical interpretation and evaluation of their results (Long & Magerko, 2020). This notion extends traditional digital literacy and is an extension of human capital theory (Becker, 1964), as technical skills are a major but insufficient source of productive capital for enhancing employability.

Drawing on Bloom's taxonomy, Ng et al. (2021) developed a theoretical model to conceptualize how AI literacy is described in the following four cognitive standards: understanding how AI models work (knowing the basic functions of AI applications); using AI (applying AI concepts and applications in different scenarios); evaluation and creation (e.g., appraise, evaluate, predict, design) and AI ethics (eg. fairness, transparency, safety). Furthermore, this concept is inspired by the "computational thinking" approach (Wing, 2006; Brennan et al., 2012), which states that progress in an algorithmic environment depends on the integration of meta-algorithmic skills such as the ability to verify the relevance of a generated response, taking into account probabilistic uncertainties, and adopting a critical approach to the limitations of models that are likely to fail by producing erroneous content (Kong et al, 2022).

AI literacy has attracted the interest of both researchers and educators, who aim to equip future generations with the digital skills and knowledge associated with AI to better prepare them for their future professional environment (Bawden, 2008).

However, this ability seems to vary around the world in terms of access to technology, social background, universities, etc., which may generate an "AI literacy gap" (Ngoveni, 2025).

2. The evolution of job markets with artificial intelligence

Artificial intelligence is redefining the structure of the job market, leading to rapid changes in occupations and the skills they require. It has also given rise to the concept of the skills gap.

Skills and job roles are changing moving towards hybrid profiles

In the age of AI technologies, we are witnessing a profound redesign marked by the emergence of several AIrelated professions and the automation of tasks (Aghion et al, 2019), which are likely to threaten jobs in all sectors simultaneously (Bruun & Duka, 2018) and expand to non-routine tasks, while maintaining its dominance over routine tasks (Ford, 2015). However, this concern has been tempered by researchers who consider the threat of mass unemployment to be exaggerated (Atkinson & Wu, 2017). AI is more likely to transform the nature and quality of work than to replace it (Bukartaite & Hooper, 2023). As long as humans adapt to new opportunities while developing hybrid profiles and specific skills and abilities (Tolan et al, 2023), they fill roles that are

difficult to replace with technology (Autor, 2015; Huang & Rust, 2018) and remain valuable in the labor market (Lane & Saint-Martin, 2021).

These skills are mainly technical (e.g., model evaluation, data literacy, prompt engineering), cognitive (e.g., analytical and synthesis skills, problem solving, creativity), and affective (e.g., interpersonal communication, leadership, emotional intelligence, ethics). Thus, in an economy dominated by AI, employability takes on a dynamic aspect (Fugate et al., 2004; Carnevale et al., 2023), reflecting a capacity for "learning agility" and proactivity (Milani et al., 2021), which attests to sustainable employability (Ybema et al., 2020). This revaluation is supported by several contemporary theories, notably the "Skill Biased Technological Change" model (Acemoglu & Autor, 2011), which explains that technologies require new skills (Aghion et al, 2019).

In addition, sociotechnical theory (Emery and Trist, 1960) provides further support, explaining the synergy between the social system and the technical system, where workers are not replaced by machines, but rather augmented and able to amplify their capabilities through AI. They need to grasp the limitations of these technologies, make contextual decisions, and perform tasks that are difficult to automate, such as social understanding, moral judgment, etc.

The "skills gap" logic

The "skill gap" refers to the discrepancy between the skills taught and those required by companies (Sarin, 2019). It is widening rapidly due to technological changes and the accelerated obsolescence of skills in favor of others, to varying degrees (Shipley & McGowan, 2020; Morandin et al 2023). This phenomenon is based on Job Assignment Theory (Sattinger, 1993), according to which matching individuals' skills to the jobs they are assigned maximizes their productivity and avoids efficiency losses. However, when academic institutions supply the market with graduates who are not properly matched to emerging occupations, employers suffer from a shortage of suitable profiles and skills (critical thinking, self-management, teamwork) and are concerned about the negative repercussions (Zahidi et al 2020; Brunello & Wruuck, 2021). In this way, a mismatch is likely to arise between the skills possessed and those sought by professionals. Hence the argument raised in recent years regarding which skills should be prioritized to address this deficit (Rotatori et al., 2021). This can lead to a mismatch between the skills possessed and those sought by professionals. This explains the debate that has arisen in recent years regarding which skills should be prioritized to address this deficit (Rotatori et al, 2021). While certain academics have emphasized the importance of skills in technology, science, engineering, and mathematics (Smith & White, 2020), some researchers argue instead for the primacy of interpersonal skills (Weitz 2022; Morndani et al. 2023). Many companies that have adopted or are in the process of adopting intelligent systems are therefore committed to retraining and upgrading the skills of their staff (Jaiswal et al., 2021; Kaliannan et al., 2023).

