Artificial Intelligence from Teachers' Perspectives and Understanding: Moroccan Study

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***Abstract*—Artificial Intelligence (AI) has made a major impact in the realm of education by leveraging machine learning algorithms, natural language processing and other AI tools to enhance learning experiences and improve educational outcomes. However, the effective implementation of AI tools in education is related to the attitudes of teachers as they play a fundamental role in the teaching and learning process. This study aims at exploring teachers' perspectives on AI-based tools in their teaching experiences, aiming to equip them with the necessary skills to integrate this new technology in their teaching practices as part of their professional development. A quantitative study was conducted, and data was collected from a questionnaire distributed to 237 public school teachers in Morocco, precisely in the region of Fez-Meknes, based on snowball method. The instrument was tested for reliability and was confirmed to meet the necessary standards. Notably, the analysis of the survey responses indicates that despite having limited AI knowledge, teachers have a positive attitude towards AI tools in their teaching approaches. Furthermore, the research underscores a direct correlation between teachers' AI proficiency and key demographic variables like gender, age, teaching years and academic level. Also, the findings revealed a strong correlation between teachers' perception and their academic level, yet no notable link was found between perception and variables like Gender, Age, or working years.**

***Keywords*—artificial intelligence (AI), educational tools based on AI, Moroccan teachers, motivation, perception, professional vocational training**

I. Introduction

Artificial Intelligence (AI) refers to the simulation of intelligent processes in human beings by computer systems. These systems are designed to perform tasks that normally require human intelligence [1], such as understanding natural language, solving complex problems, learning, and even recognizing visual and auditory patterns [2, 3], it continues to evolve rapidly, offering both promising opportunities and significant challenges in various fields, including education.

Artificial Intelligence (AI) is playing an increasingly important role in education, having a significant impact on various levels, from traditional classrooms to online learning platforms, offering innovative opportunities and unique challenges [4]

In recent years, the Moroccan educational system has been affected by new technologies in general, but recently AI has taken a center stage, with all efforts being made to introduce it into the various sectors of education and teaching, particularly, in administrative tasks, learning-teaching processes, competitions and examinations..., all within the project 14 [5] of the framework law designed to enhance technological adoption in education.

The integration of AI holds immense potential to revolutionize teaching and learning practices. Understanding teachers' knowledge, perceptions and attitudes towards AI is important for effective integration. This work delves into the insights gained from analyzing Moroccan teachers' perspectives on AI and explores the significance of effective training programs in equipping educators with the necessary skills for AI integration [6].

The study employed a quantitative approach based essentially on data collected from a questionnaire distributed among Moroccan teachers of various educational cycles (Elementary school, middle school, high school) in the Fez-Meknes region. We used statistical methods t-test and ANOVA to measure the nature of the relationship between our main factors and different variables of our case study.

II. Literature Review

A. Artificial Intelligence

The origins of Artificial Intelligence were traced back to ancient civilizations, where humans first conceptualized intelligent automatons. However, it was not until the mid-20th century that significant progress was made in this field. In 1950, Turing introduced the Turing Test, a benchmark for evaluating machine intelligence, laying the foundation for AI research [7]. AI refers to the simulation of human intelligence in machines that are programmed to think and learn like humans. It encompasses various subfields, including machine learning, natural language processing, computer vision, and robotics. AI systems can perform tasks that typically require human intelligence, such as understanding natural language, recognizing patterns, and solving complex problems [2].

AI can be categorized into two main types: narrow or weak AI and general or strong AI. Narrow AI is designed to perform a specific task, such as language translation or playing chess, and excels only in that particular area. General AI, a concept still in theoretical stages, would possess human-like intelligence and could perform any intellectual task that a human being can do [8].

Despite its transformative potential, AI faces challenges. These include ethical concerns regarding privacy, bias in algorithms, and the impact on employment. Ethical guidelines and regulations are essential to ensuring the responsible development and deployment of AI technologies [9].

