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Evaluating the Impact of Integrating Artificial Intelligence in Translation Studies: The Case of Translation Postgraduate Programs in Morocco

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Abstract

Over the past decade, artificial intelligence (AI) has revotionalized education through major breakthroughs in deep learning and big data. Within translation studies (TS), AI offers new instructional opportunities to establish solid pedagogical implications for teaching and learning. Driven by the significance of AI tools, educators are advised to develop new digitalized teaching methods to enhance translation teaching practice. Therefore, TS curricula need to be remodeled and teaching methods re-contextualized to align with the needs of 21st century translation industry. This paper investigates the current application of AI in translation teaching in higher education, with a focus on its integration into postgraduate programs'curricula. The study involved 254 participants, including 70 professors and 184 postgraduate students from Moroccan universities. Findings show that over 72% of respondents support AI integration, 63% confirm its positive impact on academic performance and translation competence, and 67% express readiness to embrace AI in teaching and learning practices.

KEYWORDS: AI, Translations Studies, postgraduate Programs

1 Introduction

Higher educational system in Morocco has undergone considerable reforms to keep pace with the latest updates in the digital world, especially the rapidly evolving AI (Tazi & Ait Lahcen, 2022). Among the most significant steps that have been taken as part of this transition within Moroccan higher education institutions is the gradual integration of AI in the pedagogical practices in many universities. This is acknowledged as a paramount leap forward in the Moroccan higher education and marks the initiation towards the digitalization of the system.

In the context of this study, TS is one of the disciplines that has had a solid relationship with technology and machine translation (MT) that dates back to 1950s1 (Hutchins, 2005). Therefore, in the midst of the current conditions, there is a pressing need to fully integrate AI in TS programs in Moroccan universities to join the worldwide trend and match the modern translation industry requirements.

This incorporation holds promising potential to make a very far-reaching change in the teaching paradigms and usher in new curricula and methodologies that will transform the discipline of TS through leveraging a wide range of AI tools. Furthermore, the intersection between TS and AI paves the way to efficient and actionable pedagogical procedures, which offer a plethora of benefits for the future translators and TS researchers in terms of translation competence that aligns with the modern marketplace and research field.

This collaboration also ignites a burst of creativity among educators and students in the TS higher education programs thanks to the diverse learning pathways at their disposal in the automated environment. For students, it creates personalized learning experiences through adapting the curriculum content to meet their future needs as translators and improve their learning outcomes (Chen, & Peng, 2020). For educators, it offers a digitalized pedagogical package that allows teaching students to improve their technical and translation competence and evaluate their progress through automated assessment and grading platforms [5]. Therefore, it is conceivable that this incorporation plays a pivotal role in enhancing future translators' performance in classroom settings and improving their technical and translation competence.

2 Literature Review

2.1 Stakeholders' Perspectives towards the Integration of AI in TS

The advances that AI technology has witnessed in the last decade significantly contributed to enhancing the quality of MT (Johnson et al, 2017). Therefore, its presence in the realm of TS has become necessary for its proven potential to equip future translators who are pursuing their studies in postgraduate programs with adequate skills to cope with the tasks of translation in the workplace upon graduation. Also, AI is capable of transforming the face of TS in the tertiary level (Hannele et al, 2023; Tao & Wang, 2022). In their study, Bo and Li (2023) note that AI has the potential to transform education paradigms, through shifting learning and teaching styles of translation.

According to Vázquez-Parra and others (2024), students show a high acceptability to adopt AI in their studies. In another study, the views of students are divided over this integration; some are optimistic because of the opportunities it offers (Kearns, 2019) and others hold that AI may negatively influence the quality of their translations due to its misinterpretations (Asscher, 2023). As for educators' perspectives towards this incorporation, some view it as a great decision that can reshape the pedagogical approaches to teaching translation in accordance with the evolving industry demands; others hold that this technology may have a negative impact on students' skills and abilities and it only improves quality and accuracy of translations if it is appropriately manipulated in the process of translation so as to make the best use of its strengths and limit its shortcomings (O'Brien, 2016).

2.2 Hybrid mode of Instruction: Teaching and Learning Implications

In the realm of TS, leveraging AI and MT tools in the postgraduate TS programs opens a wide range of compelling instructional opportunities (Muñoz Basols et al, 2023). This allows students to harness the powers of this technology to enhance their capabilities within a replicated real-world translation environment, which implies that this interdisciplinary collaboration holds promising opportunities for both educators and students in TS postgraduate programs, offering new teaching and learning models in a hybrid or multimodal environment to increase students' performance and productivity and lower educators' workload. This hybridity will put an end to the outdated teaching modes of instruction because of being time-consuming, restricting interaction and motivation in classroom settings and allowing little practice.

