The Impact of Artificial Intelligence on Student Satisfaction in Higher Education: Opportunities and Ethical Challenges

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***Abstract*—Artificial intelligence is transforming higher education, offering new strategies to enhance teaching, learning, and administration. This research explores Artificial Intelligence's (AI) impact on student satisfaction in Morocco, focusing on academic performance, institutional image, and data privacy. Using an online survey of 956 students, quantitative analysis revealed AI's positive effects on satisfaction via improved performance and image, though privacy concerns slightly reduced satisfaction. The study highlights the importance of balancing AI's benefits with ethical and privacy considerations, providing theoretical insights and actionable recommendations for institutions to boost satisfaction through innovative yet responsible AI applications in education.**

***Keywords*—academic performance, artificial intelligence, data privacy, higher education, student satisfaction**

I. Introduction

Artificial intelligence has ushered in changes in higher education at an increasingly rapid pace, while providing vital tools aimed at the modernization of teaching, learning, and administrative tasks. Adaptive learning platforms, intelligent tutoring systems, and AI-driven educational analytics are reshaping the educational landscape. These technologies open new possibilities for customized and personalized learning, enhance academic performance, and support more efficient resource management. Yet, despite the growing uptake of AI in higher education, this proactive phenomenon remains poorly understood, particularly regarding its broader ramifications—such as its effect on student satisfaction.

Student satisfaction is often used as an indicator of the effectiveness of higher education institutions. It is closely linked to classroom engagement, student retention, and the institution's image and competitiveness in a globalized education market. While students' satisfaction with AI in higher education is an important aspect, it has largely been overlooked, even though their experiences have been widely explored in the existing body of literature on AI in education. The literature review indicates that most studies have examined AI's effects on academic performance and institutional efficiency [1, 2]. Moreover, a literature search in global databases revealed a paucity of studies that explicitly link AI adoption with student satisfaction—particularly within the context of Moroccan higher education. This represents a critical gap in the literature that this study seeks to address.

The literature has highlighted many technical advantages of AI, including efficiency and personalization; however, the impact of AI on students' perceptions and overall satisfaction has received limited attention.

This research attempts to address this theoretical gap by examining the relationship between AI adoption and student satisfaction in Moroccan higher education institutions, with a special focus on three key areas: the impact of AI on academic performance, institutional image, and concerns related to data privacy. These areas are instrumental in understanding the complex effects of AI on student satisfaction, particularly in contexts where trust and ethics shape students' experiences of emerging technologies.

The study seeks to determine whether the integration of AI in higher education enhances the student experience or whether certain issues—such as ethical concerns regarding data privacy—undermine these potential benefits. By framing this question, the research aims to provide insights that can inform educators, policymakers, and institutional leaders striving to balance innovation with ethics in the use of AI. This contributes to the broader discourse on how technology can be leveraged to meet students' needs and expectations in an increasingly digital learning environment, while also fostering satisfaction and trust in higher education. To explore these dynamics, the study adopts a quantitative approach, using an online survey distributed among students in Moroccan higher education institutions. The survey focuses on students' perceptions of the impact of AI on academic performance, institutional image, and data privacy—and how these factors influence satisfaction. Regression analyses are conducted to examine the relationships under investigation, offering an empirical description of the various ways in which AI shapes students' experiences and satisfaction in higher education. This approach not only highlights the benefits and challenges of AI but also offers practical insights for institutions aiming to maximize its utility.

II. Literature Review

A. Artificial intelligence in Higher Education

Artificial intelligence is fundamentally changing the digital landscape, affecting major sectors of society, including the economy, communication, education, and health. This technological revolution has significantly altered the way individuals, businesses, and institutions interact, impacting how information is processed, services are delivered, and knowledge is transmitted. AI is an enabling technology that allows machines to perform activities that currently require human intelligence—such as learning, thinking, problem-solving, and pattern recognition [3].

Since its inception, artificial intelligence has drastically transformed various sectors, and education is no exception.

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The way students learn and teachers teach has entered a new era of personalized and flexible learning processes, driven by AI in higher education [4]. This concept was initially proposed by Alan Turing in his seminal 1950 work Computing Machinery and Intelligence [5], in which he laid the theoretical foundations of AI, with profound implications for communication and work. Over the decades, AI has established a foothold in domains such as healthcare, education, and learning. With the advancement of AI research, there is a growing interest in its application to education—particularly in improving various aspects of the learning process.

Numerous studies have highlighted the potential of AI to enhance learning opportunities and experiences. According to Mollick and Mollick [1], AI offers students novel ways to self-assess their learning and address major challenges in education. In this sense, AI facilitates deeper and more effective learning cycles by identifying areas of misunderstanding and encouraging students to seek clarification. As early as the 1990s, Balacheff *et al*. [6] explored the intersection between AI and pedagogy, suggesting that AI could transform educational practices.

One of AI's major strengths in education is its self-learning capability, acquired through experience. Like the human brain, AI systems adapt and evolve as they accumulate data. However, they do so more rapidly, efficiently, and at a broader scale. Notably, intelligent tutoring systems and AI-driven online teaching platforms exemplify this utility. As Almasri [7] states, AI can tailor learning experiences to individual students by delivering tasks and assessments aligned with their current level of understanding, based on prior performance data. This allows for more accurate feedback and guidance during assessments, helping students achieve their learning goals.

Every student brings unique skills, learning styles, and levels of prior knowledge to the educational process. Traditional systems often struggle to accommodate these diverse needs [8]. AI presents significant opportunities for creating personalized learning paths and experiences based on student profiles. Through machine learning—a prominent branch of AI—educational systems can cluster students by shared characteristics [9]. However, current developments have not yet kept pace with the rapid evolution of student learning trajectories. This underscores the urgency of developing dynamic learning models that can capitalize on new data without discarding acquired learning. Munir, Vogel, and Jacobsson [10] propose adaptive learning models that evolve over time, allowing for updates to existing frameworks rather than complete overhauls, resulting in more practical and refined teaching tools.