B. Artificial Intelligence in Education.

AI has emerged as a transformative force in various sectors, including education. The integration of AI technologies in

educational settings has the potential to revolutionize teaching and learning processes. AI in education significantly enhances personalized learning, tutoring systems, administrative efficiency, and gamification experiences. However, challenges related to privacy, data security, and bias must be addressed [10]. Continued research and development in AI technologies, coupled with ethical considerations, are essential to maximizing its potential in education [11].

While the potential of AI in education is vast, its implementation is not without challenges. Privacy concerns regarding different educational actors' data have been raised by researchers. Ensuring data security and compliance with regulations is crucial in AI-driven educational platforms. Additionally, addressing algorithmic bias is a paramount concern [12–14]. AI systems, if not properly designed, can perpetuate existing biases in education, disadvantaging certain student groups. Thus, in order to ensure a fair and inclusive AI community and promote the well-being of individuals, managers and employers in firms have to dedicate more time towards fostering AI education [15].

C. Educational Tools Based on AI

1) Enhancing personalized learning

AI-powered adaptive learning platforms have revolutionized traditional teaching methods. These platforms analyze individual student performance data to provide personalized learning experiences [16]. Intelligent Tutoring Systems (ITS) have been developed to cater to individual learning styles [17, 18], ensuring that students receive tailored instructions and feedback [19]. Moreover, AI algorithms can assess students' strengths and weaknesses, enabling educators to design targeted interventions [20, 21].

2) Gamification and AI

The integration of AI in educational games enhances the gaming experience. AI algorithms analyze students' interactions within the game, adjusting the difficulty level and challenges in real-time [22]. This dynamic adaptation keeps students engaged and motivated [23, 24].

3) Chatbots and virtual assistants

AI-driven chatbots and virtual assistants provide instant support to students, answering queries related to course content, assignments, and exams. These tools enhance student interaction and engagement, fostering a more interactive learning environment [25, 26].

4) Automated grading systems

AI-based automated grading systems evaluate assignments and assessments swiftly and accurately. These systems employ natural language processing and machine learning techniques, saving educators time, and providing immediate feedback to students [27, 28].

5) Virtual Reality (VR) and AI in education

Combining AI with Virtual Reality, educators create immersive learning experiences. AI algorithms analyze student interactions within VR environments, adapting scenarios and challenges based on real-time responses, enhancing experiential learning [29, 30].

6) Augmented Reality (AR)

Integrating AI with AR creates a dynamic overlay of digital information on the real world, enhancing user experience through personalized content. AI's real-time analysis of the environment and user interactions allows for seamless integration of relevant digital objects into physical surroundings. This blend not only enriches the user's perception but also makes the AR experience more intuitive and immersive by adapting digital content to immediate contextual needs and preferences [31].

7) Mixed Reality (MR)

Integrating AI with Mixed Reality (MR) bridges the physical and digital realms, crafting an interactive environment where real-world and virtual elements coexist seamlessly. This approach, covering both (AR) and (VR), leverages AI to enhance the real-time interaction between users and the blended environment. AI algorithms interpret and respond to user actions and environmental contexts, enriching the MR experience with adaptive, context-sensitive digital content that is intelligently aligned with the user's immediate surroundings and activities [32].

8) Validity and adaptive testing

AI-driven adaptive testing systems adjust the difficulty level of questions in real-time based on students' responses, enhancing the validity of assessments by precisely measuring their abilities. These systems provide a personalized testing experience, aligning with individual learning trajectories [33, 34]

9) Plagiarism checkers

There are many tools that are based on AI to detect and prevent plagiarism in academic papers and assignments. It compares the text to a vast database of academic content to ensure the originality of students' work [35–37].