While the traditional methods heavily draw on explanation and commentary on the students' translations, the new teaching modes, based on integrating AI, will give more room for students to engage creatively, stimulate their motivation, offer ground for interaction, communication, constructive feedback and peer evaluation, and most importantly allow to acquire the requisite skills that enables them to navigate the rapidly evolving updates in the translation marketplace (Bo & Li, 2023). This means that these innovative approaches offer a top-notch and sophisticated teaching and learning environment, where AI is given an elevated position to play a pivotal role to replicate the evolving translation market (Bo & Li, 2023; Borja Albi & Martínez-Carrasco, 2019). Furthermore, through designated AI-based platforms, they acquire the requisite knowledge prior to the scheduled sessions instead of relying on professors as a source of information. In-class time will be devoted to practicing post editing to improve efficiency and speed in translation processes (O'Brien, 2016). All the assignments will be digitalized and students will receive feedback on their works through these platforms (Allam et al, 2023).

However, because of its weaknesses, an abusive use of AI in the translation process is not recommended because AI-based translations often contain contextual and cultural misinterpretations (Asscher, 2023). For this reason, AI-driven tools are fully useful provided that the human factor is in control. Therefore, the best use of these tools is to pair them up with human intelligence so as to achieve high quality translations. Ultimately, just like human intelligence, AI has strengths and weaknesses (Bathgate, 2023). Accordingly, before embarking on any application of this technology, it is imperative to critically analyze the tools, which are intended to be integrated whether in teaching or learning translation, to fully benefit from the opportunities they offer and wisely confront the challenges (Baker, 2011).

2.3 Embracing AI in TS: Ethical Considerations

Given this hype of AI in the domain of translation, its integration in TS postgraduate programs within higher education in Morocco has become ubiquitous and no longer a matter of choice in order to keep pace with the international updates in the translation industry. The collaboration between AI and TS in higher education is fundamentally contingent on the willingness and readiness of the major stakeholders, including educators and students, to embrace this technology in teaching and training future translators to equip them with skills that are attuned to the requirements of the modern translation industry.

It is also essential to take into consideration their familiarity with this technology and the way to use it, which obviously requires training and availability of the necessary equipment, to ensure a smooth transition and optimization of teaching approaches and curricula of TS postgraduate programs and efficient accessibility for students to attain the intended learning outcomes (Chaudhry & Kazim, 2022; Hattie, 2009 ; Luckin, 2016).

All in all, this integration relies on the major stakeholders' willingness and readiness to adopt AI as part of their teaching practice, which requires keeping pace with the constant updates of the latest technologies used in the field of translation and the requirements of this continuously evolving industry. On the other hand, as being the center of the teaching and learning

process, students should also be acquainted with AI tools used in the field of translation and the way to use them effectively so that they could acquire the technical competence to practice translation in a digitalized environment.

3 Research objectives

This article aims to investigate the impact of AI on TS postgraduate programs in Moroccan universities and its potential to improve the quality of these programs. It is based on the perspectives of the main stakeholders towards the integration of AI and its potential to transform the teaching and learning paradigms of translation in the postgraduate programs in Moroccan universities. It also examines the potential of AI to enhance the academic performance and modern translation competence and investigates the readiness and willingness of the main stakeholders in TS postgraduate programs to adopt AI in translation teaching and learning.

4 Research Hypotheses

The quality of TS postgraduate programs is the dependent variable and the integration of AI tools is the independent variable. Based on these variables, three hypotheses are proposed:
H1: The integration of AI has the potential to transform TS programs in universities.
H2: The improvement in the academic performance and translation competence is strongly correlated with the integration of AI tools in TS postgraduate programs.
H3: University educators and students feel adequately prepared and open to embrace AI-based tools in a multimodal instruction mode.

5 Methodology

In order to reach various stakeholder groups and collect enough data to make informed decisions, surveys and quantitative research methods were adopted in this study. The groups that were selected for their significance for this study are university professors who teach translations studies within MA programs in different departments, including French, Arabic and English studies and students who are pursuing their studies in these programs. This study was conducted in different universities in Morocco.