3. Pedagogical Innovation as a Strategic Driver in the Age of AI

While higher education has previously met the needs of the market, current systems are considered insufficient to meet the requirements of Industry 4.0 (Zavera, 2019), and universities are judged by employers to be confined to rigid, outdated structures and systems that are unable to keep pace with the need to adequately prepare graduates and promote their employability (Kinash & Crane, 2015). Given this digital transformation, national governments and university systems are taking up the challenge of constantly adapting teaching methods to the educational needs of organizations (McDonald, 2020). In fact, these technologies are not simply auxiliary tools, but rather structuring forces that are putting institutions under intense pressure to rethink their operations, their orientation towards market needs, and their decision-making choices (Williamson et al, 2022).

One of the priority areas is to optimize collaboration between governments, industry, and academia to conduct forward-looking analyses of the labor market, anticipate changing skills needs, and adopt more holistic, systemsbased talent management strategies (Whysall et al., 2019). It would be more appropriate to engage organizations in a perspective of "value sharing" and social responsibility by establishing partnerships for staff training and reducing skills inequalities in society (Porter and Kramer, 2011). To this end, the collaborative planning model developed by Makarius and Srinivasan (2017) can be used to support the management of the talent supply chain for companies through collaboration with stakeholders (eg. universities, employment agencies, etc.) (Bukartaite & Hooper, 2023). Particularly, academic institutions are required to provide regular

and effective talent support because they can gain an in-depth understanding of the skills needed in the market and to continuously align their study programs with emerging requirements (Makarius & Srinivasan, 2017). In line with the theory of core competencies (Prahalad & Hamel, 1990), these organizations are required to redefine their core competencies (AI literacy, data skills, AI collaboration) as these evolve faster than university programs, teaching methods, etc.

The emergence of these technologies has thus marked a revolution in the educational environment, promoting the emergence of innovative techno-pedagogical experiences (Kaddachi, 2017).

MATERIALS AND METHODS

A qualitative exploratory approach was adopted for this research, which is particularly appropriate for understanding emerging phenomena involving changing organizational dynamics (Creswell & Poth, 2018), such as the integration of AI into the education system in Tunisia. It is designed to understand how the various actors involved in higher education perceive and appropriate the uses of AI technologies in learning and professional integration, and to explore institutional tensions and future expectation.

Study design: Data will be collected through semi-structured interviews and focus groups designed to elicit perceptions and experiences, to which we have added contextualized vignettes (scenarios). The usefulness of these tools has been emphasized by certain researchers (Hughes & Huby, 2004; Wieczorek, 2025), who have demonstrated that fictional but realistic situations facilitate projection into rapidly evolving technological environments without the need for prior experience. Each of the scenarios developed presents a real-world use of AI technologies in the university system, drawing on existing initiatives (GoMyCode, IA Academy, Virtual University of Tunis, E-Novate Technologies). They are built around four major themes, drawing on dynamics observed in the literature (Autor, 2015; Zawacki-Richter, 2019; Williamson & Eynon, 2020; Ng, 2021) to analyse the phenomenon of AI holistically. These are essentially the personalization of learning, automated assessment, increased employability, and the transformation of university institutions.

Sample: We aimed for a wide range of perspectives, as shown in the Appendix1.

Interview process: Each participant receives one or two scenarios (See a scenario in Appendix 2), assigned in a manner consistent with their profile. The interview guide includes a phase of free exploration of the perception of the scenario, questions focused on key concepts (AI literacy, skills, teaching role, quality, ethics, etc.), a projection phase, and questions about tensions, obstacles, and opportunities.

Data analysis: The interviews were transcribed in full and then analyzed using inductive-deductive thematic analysis (Braun & Clarke, 2021).