D. Previous Research on Teachers' Perceptions of AI

Ongoing attempts have been made to integrate AI in the realm of teaching and learning, yet the effective implementation of innovative instructional technologies goes hand in hand with the perception of teachers of this field. There is limited attention in research on teacher's perceptions of AI-based technology. As far as we know, only a few studies have delved into this topic. The surveys that have been conducted in different countries have shown that educators are open to the idea of incorporating AI as a new tool to improve the quality of teaching [38]. In fact, many educators see this as a valuable opportunity to fulfill their needs and overcome challenges in their teaching practices, despite their limited knowledge in this field [39].

Furthermore, AI technology was perceived as the most appropriate method for supporting classroom activities and problem-based learning [40] On another note, studies identified teachers' fears and skepticism into implementing AI in higher education due to their lack of knowledge in this new domain and its resources [41].

Overall, Teachers' perceptions of AI-based educational tools vary according to their pedagogical belief, teaching experience, prior exposure to educational technology, and the effectiveness and necessity of a particular technology, all of which can influence their readiness to embrace AI in education [42].

Whereas studies made in Morocco on this field have not yet gained popularity due to the lack of providing professional training programs and introducing teachers to

this new technology. This subsequently gave rise to the following queries:

1) Do Moroccan teachers have enough knowledge about AI-based educational tools, and what are their perceptions of this field?
2) Are there any variables that can affect teachers' level of knowledge and perceptions?
3) Are teachers motivated enough to be trained to integrate AI-based educational tools in their teaching practices?

III. Materials and Methods

A. General Background

In this study, a quantitative approach was employed through the design and development of a questionnaire, which underwent reliability and validity testing. following data collection, factorial exploratory and confirmatory analyses were conducted to identify key study factors and categorize items accordingly. The relationship between these factors and demographic variables was then explored using t-test and ANOVA methods.

B. The Sample

The sample consisted of 237 responses from Moroccan public-school teachers across elementary, middle, high school cycles in the Fez-Meknes region, gathered through a snowball sampling method.

C. Instrument and Procedures

In this study, we opted for a quantitative approach which involves collecting data from a questionnaire which is then subjected to statistical analysis while following the steps below.

The questionnaire was divided into three sections. The first section focused on gathering demographic information from the participants, such as their gender, age, cycle, educational level, and teaching years (Tables 1-2). The second section consisted of questions about the participants' knowledge of educational tools based on artificial intelligence. Finally, the third section delved into the participants' perceptions of the use and integration of these tools in their teaching practices. Each section was carefully formulated and consisted of a total of 16 items, all of which were based on a 3-point Likert Scale with 1 being the lowest value.

Table 1. Repartition of our study's sample

Cycle	Frequency	Percent (%)	Valid Percent (%)
Elementary school	46	19.4	19.4
Middle school	86	36.3	36.3
High school	105	44.3	44.3

Table 2. Demographic background of our sample

	Demographic	Frequency	Percent(%)	Valid Percent(%)
Gender	Female	112	47.3	47.3
	Male	125	52.7	52.7
Age	20–30	47	19.8	19.8
	31–40	86	36.3	36.3
	41–50	68	28.7	28.7
	More 50 years	36	15.2	15.2
Teaching years	0–5	31	13.1	13.1
	5–10	62	26.2	26.2
	10–15	40	16.9	16.9
	15–20	24	10.1	10.1
	20–25	42	17.7	17.7
	25–30	15	6.3	6.3
	More 30 Years	23	9.7	9.7
Academic level	Bac	5	2.1	2.1
	Bac +2	13	5.5	5.5
	Bac +3	81	34.2	34.2
	Bac +5	110	46.4	46.4
	PhD	28	11.8	11.8

Prior to the distribution of the questionnaire, we conducted reliability and validity tests. The reliability was assessed through the use of Cronbach's alpha coefficient, and the validity was tested using exploratory and confirmatory factorial analysis.

To ensure the accuracy of our questionnaire, we sought feedback from six expert university professors and shared it with 35 randomly selected teachers.

Using the Alpha Cronbach method [43], we calculated the reliability using the following formula:

$$\alpha = = \frac{N \times \bar{c}}{\bar{v} + (N-1) \times \bar{c}}$$

where: N = number of items, $\bar{c}$ = mean covariance between items, $\bar{v}$ = mean item variance.