A sample of 254 participants, which were taken from the study community, were surveyed. This study includes 70 university educators (27.56%) of the study population) and 184 students (72.44% of the study sample) in postgraduate programs in TS in different departments at faculties of Arts and Humanities in Morocco. A google form survey in English and Arabic (translated version) was distributed online to the study sample members to test the hypotheses of the study.

The questionnaire was electronically distributed to the respondents. It constitutes of five main sections. The first section is for getting demographic details of the respondents. Section two contains two questions and section three 3 questions that were designed according to Likert scale (5 for strongly agree (SA) – 4 for agree (A) – 3 for neutral (N) – 2 for disagree (D)-1 for strongly disagree (SD)) to test the first and second hypothesis. The fourth section contains three questions to test the third hypothesis using Likert scale with different values (5 for extremely (EX) – 4 for very(V) – 3 for moderately (M) – 2 for slightly (S)-1 for not at all (N/A)). 3 is the mid value that means undecided decisions. The fifth section is an open-ended question about the concerns of university professors and students on the use of AI in translation studies.

The descriptive analysis was conducted using different tools on SPSS software such as percentile values, mean (M), standard deviation (St. D). Also, different T-tests were conducted to validate or reject the hypothesis, including measures such as t-values (t-v), p-values (p-v) and standard error (St. Er). The demographic data of the participants is illustrated in the table below.

Groups	Frequency	Percentage	Gender	
Professors	70	27.56	Female	34
			Male	36
University students	184	72.44	Female	110
			Male	74

Table 1:The demographic variables of the respondents

6 Results and Analysis

6.1 Results on Hypothesis One

The second section of the questionnaire which contains two questions was designed to test the first hypothesis (H1), which assumes that ¨the integration of AI has the potential to transform TS programs in universities¨. The questions are as follows:

Q1: AI can positively change Translation Studies at the university level.

Q2: Integrating AI in translation studies curriculum positively impacts learning and teaching translation practices.

Qs	SA	A	N	D	SD	M	St. D	t-v	p-v	St. Er
Q1	34.6	29.9	33	0	2.4	3.94	0.94	11.26	< .001	0.08
Q2	48	32.3	15	2.4	2.4	4.21	0.94	14.41	< .001	0.08

Table 2: Descriptive statistics for the results on H1

Table 2 illustrates the views of the respondents on the potential of AI, once integrated, to transform TS programs in Moroccan universities. As for the questions used to test H1, table 2 indicates that over 64% of the respondents agreed that AI can revolutionize TS at the university level in Morocco. Merely less than 3% disputed the claim, which is statistically insignificant and 33% of the study sample population remained neutral.

Similarly, over 80% of the participants affirmed that integrating AI in TS curriculum positively impacts learning and teaching translation practices. Again, a small minority of the population (about 5%) refuted this claim, which is statistically insignificant and lower than the 15% of the populace who remained neutral.

The data presented also shows that a significant proportion of the surveyed population hold the view that AI has the potential to transform the face of TS in higher education institutions.

Two types of t-tests were conducted on the data to investigate the validity of H1. The first one is one sample t-test and the results are illustrated in table 2. We formulated a null hypothesis that suggests that AI cannot transform TS programs in Moroccan universities. The reason behind this is to determine if the mean score varies significantly from the neutral value 3.00. Based on the results in table 2, it is evident that the mean score of the two questions (3.94; 4.21 respectively) is significantly higher than the neutral value which means that the respondents are reacting positively to the claims. This is further backed up by the p-values, which are less than 0.001 which is strong evidence to reject the null hypothesis and support H1 that claims that the integration of AI has the potential to transform TS programs in universities.

Qs	Groups	Number	Mean	St. D	t-values	Two tailed p-values
Q1	Professors	70	3.89	1.07	-0.43	0.66
	Students	184	3.97	0.90		
Q2	Professors	70	4.11	1.05	-0.71	0.47
	Students	184	4.25	0.91		

Table 3: Independent-samples t-test results on H1

Additionally, an independent-samples t-test was conducted on the two questions to compare students and professors' attitudes towards the fact that AI can revolutionize TS at the university level in Morocco and that integrating AI in TS curriculum positively impacts learning and teaching translation practices. Based on the data provided in table 3, for the first question, t (125) = -0.43 and p= 0.66 (higher than 0.05). There were high levels of frequency and agreement between the two groups (professors variable's mean value = 3.89 and St.D=1.07 and students M=3.97; St.D= 0.90). Based on the t-value and p-value, it is evident that there is no statistically significant difference between professors and students' perspectives with regards to AI'S potential to transform TS within higher education institutions. As for the second question, t (125) = -0.71 and p= 0.47 (higher than 0.05). Thus, it can be inferred that there is no significant association between professors and students' attitudes towards the positive impact of integrating AI in TS curriculums. However, there were high levels of frequency and agreement among students and professors as evidenced by the mean score and standard deviation of each group in table 3 (professors M=4.11 and SD= 1.05; students M=4.25 and SD= 0.91).