FINDINGS

After cross-analyzing the various transcripts, we notice the emergence of four themes, each structured around the tensions experienced by the various actors between the AI's promises and the human, educational, and institutional realities (See Appendix 3):

Theme 1: Learning and educational transformation educational support from AI technologies

Stakeholders recognize AI as an assistance tool that provides indicators and speeds up decision-making while lightening the workload. "It's basically an encyclopedia" (Teacher 3). "It helps us even when designing courses," added Teacher 7. Some even see it as a daily partner: "I feel like it's a married life, you can't make decisions on your own" (Teacher 5). AI also improves student monitoring, thanks to its rapid data processing and production of useful decision-making indicators. These perceptions attest to the added value of AI in learning management.

Personalization and educational transformation

One of the benefits frequently mentioned is the personalization of learning paths. Students appreciate that content can be adapted to their level, prerequisites, or specific needs. One student explains that AI helps them manage

"subject redundancy" and "understand the links between different disciplines" (Teacher 1). However, this personalization carries risks related to a lack of contextualization.

Cognitive bias: lack of critical thinking

While AI is an assistant that improves efficiency, several stakeholders warn of the threat of cognitive resignation. Teachers criticize the passive use of certain colleagues who *"take the result as is"* without adapting it (Teacher 1), which is not in line with *"the context of higher education in Tunisia, with our rules, our cross-disciplinary subjects, etc."* (Teacher 4). Along the same lines, some teachers observe that students tend to *"skip steps"* (Teacher 8) by relying too heavily on AI. "The day he has a problem, he'll stop" (Professional 1). AI can provide overly simplistic solutions and may hinder the development of specific skills. One teacher explains: *"Giving students ready-made answers doesn't really help them in their learning process"* (Teacher 2). Some students even admit that they don't check the content generated.

This over-reliance on the tool sometimes transforms the learner's attitude into passive behavior, as illustrated in these quotes: *"AI personalizes better than I do"* (Student), *"students become passive"* (Teacher 7). These findings reinforce the literature on AI literacy (Ng et al., 2022) and the risks of cognitive substitution when human skills are not reinforced.

Theme 2: Assessment and the changing role of teachers Assessment and perceived injustice

Teachers have expressed concerns about injustice, inequality, and exclusion related to the use of AI in academic assessment. While its effectiveness is recognized for factual tasks and multiple-choice questions where the *"result is binary, either 0 or 1... it does not contextualize"* (Teacher 3), concerns arise when it comes to assessing more complex skills. Teachers point out that AI can "*approach*" fair grading, but *"it remains unfair"* (Teacher 3) for anything related to reflection, creativity, or reasoning. One decision-maker believes that it is "too early to talk about fairness" when it comes to analysis, while Teacher 4 points out that "*AI can do most of the work, but the teacher must decide the final grade"*. Students, for their part, fear a general tightening of assessment, worrying that they will be *"reduced to numbers"* and subjected to *"extensive filtering"* since AI *"will not forgive"* in the same way that a teacher considers a student's effort over the year. They also question AI's ability to handle nuances and raise the issue of responsibility in the event of an error. Several believe that its limitations stem from its programming: "*if it is unfair, it is because of the way it has been programmed*" (Student). Professionals confirm these fears by emphasizing that *"you can't judge a team using an AI model... AI can't judge that"* (Professional actor 1).

These findings show that while AI promises useful objectivity for mechanical tasks, it fails to grasp the human, contextual, and emotional dimensions of evaluation. Human intervention therefore remains essential to ensure academic fairness.

The new teacher role

Integrating AI into teaching practices raises a major dilemma related to human presence and the changing roles of those involved. Several teachers point to a significant reduction in professional interactions, despite improved collaboration and coordination, because "*AI allows you to do it immediately without asking for help as before*" (Teacher 3), leading to a decline in collaborative work. On the other hand, the limitations of AI fuel a strong need to maintain human judgment because *"students often report answers that are incorrect or not precise enough"* (Teacher 4). For their part, professionals point out that AI does not grasp essential contextual variables such as culture, fatigue, or behavioral dynamics, hence *"its inability to assess human aspects such as team toxicity or body language"* (professional actor 5). This inadequacy invites us to consider AI as a simple aid rather than a decision-maker, hence the need to *"check, reread, improve (...) We must never delegate the final decision... that would be a serious mistake"* (Professional 2). In parallel, the arrival of AI is causing teachers to profoundly rethink their identity. Some confess: *"I have to reinvent the way I teach; AI is advancing faster than our training"* (Teacher 7).

Thus, throughout these discussions, a strong demand for the human element emerges once again, despite the technical efficiency of AI.