As we notice from Table 3, our Cronbach's alpha = 0.874. Based on rule of thumb for assessing the Cronbach's Alpha value provided by George and Mallery [44], Cronbach's Alpha value above 0.80 indicates GOOD internal consistency between questionnaire's items.

Table 3. Reliability statistics

	Mean	SD	Cronbach's α	McDonald's ω
Scale	2.19	0.423	0.874	0.879

D. Data Collection

In this stage we have tried as far as possible to ensure that our questionnaire reaches a large number of educators teaching different school subjects in Fez-Meknes region. Hence, we opted for the online method using *Google Forms*. To avoid any technical problem linked to page access, questionnaire progression, filters and connections, distribution mode, etc. The questionnaire was tested following the two important preliminary steps:

1) Pre-test: To ensure that the questions are clear enough and well understood by participants as well as to test the feasibility and appropriateness of items.
2) Pilot test: The questionnaire was distributed to 35 familiar teachers in order to get their feedback and remarks on the instrument.

E. Data Analysis

To process our collected data, we opted for a qualitative descriptive approach, t-test, and ANOVA one-way non-parametric methods, using statistical analysis software SPSS, JAMOVI and Excel.

As detailed in Table 2 above, four independent quantitative demographic variables are considered in our study:

- Gender of participants, which is nominal dichotomous (Male, Female).
- Age, which is nominal.
- Academic Level, which is ordinal (Bac is the lower value and PhD is the higher value).
- Teaching Years, which is scale.

While conducting our research, we took into consideration the following three hypotheses:

- **H1**: Participant Teachers have enough knowledge about educational tools based on AI.
- **H2**: Participant teachers have a positive perception of educational tools based on AI.
- **H3**: There are several variables that influence teachers' perception, like their gender, age, working years, academic level.
  - ✧ **H3A** (**Knowledge)**: there is a significant difference between (gender, age, working years, academic level) and the level of knowledge of the AI concept.
  - ✧ **H3B (**Perception**)**: there is a significant difference between (gender, age, working years, academic level) and the perceptions on AI concept.

IV. Result and Discussion

A. Exploratory Factor Analysis.

After collecting data and based on Shapiro-Wilk test. *p*-value of all variables is < 0.05, so, our data are not conforming to the normal distribution.

We proceeded to a factorial analysis to determine the common factors of our variables, as represented in Table 4 below, we started with an Exploratory Factorial Analysis (EFA), using 'Minimum residual' extraction method in combination with an 'oblimin' rotation. Two main factors are identified, related to the knowledge of the AI concept, and teachers' perceptions of the integration of AI in the field of education. According to a bartlett test of Sphericity with a x^2 = 1218 and p value < 0.001, there are significant relationships among the variables that could be summarized by the identified factors. The Measure of sampling adequacy Kaiser–Meyer–Olkin (KMO) value was positive with an Overall = 0,893. Root Mean Square Error of Approximation (RMSEA) value= 0.0477 indicates an accepted model fit (detail in Table 5 below).

Table 4. Exploratory factorial analysis results

	Factor		
	Perception	**Knowledge**	**Uniqueness**
KNW1		0.651	0.499
KNW2		0.708	0.467
KNW3		0.850	0.312
KNW4		0.723	0.486
PRC1	0.752		0.402
PRC2	0.635		0.423
PRC3	0.860		0.258
PRC4	0.777		0.424
PRC5	0.737		0.497
PRC6	0.560		0.635
PRC7	0.703		0.548

Table 5. Model Fit Measures (EFA)

RMSEA	**RMSEA 90% CI**		**TLI**	**BIC**	**Model Test**		
	Lower	**Upper**			χ^2	**df**	**p**
0.0477	0.0186	0.0725	0.974	−133	52.5	34	0.022

Note: TLI: Tucker-Lewis index; BIC: Bayesian Information Criterion

B. Confirmatory Factor Analysis (CFA)

As shown in Table 6, our factors have a positive relationship with the observed variables. Also, there is a positive covariance between our two main factors, with an estimate = 0.465, means that the two factors are impacting each other positively in the same direction.