Overall, the statistical descriptions and t-tests output provide robust evidence in favor of the integration of AI has the potential to transform TS programs in universities and there is no statistically significant difference between the perspectives of students and teachers towards this claim.

6.2 Results on Hypothesis Two

The second hypothesis (H2) proposes that the improvement in the academic performance and translation competence is strongly correlated with the integration of AI tools in TS postgraduate programs. Three questions were developed to test this hypothesis. Below are the questions:

Q1: The integration of AI in translation studies significantly improves the quality of students' translations.

Q2: The integration of AI in translation studies boosts motivation, stimulates engagement, creates the need for knowledge acquisition and enhances creativity.

Q3: The integration of AI in translation studies enhances the translation competence.

Qs	SA	A	N	D	SD	M	St. D	t-v	p-v	St. Er
Q1	15.7	50.4	25.2	7.9	0.8	3.72	0.85	9.59	< 0.001	0.08
Q2	22	40.9	25.2	8.7	3.1	3.7	1.01	7.82	< 0.001	0.09
Q3	18.9	44.1	26.8	10.2	0	3.72	0.89	9.07	< 0.001	0.79

Table 4: Descriptive statistics for the results on H2

Table 4 provides a statistical summary on the respondents' views on the assumption that there is a positive correlation between the use of AI in TS and improvement in students' academic performance and translation competence. It is indicated in table 4 that over 66% of the respondents agreed that the integration of AI in TS significantly improves the quality of

students' translations, which is significantly higher than 8.7% of the populace that rejected the claim and the 25.2% of the respondents that remained neutral.

Furthermore, over 63% of the study sample population accepted that the incorporation of AI in TS boosts motivation, stimulates engagement, creates the need for knowledge acquisition and enhances creativity. However, only around 11.8% challenged the claim which is statistically insignificant and 25.2 % of the populace remained neutral.

The results also indicate that over 63% of the respondents hold the view that the collaboration between AI and TS enhances the translation competence. This percentage is still significantly higher than the 10.2 % of the study population that rejected the claim and the 26.8% who remained neutral. The mean score is between 3.7 and 3.72 which means that the participants are responding positively to this hypothesis. This can be further supported by the low standard deviation values illustrated in table 4.

The results of the one-sample t-test are illustrated in the table 4. They exhibit statistical significance, as evidenced by the p-values that are lower than 0.001, which provides compelling evidence to reject the null hypothesis that there is no significant connection between the use of AI and the improvement in students' academic performance and translation competence.

The results of the independent samples t-test in table 5 indicate that the p-values are higher than 0.05, which means that there is no statistically significant difference between professors and students' views with regards to the three questions.

Thus, it can be deduced that the statistical description and t-tests results provide evidence in favor of the hypothesis that posits that the improvement in the academic performance and translation competence is significantly correlated with the integration of AI tools in TS postgraduate programs.

	Groups	Number	Mean	St. D	t-value	Two tailed p-value
Q1	Professors	70	3.57	0.98	-1.25	0.21
	Students	184	3.78	0.80		
Q2	Professors	70	3.46	1.24	-1.69	0.94
	Students	184	3.79	0.90		
Q3	Professors	70	3.77	0.80	0.42	0.67
	Students	184	3.70	0.92		

Table 5: Independent-samples t-test results on H2

6.3 Results on Hypothesis Three

The third hypothesis (H3) proposes that university educators and students feel adequately prepared and open to embrace AI-based tools in a multimodal instruction mode. The questions that are prepared to test this hypothesis are as follows:

Q1: You are familiar with the AI tools used in translation studies

Q2: You would appreciate a technology driven curriculum, including examinations and assignments.