Beyond personalization, AI can help reduce the administrative burden on teachers, allowing them to focus more on direct student interaction. Tasks such as grading, analyzing student feedback, and predicting academic success can be handled by AI systems, giving educators more time to engage with students meaningfully. AI-powered tools can also analyze written student feedback, detect emotional cues, and provide insights into how students perceive course content. Additionally, AI can assist with admissions by using predictive algorithms to evaluate applicants' potential [2]. In this way, AI supports data-driven decision-making, enabling institutions to allocate resources effectively and help students reach their full potential.

Learning from mistakes is a core principle in education. Scholars such as [6, 11, 12] have emphasized the value of errors as learning tools. Reinforcement learning—a branch of AI—can emulate this concept by rewarding or penalizing actions based on outcomes. In educational contexts, reinforcement learning can generate adaptive tests and hints, adjusting tasks according to each student's learning history. Erickson *et al*. [13] demonstrated that reinforcement learning can be used to create personalized curricula, enhancing learning through tailored feedback and appropriate challenges. Nevertheless, a major limitation of this approach is that it often requires a large number of iterations for algorithms to optimize performance, which can be difficult in real-world educational settings where data is not always readily available.

AI systems powered by such algorithms can adapt in real time to students' educational needs, creating more interactive and responsive learning environments. For instance, enriched learning experiences can be designed where students receive adaptive feedback during assessments, guiding them through errors and corrections. This supports deeper, more reflective learning, and helps improve understanding over time [14]. Moreover, advanced AI systems are increasingly integrated with educational decision-making tools. These systems assist educators in evaluating student progress and designing programs by analyzing large volumes of performance data. They can identify patterns that are not immediately visible to human observers, enabling proactive interventions. AI is also used to detect students at risk of academic failure or dropout, allowing timely support to be offered [2].

Artificial intelligence is undoubtedly transforming the learning process, particularly in higher education. It offers not only personalized learning experiences and intelligent tutoring systems but also automates administrative tasks and enhances decision-making. This groundbreaking technology pushes the boundaries of efficiency, effectiveness, and fairness in teaching and learning.

While not without its limitations—such as data quality and algorithmic bias—the benefits of AI in education are becoming increasingly difficult to overlook. This area of research is rapidly evolving, and AI is poised to play a central role in the future of higher education, offering students and teachers valuable tools to support and enhance the learning experience.

B. Students' Satisfaction

The conceptualization of satisfaction can be distinguished in terms of specific transactions or brand-specific experiences [15]. Oliver [15] argues that transaction-specific or brand-specific satisfaction is limited to a single occasion, whereas cumulative customer satisfaction refers to an overall evaluation based on multiple purchase and service consumption experiences over time. Anderson *et al*. [15] assert that customer satisfaction can be understood as a function of both past and specific transactions.

Braun and Clarke [16] define satisfaction as a state experienced by an individual when a performance or outcome meets their expectations. Satisfaction is therefore a function of the relationship between expectations and perceived

performance. In the context of higher education, the concept of satisfaction primarily focuses on the student community. As such, researchers face the challenge of developing a standard definition of student satisfaction, which requires the adaptation of customer satisfaction theories to the educational context.

Satisfaction has been defined as a psychological state resulting from the perception that a performance or outcome meets expectations [16]. Abbasi *et al*. [17] also define satisfaction as an intentional response arising from a sense of contentment. While most studies on student satisfaction draw from the customer satisfaction perspective, researchers still struggle to formulate a consistent definition of student satisfaction. This necessitates the selection and adaptation of appropriate models from customer satisfaction theory.

Although treating students as customers can be controversial, the current market-oriented climate in higher education has led to a moral imperative in which students, as fee-payers, are increasingly seen as "clients" with the right to have their voices heard and their experiences considered.

Student satisfaction, therefore, refers to students' evaluation of their educational experiences and outcomes [18]. Douglas *et al*. [19] identified key dimensions of satisfaction in higher education, including teaching ability, curriculum, institutional image, independence, personal development, faculty support, campus environment, organizational effectiveness, and social conditions.

Other important factors include lecture quality, physical infrastructure, and technological integration [20]. Similarly, factors such as feedback systems, classroom quality, student-teacher relationships, peer interaction, curriculum relevance, library services, and learning tools contribute to overall satisfaction [21].

Various models have been developed to examine student satisfaction in higher education. One widely used framework is SERVQUAL, a validated instrument developed to assess service quality and student satisfaction across five dimensions: tangibles, reliability, assurance, responsiveness, and empathy [22, 23]. Another important tool is the Noel-Levitz Student Satisfaction Index, developed in 1994, which measures satisfaction in areas such as academic experience, support services, faculty interaction, campus environment, and social life—taking into account both the importance and satisfaction levels of these variables.

Elliot and Shin [18] proposed a model that includes campus life, academic advising, campus climate, institutional effectiveness, safety, enrollment procedures, and service excellence. Similarly, Navarro *et al*. [24] found that faculty, teaching methods, administrative support, infrastructure, and enrollment processes are key variables in measuring student satisfaction.

Yusoff *et al*. [25] emphasized factors such as evaluation experience, program content, tuition fees, support services, administrative procedures, faculty quality, helpfulness, feedback systems, and class sizes as major contributors to student satisfaction. In this context, satisfaction is continuously shaped by students' experiences on campus during their studies. Satisfied students are more likely to return to the institution for further studies or enroll in additional programs [26].