Table 6. Factor loadings (CFA)

Factor	**Indicator**	**Estimate**	**SE**	**Z**	***p***	**Strd. Estm**
Knowledge	KNW1	0.477	0.0407	11.73	< 0.001	0.714
	KNW2	0.503	0.0418	12.03	< 0.001	0.729
	KNW3	0.615	0.0439	14.02	< 0.001	0.816
	KNW4	0.431	0.0367	11.75	< 0.001	0.714
Perception	PRC1	0.473	0.0341	13.86	< 0.001	0.781
	PRC2	0.418	0.0333	12.56	< 0.001	0.730
	PRC3	0.521	0.0326	15.96	< 0.001	0.858
	PRC4	0.461	0.0346	13.31	< 0.001	0.760
	PRC5	0.414	0.0346	11.97	< 0.001	0.704
	PRC6	0.374	0.0379	9.87	< 0.001	0.606
	PRC7	0.430	0.0397	10.85	<0.001	0.653

As demonstrated in Table 7 below, the model demonstrates a very good fit based on the CFI (0.966) and TLI (0.957) values, which are above the recommended threshold of 0.95. The SRMR (0.0498) value indicates a good fit, suggesting that the model's residuals are small. The RMSEA (0.0631) and its confidence interval suggest a reasonable fit.

Table 7. Fit Measures (CFA)

CFI	TLI	SRMR	RMSEA	Lower	Upper	AIC	BIC
0.966	0.957	0.0498	0.0631	0.0425	0.0831	3907	4025

RMSEA 90% CI

C. Frequency Analysis

Concerning teachers' knowledge of artificial intelligence, as detailed in Table 8 and represented in Fig. 1, most teachers have an average level of mastering new technologies 55.3%, while a notable 51.5% lack familiarity with the concept of AI. Furthermore, 43.0% have inadequate information on AI-based tools, and 59.5% use some AI-based tools in their personal lives once in a while.

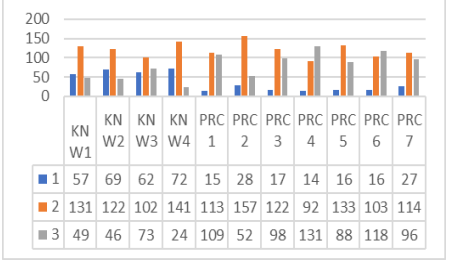

Fig. 1. Questionnaire's results graphic representation.