Q3: You need a training to cope effectively with these tools and use them appropriately

Qs	Ex	V	M	S	N/A	Mean	St. D	t-value	p-value	Std. Er.
Q6	34.6	37	22	4.7	1.6	3.98	0.951	11.663	< 0.001	0.08
Q7	35.4	35.4	24.4	4.7	0	4.02	0.891	12.851	< 0.001	0.08
Q8	24.4	38.6	22	6.3	8.7	3.66	1.173	6.128	< 0.001	0.1

Table 6: Descriptive statistics for the results on H3

Table 6 suggests that the respondents perspective on the claim that university educators and students feel adequately prepared and open to embrace AI-based tools in a multimodal instruction mode is predominantly positive. The table shows that 71% of the respondents affirmed that they are familiar with AI tools used in TS teaching and learning. However, less than 7% claimed that they are not familiar with these tools, which is statistically insignificant and less than the 22% who remained neutral.

Similarly, over 70% confirmed that they appreciate a technology-driven curriculum, including examinations and assignments. However, less than 5 % expressed their unwillingness to adopt these tools and 24.4% remained neutral.

Also, the data shows that 63% of the participants confirmed that they a training to cope with AI tools effectively and appropriately. 15% of the population confirmed that they do not need a training and 22 % remained neutral. According to the mean values, question 5 scored 3.98, which indicates that the majority of the population surveyed is familiar with AI tools using in TS. The second mean score is 4.02, which shows that a significant number of the participants responded positively.

The hypothesis is being tested by the one sample t-test on all the questions. The results that are presented in table 6 indicate that the p-values are less than 0.05 which is a robust evidence in favor of H3. In order to compare between the professors and students' perspectives on the willingness and readiness of the major stakeholders surveyed to embrace AI-based tools in multimodal instruction mode, the results of the independent t-test in the table indicate that the p-values are higher than 0.05. This shows that there is no statistically significant difference between professors and students' views on the all the three questions**.** Also, there were high levels of frequency and agreement among students and professors as evidenced by the mean score and standard deviation of each group in table 7, which signifies that there is no difference between professors and students' perspectives on this claim.

	Groups	Number	Mean	St. D	t-value	Two tailed p-value
Q1	Professors	70	3.91	1.011	-0.510	0.611
	Students	184	4.01	0.932		
Q2	Professors	70	3.83	0.891	-1.467	0.145
	Students	184	4.09	0.885		
Q3	Professors	70	3.63	1.516	-0.054	0.957
	Students	184	3.64	1.023		

Table 7: Independent-samples t-test results on H3

7 Results of the Open-Ended Question

Professors and Students have several concerns on the use of AI in their studies. Some students see it "just like other technologies, they are like a double-edged sword" and one professor agreed that " It may be a double-edged sword, when AI gets integrated into the curriculum, it will be a big step towards learning about the modern technologies of translation, and

may help students have a better eye for the differences between AI text and human-written texts, but on the other hand it might open the floodgates for students to solely rely on AI to do assignments and research, to be honest some already d, which would kill the creativity and research part of translation(the most fun aspect of translation." This implies that AI is not yet fully trusted by university students and professors. Another student added, "I do not completely trust AI, I still believe that human oversight is necessary". Human control is needed when using AI. In the same context of mistrust, one of the respondents said, "from my past experiences with Chatgpt, I believe that AI still has a long way to go in translation especially when translating into Arabic. It also has the tendency to follow a certain pattern in its texts, which is not so good on the ears when reading it." Feedback and editing of AI translations is necessary and overreliance on AI may result in silly mistakes that should not be missed by the human eye. To corroborate this, one student added, "it can still make cardinal mistakes that can be clear after a revision. It is a tool that remains not to be used all the time and one must employ traditional means to get by. I could safely say that at this stage I do not trust AI." Other concerns were about the fact that overreliance on AI may have a negative effect on the improvement of translation competence that can be restricted while abusing the use of AI. As one remarked, "My concern regarding this integration is the risk of students relying entirely on AI tools for their assignments, potentially undermining the development of essential translation skills and critical thinking" and another added, "It would be highly beneficial but could have a slight impact on the skills improved by students". Some professors had concerns about misusing AI because of lack of training, which may lead to unexpected results as one of the professors assumed, "a valid concern about AI in TS postgraduate programs could be the risk of not integrating it effectively or early enough which could leave students underprepared for the demands of the modern translation industry."