Theme 3: Employability and the risk of exclusion

New skills requirements

AI is redefining the skills required. *"In the age of AI, we are looking for profiles that can fulfill several roles at once"* (Decision-maker 1), combining expertise and AI-related skills, even though current training programs are struggling to produce profiles that are truly suited to the *"new requirements"* of the market. To achieve this, *"we need to take a different approach (...) and provide more effective, skills-oriented training programs to guarantee the quality of job opportunities"* (Expert 4).

Among the skills required, "prompting" was mentioned by respondents: *"Prompting is essential... You must know how to frame the subject"* (Student); *"Students absolutely must master AI... otherwise they will be left behind"* (Professional 1; Teacher 7).

The risk of exclusion

AI technologies are considered fair for measuring performance (figures, hours, productivity) as they are based on precise algorithms and data. In terms of assessment and recruitment, professionals attest to their objectivity when managing large volumes of applications and automatically pre-selecting or detecting profiles. One of the professionals points out that: *"(...) In the freelance sector, with the "Talent 619" platform, we can match the person requesting a task or job with the person providing the work. Thanks to AI, we know who is best placed to work for whom. 'Best placed' does not mean the person who knows how to do the job best, no. For example, certain types of profiles are more successful with certain types of clients"* (Actor 2: platform manager).

Yet the effectiveness of AI coexists with a sense of injustice felt mainly by students, who tend to perceive these new forms of automated selection as unfair when they weed out good profiles through an algorithmic filter. They express fears of being evaluated not on their actual skills but based on their digital visibility (choice of keywords, CV structure). One student denounces the fact that a candidate can be rejected *"just because they didn't put the right keywords on LinkedIn"* leading to "human waste.

Professionals, for their part, admit to the pressure of involuntary exclusion caused by poor technical skills, stating that candidates *"must adapt"* and that *"CVs must be contextualized"* to pass through automated filters (Actor5). Taken together, these perceptions point to the emergence of a second-level digital divide, where the issue is no longer access to technology, but the ability to be correctly interpreted by it. The advantage goes to those who know how to use the tools and optimize their digital presence, to the detriment of actual skills. Inadequate training reinforces this cognitive inequality.

Theme 4: Social risks and technical limitations the data unreliability

The perceptions of stakeholders highlight a significant risk regarding the reliability and accuracy of the information provided by these emerging technologies. Teachers recognize that AI lacks the expertise and contextual understanding necessary to produce high-quality documentary analysis, and they emphasize the need to verify the information generated before integrating it into their teaching practice, as the following teacher points out: *"I am concerned about incorrect or misleading answers generated by AI. I have often noticed that the information produced is incorrect, especially when I request finance exercises, there are always mistakes"*.

Ethical risks and decontextualization

AI offers rapid adaptation but can produce resources that are disconnected from local realities. This situation fuels a sense of decontextualization and raises questions about the reliability of content, a problem exacerbated by cultural biases. As expert 2 points out, the models *are "set up for an environment that is not ours... we have to take biases into account",* which sometimes limits their relevance. In addition, some stakeholders are concerned about technological dependence on unsuitable Western models. Indeed, the tools imported by AI do not always correspond to local educational standards, cultural values, or institutional needs. As one expert summarizes, *"the legislation ignores this technology and the ecosystem lacks up-to-date competency frameworks (...) The Tunisian context, which still lacks legislation integrating AI into education, exacerbates the gaps, making it difficult to integrate these tools coherently within institutions"* (Expert 4).

Another expert recommends designing local AI. "*Itis better to make our own intelligent agents*" (Expert 2). Another expert supports this structural issue by stating that *"the adoption of AI does not depend solely on technology, and without agile governance of AI (legislation, infrastructure, etc.), it risks widening inequalities rather than improving educational performance"* (Expert 3 in educational innovation).

Access bias and the digital divide

A verbatim analysis shows that most stakeholders agree that technical and financial access are prerequisites for equity, as illustrated by the following verbatim:

"Three limitations: network access, financial access, use/performance (...) There are the pro versions, and then there's another limitation... we don't have the option of making payments abroad" (Teacher 2).

"With the free versions, we don't get very far... we need the pro version" (Decision-maker 2).

"The integration of AI depends on the infrastructure... otherwise we will suffer the consequences" (Student).

Added to this are institutional obstacles. Administrators recognize the lack of resources to support this transition: *"There is a real need for training, but our institutional resources are limited"* (Decision-makers 3&5).

Thus, these factors show that the integration of AI is heavily dependent on institutional support, which is still insufficient. The ecosystem should therefore get prepared.