Table 8. Global results of questionnaire

	Statements			Frequency	Percent (%)
Knowledge	KNW1. What is your level of mastery of new technologies?	1	Beginner	57	24.1
		2	Average	131	55.3
		3	Advanced	49	20.7
	KNW2. Are you familiar with Artificial Intelligence concept?	1	No, not at all.	69	29.1
		2	Not good enough.	122	51.5
		3	Yes, enough.	46	19.4
	KNW3. Do you know some tools based on Artificial Intelligence (ChatGPT, Google Bard, Perplexity, Chatbot, facial recognition, intelligent tutoring, etc.)?	1	No, not at all.	62	26.2
		2	Not good enough.	102	43.0
		3	Yes, enough.	73	30.8
	KNW4. In your personal life, do you use tools based on artificial intelligence?	1	Never.	72	30.4
		2	Once in a while.	141	59.5
		3	Every day.	24	10.1
Perception	PRC1. Do you think that Artificial Intelligence is useful for teaching?	1	Not really, no.	15	6.3
		2	Yes, maybe.	113	47.7
		3	Yes, absolutely.	109	46.0
	PRC2. How motivated are you to integrate tools based on Artificial Intelligence into your teaching practices?	1	Unmotivated.	28	11.8
		2	Motivated.	157	66.2
		3	Highly motivated.	52	21.9
	PRC3. Do you think artificial intelligence can improve teaching quality and learning performance?	1	Not really, no.	17	7.2
		2	Yes, maybe.	122	51.5
		3	Yes, absolutely.	98	41.4
	PRC4. Do you think that educational tools based on artificial intelligence can make your job as a teacher easier (lesson preparation, teaching, assessment, support, etc.)?	1	Not really, no.	14	5.9
		2	Yes, maybe.	92	38.8
		3	Yes, absolutely.	131	55.3
	PRC5. Do you think Artificial Intelligence can help manage the cognitive heterogeneity of learners. (differentiated teaching)?	1	Not really.	16	6.8
		2	Maybe.	133	56.1
		3	Yes, absolutely.	88	37.1
	PRC6. As a teacher, how do you see the role of teachers in a learning environment supported by Artificial Intelligence?	1	Not important.	16	6.8
		2	Rather important.	103	43.5
		3	Important.	118	49.8
	PRC7. Do you think Artificial Intelligence necessarily needs to be integrated into continuing professional training for teachers?	1	Not at all necessary.	27	11.4
		2	Necessary.	114	48.1
		3	Very necessary.	96	40.5

Regarding teachers' perceptions of AI in education, a majority (47.7%) see it as potentially beneficial, with a similar percentage (66.2%) showing motivation in integrating AI-based tools in their pedagogical practices. Many teachers (51.5%) perceive AI as an opportunity to enhance teaching quality and simplify their roles. Addressing the problem of cognitive heterogeneity in the classroom, a portion of (56.1%) see AI as an aid. In regard to the importance of teachers in AI-supported learning environment, nearly half (49.8%) insist on the importance of teachers with the condition of receiving adequate professional trainings on AI-based educational tools.

D. Correlation Inter-Items

As we can see in Table 9 below, based on Pearson test, a correlation Coefficient $r > 0$ and a p-Value < 0.05 indicating that the observed correlation is statistically significant. So, all variables are correlated positively, except the relationship between the two variables PRC7 and KNW4. the results show that there is no correlation (p-value > 0.05). We can notice the correlation between variables is average with a maximum $r = 0.665$ (PRC1, PRC3) and minimum $r = 0.106$ (PRC7, KNW4)

Table 9. Questionnaire's correlation inter-items matrix

		KNW1	KNW2	KNW3	KNW4	PRC1	PRC2	PRC3	PRC4	PRC5	PRC6	PRC7
KNW1	Pearson's rdf	—										
	p-value	—										
		—										
KNW2	Pearson's r	0.506	—									
	df	235	—									
	p-value	< .001	—									
KNW3	Pearson's r	0.599	0.585	—								
	df	235	235	—								
	p-value	< .001	< .001	—								
KNW4	Pearson's r	0.475	0.541	0.596	—							
	df	235	235	235	—							
	p-value	< .001	< .001	< .001	—							
PRC1	Pearson's r	0.284	0.294	0.302	0.255	—						
	df	235	235	235	235	—						
	p-value	< .001	< .001	< .001	< .001	—						
PRC2	Pearson's r	0.418	0.431	0.361	0.328	0.591	—					
	df	235	235	235	235	235	—					
	p-value	< .001	< .001	< .001	< .001	< .001	—					
PRC3	Pearson's r	0.330	0.321	0.261	0.258	0.665	0.593	—				
	df	235	235	235	235	235	235	—				
	p-value	< .001	< .001	< .001	< .001	< .001	< .001	—				
PRC4	Pearson's r	0.249	0.225	0.236	0.192	0.628	0.537	0.653	—			
	df	235	235	235	235	235	235	235	—			
	p-value	< .001	< .001	< .001	0.001	< .001	< .001	< .001	—			
PRC5	Pearson's r	0.262	0.197	0.149	0.185	0.503	0.472	0.642	0.584	—		
	df	235	235	235	235	235	235	235	235	—		
	p-value	< .001	0.001	0.011	0.002	< .001	< .001	< .001	< .001	—		
PRC6	Pearson's r	0.343	0.207	0.220	0.268	0.459	0.439	0.554	0.391	0.407	—	
	df	235	235	235	235	235	235	235	235	235	—	
	p-value	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	—	
PRC7	Pearson's r	0.224	0.192	0.143	0.106	0.504	0.549	0.542	0.474	0.457	0.439	—
	df	235	235	235	235	235	235	235	235	235	235	—
	p-value	< .001	0.001	0.014	0.052	< .001	< .001	< .001	< .001	< .001	< .001	—