The importance of student satisfaction highlights a core concern for higher education institutions: meeting or exceeding student expectations is essential to sustaining institutional success [15]. Faculty performance and teaching methodology are often used by students as benchmarks for their academic development and success. Tutors' expertise, consistency, and adaptability significantly influence student performance, while punctuality and professionalism can enhance tutor preference [27, 28].

Student satisfaction also has broader implications for institutional reputation, student recruitment, and retention. According to the School of Economics (Indiana, 2017), institutions that fail to meet student satisfaction risk losing positive word-of-mouth and may struggle to attract prospective students [29].

Other scholars [30, 31] define service quality dimensions in higher education by combining academic and non-academic aspects, including library resources, program structure, recreational facilities, availability of qualified faculty, and teaching quality. As such, institutions must address these dimensions to ensure students have positive and meaningful learning experiences [32].

In conclusion, in an increasingly competitive higher education environment, student satisfaction is a matter of survival. Drawing on previous studies exploring the relationship between perceived service quality and satisfaction, this research aims to identify and analyze the key determinants of perceived quality in Moroccan higher education institutions and examine their impact on student satisfaction, as reflected in the work of [33].

C. The Impact of Artificial Intelligence Integration on Higher Education: Opportunities and Challenges

1) Opportunities associated with the use of AI

AI systems provide significant support for enhancing academic performance. By analyzing learning data and identifying patterns of success and failure across different student groups, these systems assist teachers in understanding specific student challenges and in delivering meaningful, targeted feedback. This, in turn, allows for timely and effective interventions. Additionally, AI technologies help reduce the workload of teaching and administrative staff by automating repetitive tasks that have traditionally consumed substantial departmental resources. This reduction in manual work frees up time and resources that can be redirected toward teaching, research, and student support services [34].

AI also contributes greatly to the personalization of learning paths. Through AI-driven learning platforms, education is moving away from the one-size-fits-all model towards customized pathways that respond to each student's individual needs. These innovations enhance learning quality, increase student motivation, and boost engagement [35]. For example, some students may prefer visual or interactive content, while others may benefit more from hands-on exercises. Intelligent systems can adapt content and delivery methods accordingly, thereby improving both learning outcomes and academic performance. This personalization also offers substantial benefits for students with learning difficulties, helping to lower dropout rates significantly [36].

AI also plays a crucial role in improving services and enhancing the overall student experience. For instance, chatbots can provide round-the-clock assistance, delivering

instant answers to frequently asked questions related to administrative procedures, course registration, or access to academic resources. By ensuring service availability at any time, AI contributes to a more dynamic, responsive, and inclusive academic environment [37]. Moreover, AI tools can collect and analyze student feedback to offer a comprehensive understanding of their expectations and needs.

This insight allows institutions to identify areas for improvement—such as teaching quality, infrastructure, or student support services—thereby creating a more conducive and student-centered learning environment. The integration of hybrid learning practices—where instruction is delivered both online and in-person—has further increased flexibility for both students and instructors. The potential of AI to support these flexible learning models has become particularly evident since the COVID-19 pandemic. Intelligent platforms can adapt schedules, track progress, and tailor assessments, fostering a more adaptive and inclusive educational experience. In this way, AI is not only transforming e-learning; it is also reshaping the broader landscape of education by introducing pedagogical innovations that were previously out of reach.

2) Challenges and risks of AI uses in higher education

Despite its many advantages, the use of AI in higher education presents major challenges, including concerns about data privacy, equity, and faculty acceptance. The most pressing issue—one that raises considerable alarm—is data privacy. AI systems collect and analyze vast amounts of personal and academic data, such as grades, online behaviors, and learning styles. These types of information are highly sensitive and must be handled with strict confidentiality to prevent misuse, biased judgments, or unethical practices [38]. There is a growing concern over the transparency of AI algorithms and the types of data they use. This lack of clarity can lead to fluctuating system performance and, more worryingly, mistrust in how the data is collected, processed, and interpreted. This raises serious questions about the reliability and sensitivity of the data, as well as the risks involved when such data is released or utilized [38].

Moreover, the growing reliance on AI can exacerbate existing inequalities in access to technology. In many regions, not all students have consistent, real-time internet access or the devices needed to fully participate in AI-driven learning environments. In some cases, the infrastructure to support such technologies simply does not exist. This digital divide creates a stratified learning landscape, where students with better access benefit more, while others are left behind. These disparities run counter to the ideals of inclusion and equity that underpin the principles of open and distance learning [39].

Resistance to AI integration—particularly from faculty—is another barrier to its widespread adoption. Some educators may view AI as a threat to their teaching autonomy or as a tool that could devalue their pedagogical expertise. Additionally, AI-based approaches require time for educators to adapt, and necessitate a critical reassessment of the effectiveness of traditional teaching methods.

This transition demands not only proper training but also institutional support to help teachers understand that AI is a complementary tool rather than a replacement for their skills and experience [40]. Without this support, the shift to AI-enhanced teaching may create friction within academic teams and undermine the success of digital learning initiatives.

In addition to these structural and practical challenges, AI also presents ethical dilemmas. Decisions made by AI systems can carry inherent biases that affect student outcomes and perceptions. For instance, algorithms trained on historical data may unintentionally reinforce biases against certain groups based on race, gender, or cultural background [41].

Such algorithmic bias raises serious ethical concerns about the fairness and neutrality of AI-based decisions in education. These concerns have prompted calls for stricter regulations and oversight to ensure that AI technologies are implemented in ways that minimize discrimination and uphold equity and justice in educational settings.