DISCUSSION

The study focuses on understanding the role of educational institutions in driving the transformation of pedagogical, assessment, and professional practices following the integration of generative AI. This has led to a transformation in relationships with knowledge, roles, and skills, in line with recent work which confirms that AI is neither a tool nor a simple support, but rather an agent that reshapes human action (Vartiainen et al., 2025).

A first challenge is the gap between technology designed for global environments and the specifics of the Tunisian education system. The lack of a legal framework, up-to-date competency standards, and solid infrastructure, as well as the limited availability of the necessary devices, are consistent with some studies (Shiri and Baigutov, 2024; Ranes et al., 2025) that emphasize the decisive role of organizational support in the adoption of educational innovations. These limitations reflect a phenomenon of innovation system failure (Edquist, 2011), according to which the diffusion of technology is less dependent on technical artifacts than on facilitative conditions, like governance and infrastructure.

The tension between personalisation and decontextualisation is also central in the context under study. AI-driven personalisation is widely perceived as a lever for adaptation that is praised by students, which is in line with adaptive learning logic (Rachmad, 2022; Gligorea et al, 2023). Nevertheless, teachers denounce the fact that the uncritical use of generated decontextualized content threatens local pedagogical relevance and consistency. This is consistent with Situated Learning Theory (Lave & Wenger, 1991), which argues that knowledge validity depends on its cultural and institutional roots. Furthermore, the over-reliance on AI, as expressed by teachers, is likely to reduce cognitive load and make learning superficial, which is consistent with cognitive load theory (Sweller, 2010). We therefore note a redefinition of the role of the teacher. They go beyond the role of a simple transmitter to become a mediator, facilitator, and evaluator of the quality of the content produced by AI, corroborating the theoretical move from 'Learning from technology' to 'learning with technology' (Jonassen, 1999).

In terms of assessment and recruitment, the results highlight the risks of injustice, skill gaps, and exclusion. The idea that graduates must "perform several roles at once" to meet the new requirements of the labor market supports human capital theories (Becker, 1993), in which employability is based on the dynamic acquisition of technical and cross-cutting skills, as pointed out by several contemporary studies (Brunello & Wruuck, 2021; Weitz 2022; Morndani et al 2023; Morandin et al 2023).

Such concerns echo debates on procedural equity in assessment (Tyler, 2000) and confirm the need for the Human-in-the-Loop model (Zanzotto, 2019), where the human retains the final decision. In the same vein, professionals raise the risk of a second-level digital divide (Hargittai, 2001), in which competent candidates are rejected simply because they fail to optimize their algorithmic visibility, leading to algorithmic bias (O'Neil, 2016) and amplifying inequalities.

Finally, the study shows that AI is a powerful tool for educational governance, capable of providing indicators that facilitate decision-making, which corroborates recent studies on data-driven learning environments (Williamson, 2020). However, the lack of regulation, the risks of technological dependence, and weak infrastructure underline the need to establish responsible AI governance, in line with the principles of ethical and human-centered AI (Rafsanjani & Nabizadeh, 2023).

Implications Of Study

For education policymakers and managers, this study makes several recommendations. It is essential to develop a regulatory framework appropriate to the local context to guide the implementation of AI. Clear institutional policies should also be defined to ensure compliance with ethical standards relating to the use of AI. Higher education institutions must ensure that teachers have the necessary technological infrastructure resources, including (Internet connectivity, appropriate hardware) to efficiently employ AI for educational aims.

They should therefore invest in teacher training so that they can adapt AI tools to their context through conducting workshops and technical sessions (Mughairi and Bhaskar, 2025). The students themselves could be coached in the optimal and efficient use of these new technologies and made more aware of the AI bias to develop their critical thinking skills and to avoid over-dependence. They must also be sensitized regarding the new technical and interpersonal skills needed in the workplace (critical thinking, self-management, teamwork) (Brunello & Wruuck, 2021; Morndani et al 2023). AI-integrated recruitment and evaluation strategies must be also developed with a strong human oversight to prevent exclusion and to ensure fairness, by assessing not only factual knowledge but also critical skills and creativity. Moreover, they can work with AI service providers to meet the expectations of the educational sector and to provide guidelines on the effective use of AI for academic ends.

This study takes a social stance, arguing for proactive public policies that guarantee transparency, human monitoring, equity, and data governance considering the risks identified (e.g., text nuances, failure to capture culture).