8 Discussion

The findings presented in the data analysis section provides an evaluation of the insights of the study population on the integration of AI in TS within higher education institutions. The first hypothesis, with a percentage exceeding 64%, was substantiated as the results reveal that a significant majority of the primary stakeholders surveyed acknowledged the potential of AI to transform the translation ST in Moroccan universities, especially Mohammed First University in Oujda and Nador Multidisciplinary Faculty from where the population of this study was drawn. Nonetheless the claim was challenged by a minority of the populace with an insignificant percentage of 2.4%, while a significant proportion the respondents abstained from taking a definitive stance and maintained a neutral side. This reveals that the majority of the major stakeholders in the university under study share a unanimous agreement regarding the claim in question. Moreover, it was observed that a significant proportion of the population, exceeding 80%, concurred that integrating AI in TS curriculum positively impacts learning and teaching translation practices. This claim was only refuted by 4.8%, while 15% refrained from taking a position. This implies that both teachers and students in the TS programs under study both acknowledged the indispensability of incorporating AI in TS for its potential to shift the field to the technology-driven era.

The data shows that the majority of the respondents hold favorable view towards the use of AI tools in TS postgraduate programs results in improved academic performance and translation competence. A majority of over 66% believe that the integration of AI in TS significantly improves the quality of translations. Similarly, over 62% affirmed that the integration of AI in TS boosts motivation, stimulates engagement, creates the need for knowledge acquisition and enhances creativity. Nonetheless, this claim was challenged by a minority of 11.8%, while 25.2% refrained from choosing a side. The presented data also shows a significant population with a percentage of 63% shared a consensus on the claim that the integration of AI in

TS enhances the translation competence. A significant proportion of the population remained neutral (26.8%).

According to the results, more than half of the participants hold a positive attitude towards readiness and willingness of the stakeholders to embrace AI-based tools in multimodal instruction mode. A majority of the study sample population with over 71% affirmed that they are familiar with the AI tools used in translation studies. This familiarity implies that AI tools are widespread and already popular among the major stakeholders. A significant population of over 70% appreciate a technology driven curriculum, including examinations and assignments, while a significant majority of 63% remained undecided. A significant majority confirmed that they need training to cope with this technology in an effective way to avoid crises. This implies that a vast of the major stakeholders did not receive a training. Also, the university under study is lagging behind with regards to integrating AI in teaching and learning translation practices.

All in all, the three hypotheses are validated and indicates that the major stakeholders who took part in this study share a solid consensus about integration AI in TS. It is also evident that this integration will positively impact the academic outcomes, motivation, creativity, engagement, translation quality and competence. Also, the major stakeholders showed willingness and readiness to embrace AI into translation teaching and learning practices, but they still need to be adequately trained to able to these tools effectively.

Despite the positive perspectives of the stakeholders, there are some challenges that still need to be dealt with and concerns to be taken into consideration when integrating AI in the TS postgraduate programs. AI translations should be edited and refined because AI often overlooks contextual and cultural nuances. Additionally, this technology should be critically analyzed and used wisely to ensure its best use. Professors and students are highly concerned about the potential negative impact of AI on translation competence that might be put at risk when relying on AI. One more concern is lack of training because this issue will certainly hamper the integration process and use AI in a way that could bring up unexpected crises.

9 Conclusion

This study explored the importance of integrating AI in TS and its potential to transform the teaching and learning of translation. It also evaluated the perspectives of the major stakeholders on how this integration can improve academic performance and translation competence of students in the postgraduate TS programs and examined its impact on motivation, engagement and creativity. It also provided insights on the readiness and willingness of the main stakeholders who participated in this study to embrace AI in a multimodal instruction mode. An online questionnaire using google forms was used to collect data from 127 participants. The results showed acceptance of the three hypotheses. Over 72% of the participants acknowledged that AI has the potential to revolutionize TS within higher education. Likewise, over 63% of the study population affirmed that the use of AI positively impacts students' academic performance and educators' pedagogical performance. The data also indicates that 67% of the participants showed that they are ready and willing to integrate this technology in the TS teaching and learning process. Nonetheless, a significant majority, exceeding 63%, need a training to use it appropriately. It is thus concluded that the integration in the TS within higher education institutions is useful and beneficial and can yield favorable outcomes.

10 Limitations and Future research

This study has many limitations that should be reconsidered when using the findings. Most importantly, the size of the study sample was relatively small because of the time span that was allotted for this study and therefor the findings cannot be generalized to the broader population of students and professors in Morocco because their perspectives may vary and therefore the results may be different. Furthermore, this technology is new to the Moroccan

universities and students are not fully familiar with it and the data collected shows a significant number of the respondents remained neutral because of lack of a well-informed opinion.

Future research should take these limitations to target a bigger study sample and reach to students from different universities across Morocco. This research is needed to have an in-depth understanding of the stakeholders and for an effective integration of AI in higher education institutions in Morocco.

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