Finally, as AI becomes increasingly embedded in various sectors—including education—there is growing concern that overdependence on such technologies might hinder the development of essential human skills. While AI can enhance certain cognitive abilities, it does not necessarily promote critical thinking, problem-solving, or independent learning—skills that remain fundamental in professional and academic environments. Therefore, it is crucial that higher education institutions avoid over-reliance on AI and continue to cultivate the soft skills and human qualities that are vital for students' holistic development.

3) Privacy concerns in AI systems and impact on education policies

In recent years, concerns about data privacy in AI systems have been widely discussed, particularly in the context of higher education. As AI technologies collect vast amounts of personal and academic data, including student performance, behavior, and preferences, questions surrounding data security and confidentiality have become crucial. Several studies, such as this by Lampou [38] emphasize the ethical implications of using AI in educational settings, particularly with respect to data privacy. These concerns raise the issue of how educational institutions safeguard students' personal data against misuse, data breaches, or unethical use. A growing body of research points to the need for clearer policies that govern data storage, consent, and the transparency of AI systems used in academia. Furthermore, universities must develop policies that address students' concerns about the confidentiality of their personal data, ensuring that AI systems do not infringe on students' privacy while improving educational outcomes. Institutions must find a balance between utilizing AI to enhance learning experiences and safeguarding students' rights to privacy.

In addition to privacy concerns, algorithmic bias remains a significant issue when implementing AI in educational contexts. Bias in AI systems can lead to unfair outcomes, reinforcing existing inequalities or creating new forms of discrimination. Research by [40, 41] highlights how algorithmic bias can manifest in educational tools, leading to skewed academic assessments, unequal access to resources, or discriminatory treatment of students based on gender, race, or socioeconomic status. These biases can undermine students' trust in AI systems, which is crucial for successful adoption. Educational institutions must recognize and mitigate these biases by implementing fairness-aware algorithms and providing transparency in how AI decisions

are made. Universities must also create ethical frameworks to guide AI development and use, ensuring that these systems are both effective and equitable. Addressing these concerns is essential not only for the ethical deployment of AI but also for maintaining students' trust in the integrity and fairness of AI-driven educational systems.

4) Research gap and positioning of the study

Although past research has investigated technological benefits of Artificial Intelligence (AI) in higher education, including enhanced learning experiences, better student learning results, and increased process efficiency [1, 7], little attention has been paid to the impact AI will have on student satisfaction. The majority of the literature has examined how AI will personalize the learning experience and improve administration for the institution, but they have glossed over the subjective experience of student satisfaction, especially in developing nations like Morocco. The research indicates that artificial intelligence may be a valuable resource for student engagement in the form of intelligent tutoring systems, generative AI for educational purposes, and learning models that are based on data [2, 14]. However, there is little research that looks at how students perceive and evaluate AI process and satisfaction factors, including institutional trust and data privacy. This study will address the gap in the literature by exploring the multiple factors of AI integration on student satisfaction, academic performance, institutional image, and issues relating to data privacy. These factors are becoming increasingly salient as AI emerges and continues to permeate the education space.

In addition, although there are studies that have found institutional reputation and student satisfaction through quality of service [19, 20], few studies have examined how AI adoption is correlated to these perceptions. As higher education institutions embed AI into their educational infrastructure, students may associate that technology with institutional value and modernity, which may also affect their satisfaction. Nevertheless, feelings of mistrust about the use of data and of having decisions made about them by technology create ethical dilemmas that may counter some of the pleasure and satisfaction AI may build with higher education institutions, as students may lean towards scepticism instead of trust [38, 41]. This study will address this gap by assessing empirically how the dual facets of AI as an improver of educational quality and as an ethical issue impacts student satisfaction in Moroccan higher education institutions. By addressing this intersection, the research aims to inform educators, policymakers, and leaders within the institutions about the ethical responsibility to balance ethical practices while encouraging innovative education.

III. Methodology

A. Data Collection and Sample

In this quantitative study, the researcher used an online survey as the data collection tool to assess how students' satisfaction is affected by artificial intelligence. The reason for selecting this method is fairly rightfully justified. First, such a method gives remarkable convenience to the researchers and the participants alike [42]. It allows researchers to collect fast and easy responses from a wide range of people, which is mainly significant for taking representative results in a short time. Secondly, online surveys eliminate the geographic barrier because the respondents can fill out the questionnaire from anywhere, they want and at their own convenient time. However, despite their advantages, online surveys have some limitations. They may suffer from selection bias, as only those with internet access can participate, potentially excluding certain groups. Additionally, the response rate may be lower, leading to non-response bias. While anonymity encourages honest answers, it can also make it harder to verify the accuracy of the responses. These factors should be considered when interpreting the results [42].

To address these limitations, Random sampling was adopted as the main method in the selection of participants. Randomly selected students from a diverse database formed to develop more balanced representation of the target populations were studied in their respective demographic factors, e.g., age, gender, academic level, and field of study. These criteria, however, were meant to guarantee that respondents had relevant experience with technologies in their academic tenure, critical for addressing the research objectives.

From the surveys distributed, 956 students took an online survey giving an ample size for statistical conclusions. This size will provide adequate statistical power for the regression analyses, set to investigate AI chatbot use and student satisfaction from cognitive, emotional, and behavioural aspects.

For this study, the HESQUAL scale [43] was employed to measure student satisfaction in the context of artificial intelligence (AI) integration in higher education. The HESQUAL scale, a validated tool for assessing service quality in educational settings, consists of 26 items divided into five dimensions: Academic Environment, Reputation, Administrative Service, Campus Facilities, and Teaching and Learning. The scale uses a 5-point Likert scale, where respondents rate their agreement with statements related to various aspects of service quality. Although originally designed to assess general educational service quality, the scale has been adapted for this study to include questions specific to students' perceptions of AI's impact on academic performance, institutional image, and overall satisfaction. This adaptation enables a comprehensive analysis of how AI influences the factors that contribute to student satisfaction. The HESQUAL scale is a well-established instrument, widely used and validated in the higher education context, ensuring reliable and valid measurements for this study.