Limitations And Future Research

While this study provides valuable insights, it is limited to a specific context and cannot be statistically generalized. Perceived challenges may vary across disciplines, levels of education, or geographic contexts. We hope that findings from this study, will encourage conducting more in-depth analysis of the specific skills that AI cannot assess and innovative teaching methods to develop them. Also, further research may include comparative studies between different educational systems to identify best practices in the ethical integration of AI.

In addition, we call for quantitative postures aimed at developing and testing models of AI governance in education while integrating principles of justice. Future research could also measure the impact of AI on student employability and success in different contexts.

CONCLUSION

This study explores the transformations and challenges facing higher education with the integration of artificial intelligence, through a qualitative analysis drawing on the perspectives of multiple stakeholders. Through confronting the views of stakeholders with different roles and interests (students, professionals, decision-makers, teachers, experts), we aim to bring together different views to highlight the various perceptions and ethical commitments required for AI implementation.

The results highlighted the motivation of stakeholders to explore innovative education technologies, recognizing the potential to adapt teaching methods to the digital age by enhancing personalization, the teaching-learning process, academic integrity, and the preparation of degrees through the development of new cross-disciplinary and technical skills. Nevertheless, there are disruptive features that must be considered, such as generated sociocognitive biases, the reliability of AI-generated information, underlining the necessity for analysis, the risk of decontextualization, and legitimate concerns regarding competency assessment, fairness, etc. Also, concerns about overreliance on AI raise apprehensions about the major change in the role of the teacher. Similarly, particular attention was paid to issues of exclusion, justice, and institutional restrictions. The study reveals that the integration of AI into education and employability in Tunisia is perceived as a challenge of human and structural adaptation rather than a simple technical revolution.

In view of the various issues and dilemmas raised, the success of this transformation goes beyond simple blind automation to rely instead on contextualizing tools and strengthening the human-machine relationship as well as summative assessment for a more inclusive approach.

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Disclosure statement

No potential conflict of interest was reported by the authors

Data availability statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request. To protect participant confidentiality, anonymized transcripts and coded materials cannot be publicly shared but may be accessed under restricted conditions for academic purposes.

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APPENDICES

Appendix 1: Sample profile

Method	Profile	Number	Role and Rationale for Selection	Assigned Scenario Focus
Focus Groups	Students	2 groups of 6–8 students each	Beneficiaries of AI-enhanced learning; selection justified by collective dynamics that help surface emerging uses, concerns, and expectations (Krueger & Casey, 2015)	Personalization and Assessment Scenarios
Individual Interviews	HR manager, Platform manager, AI/recruitment specialist, 2 Marketing managers (marketing agency)	5	Linked to employability and talent management	Employability
Individual Interviews	Technological experts (2 AI trainers, 2 pedagogical innovation experts)	4	Ensure technical feasibility and quality of AI systems; analyse evolving skill requirements and the relevance of university-level AI training	Employability & Governance
Individual Interviews	Teachers (Computer Science, English, HR, Marketing)	8	Influence personalization practices and assessment processes	Personalization and Assessment Scenarios
Individual Interviews	Academic decision-makers (Dean, Quality Manager, Head of Management Department, Head of Finance Department, Director of Studies)	5	Provide strategic vision and institutional constraints; key actors in governance, planning, and strategic decision-making	Governance

Appendix 2: scenario1: Learning personalisation

Context: GoMyCode: a Tunisian digital training platform.

Meriem Abbes, 22, is enrolled in the "Data Science" course on GoMyCode. The platform's integrated AI system analyzes her progress in real time: it identifies gaps in her knowledge, reorganizes the modules, and suggests additional exercises. One day, Meriem notices that her progress chart has dropped, even though she has been working regularly. The AI has detected a "low click-through rate" and interpreted it as a lack of engagement. Meriem feels discouraged: does the AI truly understand her? She discusses this with her instructor, Mr. Youssef Ben Salah, to understand if the system is accurately reflecting her efforts.

Appendix 3: Emerging themes

Themes	Sub-themes
Theme 1: Learning and educational transformation	Educational support from AI technologies
	Personalization and educational transformation
	Cognitive bias: lack of critical thinking
	Assessment and perceived injustice

Theme 2: Assessment and the changing role of teachers	The new teacher role
Theme 3: Employability and the risk of exclusion	New skills requirements
	The risk of exclusion
Theme 4: Social risks and technical limitations	Data unreliability
	Ethical risks and decontextualization
	Access bias and the digital divide