E. The Relationship between our Factors and Demographic Variables

Four quantitative variables are considered in our study, gender of participants, their age, teaching years and academic level.

Before performing the t-test or ANOVA methods to evaluate the difference between the means of the variables under study, we must first perform a Levene test to verify the homogeneity of the variances in our sample and a Shapiro-Wilk test to verify the normality of our distribution (see Table 10 and 11).

Table 10. Normality Test (Shapiro-Wilk)

	W	*P*
Knowledge	0.968	< 0.001
Perception	0.947	< 0.001

Table 11. Homogeneity of Variances Test (Levene's)

	F	df	df2	*p*
Knowledge	2.30	1	235	0.131
Perception	3.08	1	235	0.081

According to normality test of Shapiro-Wilk, a *p*-value < 0.05 signifies that our data are not conforming to the normal distribution. To verify our following hypothesis: H3A and H3B.

H3A: there is no significant difference between demographic variables] and the level of knowledge of the AI concept.

H3B: there is no significant difference between demographic variables] and the perceptions on AI concept.

We proceeded for a non-parametric T-TESt of Mann-Whitney between our factors and the gender (Two groups male, female) of participants, while we used ANOVA one way non-parametric test of Kruskal-Wallis between our factors and the age, academic level, teaching years, based on the mean of the factors' items, following the formula:

Factor (Knowledge) = Mean (KNW1, KNW2, KNW3, KNW4)

Factor (Perception) = Mean (PRC1, PRC2, PRC3, PRC4, PRC4, PRC5, PRC6, PRC7)

The impact of participants' Gender on their knowledge and perception is shown in Table 12.

Table 12. Independent samples t-test of Mann-Whitney U result, between gender of participants and factors

	Group	N	Mean	Median	SD	SE	Mann-Whitney U		
							Statistic	*p*	Mean difference
Knowledge	Female	112	1.79	1.75	0.492	0.0465	5230	< 0.001	−0.250
	Male	125	2.05	2.00	0.581	0.0520			
Perception	Female	112	2.31	2.29	0.446	0.0422	6577	0.420	$-2.21e^{-5}$
	Male	125	2.36	2.43	0.490	0.0439			

As we notice in Table 10 above, *p*-value < 0.001 means the presence of a significant difference between the gender of participants and the Knowledge factor, that is to say, the gender has an impact on the level of knowledge of the concept of AI. On the other hand, *p*-value > 0.05, suggests that there is NO significant difference between the gender of participants and the perception factor, that is, the gender has no impact on participants' perceptions of AI.

The impact of participants' Age on their knowledge and perception is shown in Table 13.

Table 13: Analysis of Variance Across participants' age via Kruskal-Wallis Test

	χ^2	df	p	ε^2
Knowledge	21.73	3	< .001	0.09209
Perception	2.28	3	0.517	0.00964

P-value < 0,001 means the presence of a significant difference between the age of participants and the knowledge factor, that is, the age has an impact on the level of knowledge of the concept of AI.

On the contrary, *p*-value= 0.517 > 0.05, signifies that there is no significant difference between the age of participants and the perception factor, that is, the age has no impact on participants' perceptions on AI.

The impact of participants' teaching years on their knowledge and perception is shown in Table 14.