A maximum error of 4.06% and a 95% level of confidence with $p \leq 0.5$ was assumed. Control measures were, however, employed in the course of developing the survey to mitigate the effects of the common bias in the case of non-response and common-procedure bias. Late respondents were used as a proxy for non-responders. With statistical tests, there were no key differences between the responses of initial and follow-up respondents. Harman's single-factor test [44] was performed to evaluate the presence of common method bias. The factor analysis disclosed three clearly separated factors with none accounting for a considerable amount of variance [45]. These observations suggest that common method bias was not a significant concern in this study.

B. Hypothesis

H1: The use of Artificial Intelligence in higher education would lead to great academic performance among students that would consequently lead to satisfaction.

The central premise to be investigated is whether the perception of AI being assistive to learning would add more satisfaction to the student life cycle, be it through personalized assistance in learning experiences or AI-enhanced teaching practices assuming that wherever AI helps students to perform better, student satisfaction with education is raised. This hypothesis is characterised by a cognitive dimension of satisfaction in that, if there are indeed improvements in academic performance, they will contribute to student satisfaction with the educational process.

H2: The use of Artificial Intelligence in higher education positively impacts the institution's image, which consequently enhances the satisfaction of students.

The thread of hypothesis investigates if a student would or could consider an institution's endeavour to have established a reputation for innovation and modernization by virtue of being reasonably more content with their academic experience. The premise is to trace how an advancement in technology could be associated with, in a more modern, technologically-developed institution, a change in students' perceptions for prestige and quality of such an educational habitat. This component, therefore, is expected to heighten the level of satisfaction toward the institution as a whole.

H3: Concerns about data privacy related to the use of artificial intelligence in academic settings decrease students' overall satisfaction.

This hypothesis investigates whether those students, amid their thoughts of confidentiality and security about their personal data in certain AI applications such as chatbots or academic performance tracking systems, have satisfaction problems. In a higher education institution with a large volume of sensitive student information, fears of insecurity and scandal can dent students' trust in the institution's use of AI whereby they will eventually decrease their general satisfaction with the integration of AI technologies into their academic pathway. This hypothesis reflects the ethical dimension of AI use in education and outlining the security tenets.

IV. Analysis and Results

A. Descriptive Statistics

Age distribution: The age distribution of respondents shows that a very large majority of them-90.1%-range between 18 and 25 years of age (See Table 1). This fact is consistent with the demographic profile of the primary population studying through higher education, where undergraduate and early postgraduate students dominate. The concentration of this age group emphasizes its relevance in this context of studying the effects of AI tools on academic performance and satisfaction since most likely these are the very students making the big number of users of educational technologies and tools.

In the 26–35 age group, only 5.9% of respondents belong. Most of these would then belong to the category of mature students returning to education or pursuing advanced studies like master's or doctoral programs. Very few are those below 18 years of age (2.2%), which could mean that these students would most probably be those enrolled in preparatory courses or younger undergraduates. Representation of respondents aged 36 and above is slightly lower (i.e., 1.8%) and could mean that AI usage and its perceived impact is of little concern or accessibility in that demographic. Such findings suggest that although they might reflect the experiences mainly of younger students, additional studies could address whether older students present distinct challenges or opportunities for AI use within educational contexts.

Table 1. Age distribution

		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	<18	21	2.2	2.2	2.2
	18–25	860	90.0	90.1	92.3
	26–35	56	5.9	5.9	98.2
	36–45	14	1.5	1.5	99.7
	More than 46	5	0.3	0.3	100.0
	Total	956	100	100.0	

Gender representer: Female respondents making up 67.9% of this sample, compared to only 32.1% male respondents-as shown in Table 2. The significant disproportionality of the gender distribution among the respondents reflects the general enrollment trend in Moroccan higher education. In some fields of study, particularly in public institutions, women allegedly outnumber men. It could also indicate a gendered dimension to interest, awareness, and/or adoption of AI tools in education.

This gender gap is important in interpreting the findings, as the perspectives and experiences of females would dominate the data obtained. It, in turn, opened rooms for further exploration of how gender influences perceptions of AI's benefits and risks. The underrepresentation of male respondents also raises questions about whether institutional or societal factors affect their engagement with these technologies.

Table 2. Gender distribution

		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	Men	307	32.1	32.1	32.1
	Women	649	67.9	67.9	100.0
	Total	956	100.0	100.0	

Sector Representation: The overwhelming number of participants are from public-sector higher education

institutions (89.2%). Of them, only 10.8% are with private institutions (See Table 3). This disparity mirrors the general educational panorama in Morocco. In it, public universities are in the majority and host a more significant number of students. The public institutions tend to have a greater exposure to AI-induced tools due to their scale and governmental support and thus form a focal point for research into AI's integration within the academic ecosystem.

Consequently, the lesser number of students representing the private sector were probably less informed about or more disadvantaged in the use of AI technologies. This may speak to different priorities of the institution, distribution of resources, or even the disposition of their setting for the implementation of AI within teaching and learning. This discrepancy in numbers again calls for caution in the generalization of results, as the experience of private-sector students may differ a lot. Further studies might research whether private institutions could differently employ AI, if they offer students even more personalized applications, and how these may affect their satisfaction.

Table 3. Sector distribution

		Sector			
		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	Public	853	89.2	89.2	89.2
	Privé	103	10.8	10.8	100.0
	Total	956	100.0	100.0	

B. Scale Reliability

The scale indicating a Cronbach's alpha of .709 based on all four items "Perfoacadémique" (academic performance), "ImageEtab" (institution's image), "Menachum" (threat to humans), and "Confidendonnées" (data confidentiality) (Refer to Table 4). The level of internal consistency indicated by this figure indicates that, in typical conditions, internal consistency, as inferred through Cronbach's alpha, is primarily validated between values of .70 and above; this means the scale can generally be used to describe sound scales for use in social science research. The alpha coefficient remained consistent at .710 based on standardized items, offering further proof of the scale's reliability. The inclusion of all of these variables together on the scale shows these measures each of all three contained great value to the common underlying construct concerning perceptions toward artificial intelligence in education.

Table 4. Reliability statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of Items
0.709	0.710	4

Inter-Item Correlation Matrix: The inter-item correlation matrix depicts the relationship among the different items used in the scale.

"Perfoacadémique" and "ImageEtab" correlate highly (r = 0.759) meaning that students that see AI enhancing academic performance are likely to consider that it will improve the institution's image (Refer to Table 5). The correlation with "Menachum" is weaker with "Perfoacadémique" (r = 0.159) and "ImageEtab" (r = 0.183) suggesting that the concern of AI escapes human nature does not strongly correlate with the perceived benefits in performance or institution image. There are moderate correlated relationships for "Confidendonnées" with "Perfoacadémique" (r = 0.336) and "ImageEtab" (r = 0.328), signifying that concern for data confidentiality is somewhat related to perceived benefits of AI in education. As for "Confidendonnées", the strongest correlation observed is with "Menachum", being r = 0.510, indicating that the privacy concerns are associated with the broader issues about the influence of AI on humanity. These correlations give a good idea on the dimensions of the scale: items like academic performance and institutional image are much more closely connected to each other than to others such as "Menachum", which captures distinct dimensions of perceptions on AI.

Table 5. Inter-item correlation matrix

	Perfoacadémique	ImageEtab	Menachum	Confidendonnées
Perfoacadémique	1.000	0.759	0.159	0.336
ImageEtab	0.759	10000	0.183	0.328
Menachum	0.159	0.183	1,000	0.510
Confidendonnées	0.336	0.328	0.510	1.000

Item-Level Statistics and Contribution: The item statistics provide some revealing information regarding the contribution of each variable.

"Perfoacadémique" have 0.563 corrected item-total correlation, being a strong constituent of the scale. With a Cronbach's alpha of 0.602 when reversed, "ImageEtab" followed the same principle. However, in its absence, the alpha further drops to 0.596. The corrected item-total correlation for "Menachum" is fairly low with a value of 0.343; hence, it contributes only weak support to overall reliability. Following the removal of this variable, the alpha would increase up to 0.736, suggesting that its coherence with other scale items is not as strong. Removed "Confidendonnées" raised alpha to 0.635 with lower contribution by moderately corrected item-total correlation of 0.515 although its involvement with other items is marginally moderate. A reliable scale is available to analyze such students' perceptions of AI in education. Having a strong correlation, "Perfoacadémique" and "ImageEtab" substantiate the premise that students connect the application of AI expertise to several institutional and academic contributions. The moderate connection for "Confidendonnées" with all other items highlights the fact that it represents one ethics dimension while "Menachum" brings in the much-needed contrast by giving room for a better description of the negative perceptions; however, it ends up not being strongly linked to the other items.

V. Hypothesis Analysis

H1: The use of Artificial Intelligence in higher education

would lead to great academic performance among students that would consequently lead to satisfaction.

Regression analysis is the assessment of the relationship between the perceptions of students on the AI facilitating improvements in a student's performance (Perfoacadémique) and the general satisfaction toward higher education (Satisfaction). The Model Summary R-squared value is 0.020 thereby explaining that 2% of variance in satisfaction among students has arisen directly from their perceptions of AI improving students' academic performance (Refer to Table 6). Although this value indicates a slight explanatory value associated with the model, it is statistically significant by means of ANOVA results ($F = 19.035$, $p < 0.001$).

Table 6. Academic performance regression

ANOVA[a]						
Model		Sum of Squares	Degrees of Freedom (df)	Mean Square	F	Sig.
1	Regression	46.578	1	46.578	19.035	0.000[b]
	de Student	2334.404	954	2.447		
	Total	2380.982	955			

a. Dependent Variable : Satisfaction
b. Predictors : (Constant), Perfoacadémique

The regression coefficients offer a further, more detailed explanation. The unstandardized coefficient indicates that for a unit increase in the perception of academic performance enhancement, satisfaction would increase by 0.184 units. The standardized beta coefficient indicates that the relationship among various factors under consideration is of weak to moderate strength $\beta = 0.140$. The t-value confirms that the independent variable in the regression is statistically significant predictor ($t = 4.363$, $p < 0.001$).

Satisfaction among students concerning AI's role in improving their performance, although being limited in the strength of effect, highly contributes to satisfaction: This result shows that the overall satisfaction among students is significantly influenced by the AI perceptions regarding improved academic performance. These allege full agreement with the prior studies which showed that AI has the ability to positively affect students' academic performance and thus satisfaction.

There are researches that show that AI enhancement of learners' academic performance. To use an example, AI provides personalized learning experiences through its adaptive learning support systems, thus leading to improved academic performance [7]. Such individualized interventions most likely will lead to a sense of achievement in students and hence to satisfaction in the educational experience [1].

The lower the value of R-squared, the more an indication it is that there are other factors apart from academic performance that are able to account for some variation in satisfaction. According to [19], other possible determinants include the attention given to students by the faculty, organizational effectiveness, and the campus environment, thus augmenting the proposition that while academic performance per se is extremely important, it actually operates within a larger ecosystem of factors solving the problem of satisfaction.

Moreover, putting educational satisfaction into the framework of cognitive satisfaction, a positive coefficient is consistent with past research in that higher academic performance leads to a more positive evaluative rating on the part of the student. Such personalization of AI-supported learning, through adaptive tests and real-time feedback [14], seems to have further contributed to this positive perception, as students feel far better supported in their learning.

In short, evidence within these regression results would seem to endorse Hypothesis 1: students who view AI as assisting them in achieving better academic performance are more satisfied. However, the overall small effect size is reflective of a complex nature of satisfaction brought about by several factors more pointedly driven to satisfaction than higher academic achievement. This is in keeping with a fairly larger body of literature, which suggests that while AI offers potential in improving educational experiences, their effect should be thought of as supplementary rather than wholly transformative. Institutions embarking on using AI in building satisfaction must thus embrace the utmost integrative nature of AI, alongside other curricular inputs, rather than isolate and disjoint it.

H2: The use of Artificial Intelligence in higher education positively impacts the institution's image, which consequently enhances the satisfaction of students.

Establishing a Regression-Anaylsis evaluating student perception on AI-enhanced image of the institution vis-a-vis overall satisfaction with Educational Experience (satisfaction). R-square value of .032 indicates that 3.2% of the changes in student satisfaction are sanctioned by the image of AI enhancing the institution (Refer to Table 7). It can be argued that this is a meager but sufficiently significant power of explanation, as endorsed by the ANOVA results ($F = 31.771$, $p < 0.001$).

Table 7. School Image regression

ANOVA[a]						
Model		Sum of Squares	Degrees of Freedom (df)	Mean Square	F	Sig.
1	Regression	76.739	1	76.739	31.771	0.000[b]
	de Student	2304.244	954	2.415		
	Total	2380.982	955			

a. Dependent Variable: Satisfaction
b. Predictors : (Constant), ImageEtab

The analysis illustrates that the unstandardized coefficient ($B = 0.235$) indicates that with every one-unit increase in the perception of AI improving the institution's image, student satisfaction increases by 0.235 units. The standard beta

coefficient believes there is a weak-to-moderate positive relation between the variables (β = 0.180). The t-value validates the model such that obviously there is a positive and significant impact on the student satisfaction with $F = 31.774$, $p < 0.001$.

This finding is that the accepting of the hypothesis means institutions project: students viewing the entire institution in terms of image must feel satisfied to be enrolled, although the effect is slight. Here, the prior literature accords with the finding where institutional image helps establish student satisfaction. The mere adoption of out-of-the-ordinary technologies like AI serves to pronounce styles of change and modernization within institutions and manages to enhance the quality perception amongst different institutions out there to capture the market (Saaida, 2023). This is important considering that schools in competitive higher education settings outsmart each other through sophisticated means to woo prospective and already students.

Another result of interest is the positive and significant coefficient value (B-value=0.235), which implies that AI will assure students that their institution is a trendsetter and, thus, lends credence to research redefining the reputational gains of adopting AI-driven platforms and tools [34]. This gives a new outlook at the institution, while [37] observe a more conducive living environment for the students.

However, the relationship between institutional image and student satisfaction is low, as reflected in the R-squared value of 0.032. The other significant factors found to be contributing toward overall satisfaction are: teaching quality, campus environment, and support services [19]. This shows that AI-based image enhancement may have an impact on satisfaction, but this will work best if remedial activity in the other sectors is combined.

The findings are suggestive of cognitive and effective levels of satisfaction. A prestigious image of the institution and positive interactions would create a solid foundation for the students' pride and trust and, consequently, strengthen their satisfaction from their academic experience [18]. Institutions, therefore, create a differentiation pull with the demonstration of modernization through AI in what is becoming an increasingly competitive sphere of higher education.

Although the findings support Hypothesis 2, the weak-to-moderate value of the beta coefficient (β = 0.180) indicates that institutional image plays a supplementary role toward the attainment of satisfaction. This might probably be justified by the fact that AI adoption in higher education is still evolving, thus its full possibility in transforming perceptions has not yet been realized [2]. The perception of the institutional image may also differ across languages among several other sorts of students by different demographics or programs. For example, students engaged in technology studies may perceive AI-enhanced integration as more valuable than other more traditional fields. This variability implies the need for tailored communicative approaches as suitable channels for promoting AI benefits to diverse student demographics.

Another consideration is that while AI raises image, things like personal data privacy dread or apprehension of change among faculty could temper its further overall impact [38, 40]. Institutions must address these barriers first in order to reap full rewards from AI for improving both reputation and satisfaction.

Hypothesis 2 is supported in the sense that general perception of AI as a driver of institutional innovation explained positively student satisfaction. Though not strong enough, the result justifies the effort in using AI to enhance the institution's image and win huge trust and pride from its students.

Satisfaction, in turn, would require integrating AI acceptance with the general improvement of teaching, infrastructure, and services that facilitate the students in furthering their education. Blended, the combination of AI has to ensure that it will raise the reputation of the institution and give tangible benefits to the academic experiences of the students.

H3: Concerns about data privacy related to the use of artificial intelligence in academic settings decrease students' overall satisfaction.

The regression looked at the impact students' satisfaction could have through concerns for data privacy. The model summary indicates that the coefficient of determination is about 0.051, which means a mere 5.1% of the variability in the student satisfaction could be explained through privacy concerns in using artificial intelligence. The limited explanatory power was further validated through an ANOVA analysis ($F = 51.551$; $p < 0.001$), which reported that the model is statistically significant (See Table 8).

Table 8. Data privacy regression

ANOVA[a]

Model		Sum of Squares	Degrees of Freedom (df)	Mean Square	F	Sig.
1	Regression	122.064	1	122.064	51.551	0.000[b]
	de Student	2258.918	954	2.368		
	Total	2380.982	955			

a. Dependent Variable: Satisfaction

b. Predictors: (Constants), Confidendonnées

The positive correlation reveals a moderate relationship between privacy concerns and student satisfaction, with R = 0.226. However, the adjusted R-squared is very low (0.050), indicating that the model's explanatory power is limited and could only be marginally improved with further adjustments. The standard error of estimation, recorded at 1.539, reflects the degree of presumed precision in the satisfaction scores derived from privacy considerations.

These findings suggest that concerns regarding data privacy significantly influence students' satisfaction with AI use in higher education. Ethical and security dimensions thus emerge as vital components in shaping students' perceptions. The results also highlight a growing awareness and sensitivity toward the ethical implications of AI deployment in education.

Data privacy is a core issue, as students may fear the misuse or mishandling of their sensitive academic and personal data, potentially leading to a loss of trust in both the

AI systems and the institutions deploying them. This underscores the importance of transparency and responsible AI governance to ensure a credible relationship between institutions and their stakeholders [38].

Students form their opinions of AI not only based on performance and institutional image, but ethical concerns—particularly those related to privacy—carry a unique influence. This is because privacy directly affects trust, which is a prerequisite for student satisfaction [38]. The findings align with existing literature that raises concerns over the potential misuse of data by or for AI systems.

The absence of clear data privacy protocols or ambiguous communication about how student data is used can heighten student anxieties, thereby reducing satisfaction [2]. These concerns may include fears of unauthorized access to academic records or doubts about the ethical nature of predictive algorithms, leading students to question whether institutions truly have their best interests in mind.

While Hypothesis 3 is supported—acknowledging a negative relationship between privacy concerns and satisfaction—the effect size is minimal (R-squared = 0.051), indicating that privacy concerns alone do not fully explain variations in student satisfaction. This confirms broader findings that student satisfaction is a multidimensional construct, influenced by academic quality, environmental factors, and personal experiences [19].

Furthermore, the impact of privacy concerns may vary depending on demographic or cultural factors. For example, tech-savvy students may be more aware of data risks and thus expect greater institutional accountability, whereas other students might exhibit less concern or awareness. These differences point to the need for further research to explore how such variations influence the relationship between privacy and satisfaction.

A recommended course of action would be for institutions to actively respond to student concerns. Some studies suggest that implementing robust data protection mechanisms and offering transparent information about how AI systems work may help reduce privacy-related anxieties [40]. This could not only alleviate student fears but also foster greater institutional trust, thereby enhancing overall satisfaction.

In conclusion, the regression analysis provides strong support for Hypothesis 3, which posits a negative relationship between privacy concerns and student satisfaction regarding AI use. Although the overall statistical impact is limited, the findings underscore the importance of addressing ethical implications—especially privacy—in AI implementation. Building solid data protection frameworks and maintaining transparency are essential for cultivating student trust and improving their educational experience.

VI. Conclusion

This research is among the few recognized efforts to explore the multidimensional impacts of artificial intelligence on student satisfaction within the context of higher education in Morocco. It also sought to establish relationships between AI-driven improvements in academic performance, institutional image, and levels of concern regarding data privacy. In addition to highlighting the opportunities and challenges of using advanced technologies in education, the findings suggest that AI can significantly enhance personalized learning experiences, which in turn strengthen institutional reputation. Nevertheless, ethical concerns—particularly regarding data privacy—remain a top priority. Based on these findings, a blended approach is recommended, one that leverages the benefits of AI while carefully managing associated risks.

This study contributes to the existing literature in several ways. Firstly, it addresses a theoretical gap by empirically examining the relationship between AI adoption and student satisfaction—an area that has received limited attention, especially in the Moroccan higher education context. Secondly, it offers actionable insights for institutional leaders and policymakers regarding the key factors that influence student satisfaction, and suggests strategies for the effective and ethical integration of AI. More broadly, the study reinforces the importance of transparency and trust in ensuring a positive student experience in AI-enhanced educational environments.

Moreover, the findings indicate that integrating AI in higher education can create opportunities for more personalized learning and improved academic performance. However, educators and institutions must remain vigilant regarding ethical challenges—particularly data privacy and algorithmic bias—which can shape student perceptions and undermine trust in AI systems. Institutions must therefore establish clear policies for AI use, ensuring robust data protection. Educators should also receive proper training to understand AI technologies, their impact on learning, and how to address the ethical issues they raise. These practical measures can help maximize the advantages of AI while minimizing its risks.

Despite its contributions, this study has certain limitations. As a cross-sectional study, it captured perceptions at a single point in time, whereas experiences and opinions may evolve as AI technologies become more integrated into educational settings. Additionally, the study focused solely on Moroccan higher education, limiting the generalizability of the findings to other contexts with different technological infrastructures and cultural dynamics. Lastly, while the quantitative approach provided valuable statistical insights into student satisfaction and trust, the lack of qualitative data may have limited the depth of understanding regarding the nuances of students' experiences.

Future research should consider longitudinal designs to examine how student satisfaction and perceptions of AI evolve over time. Comparative studies involving different regions or countries could also enhance the generalizability of findings. Moreover, integrating qualitative methodologies—such as interviews or focus groups—would offer deeper insights into the specific factors that shape student satisfaction and trust in AI-integrated education.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

IA conceptualized and designed the study, performed the literature review, and wrote the initial manuscript. DI contributed to the research methodology, data collection, and analysis. BL contributed to the interpretation of data, refined

the manuscript, and ensured the accuracy of statistical analyses. All authors reviewed and approved the final version of the manuscript.

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