Table 14: Analysis of Variance Across participants' teaching years via Kruskal-Wallis Test

	χ^2	df	*p*	ε^2
Knowledge	25.32	6	< .001	0.1073
Perception	9.01	6	0.173	0.0382

P-value < 0.001 means the presence of a significant difference between the teaching years of participants and the Knowledge factor, that is, the teaching years have an impact on the level of knowledge of the concept of AI. On the contrary, P-value= 0.173 > 0,05, signifies that there is NO significant difference between the teaching years of participants and the perception factor, that is, the teaching years has no impact on participants' perceptions on AI.

The impact of participants' academic level on their knowledge and perception is shown in Table 15.

Table 15: Analysis of Variance Across participants' academic Level via Kruskal-Wallis Test

	χ^2	df	p	ε^2
Knowledge	23.8	4	< .001	0.1008
Perception	17.7	4	0.001	0.0748

P-value =< 0.001means the presence of a significant difference between the academic level of participants and the two main factors, that is to say, the academic level has an impact on the level of knowledge and the perception on AI concept.

Table 16. Results recap of the relationship between factors and demographic variables

	Gender	Age	Academic level	Working years
Knowledge	**Yes**	**Yes**	**Yes**	**Yes**
Perception	No	No	**Yes**	No

F. Discussion

Overall, based on the results above, teachers generally have a positive view of AI, especially in educational tools. They are motivated to integrate AI into their teaching practices as it proves to be useful in offering pedagogical materials as well as providing an ideal learning environment that certainly helps simplify their jobs. Furthermore, they agree with the fact that AI will definitely enhance their teaching quality and learning performance.

Concerning teachers' familiarity with the concept of AI, most teachers have an average knowledge of AI. This is likely due to their daily tech use, like ChatGPT, Google Bard, Perplexity, Chatbot, facial recognition, intelligent tutoring, etc.., because those tools are available in any smartphone or computer.

Based on the inter-factors correlation results (value = 0.425), It was proved that positive perceptions of AI and knowledge are overlapped. That is to say, individuals who master the new means of technology are more likely to have a favorable attitude towards AI [45]. Teachers recognize AI's value but emphasize the irreplaceable role of teachers in the education process. Teachers serve as the backbone of the teaching and learning process while AI acts as a tool to support and amplify their efforts.

After verifying our hypothesis on the relationship between Teachers' perceptions on AI and their gender, age, teaching years or academic level, based on (Tables 12–16), it is perceived that the academic level is the only variable that influences their perceptions, and this is totally logical, because teachers who develop their conceptual level become more confident and ready to accept new things and adapt quickly by changing their usual practices.

Looking at the (Tables 12–16), we see that the four demographic variables have a strong correlation with the Knowledge concept. Concerning gender, men have more knowledge on AI concept than women [45]. Also, it is noticed that young teachers aged between 20 and 40 years are more familiar with AI concept. Growing up in a technology-driven era and widespread use of Information and Communication Technology (ICT) in all aspects of daily life, millennials exhibit a more favorable outlook towards embracing new technology [46, 47]. Concerning working years variable, teachers who have less professional experience are more likely to be updated by any new technologies and constantly looking for new courses to enhance their level of knowledge in this field, and this is represented by the relationship between the knowledge factor and the academic level. On the other hand, teachers who have long working years are more comfortable with their traditional methods, because they think technology will be a challenging experience for them [48].

AI-based educational tools continue to revolutionize

learning experiences by personalizing education, improving engagement, and providing valuable support to both students and educators. As technology advances, it is essential for educators to stay informed about these tools to effectively integrate them into the educational landscape [42], for this reason, we need to set up an effective strategy to include AI in the professional vocational training programs. Admittedly, teachers suggest the need for getting adequate training and scaffolding to master the use of AI-based tools in order to ensure the successful adoption of AI in their teaching practices and this is proven in Table 3 PRC7. Therefore, continuous professional development training programs should be provided to teachers to gain practical knowledge, skills, and attitudes towards using AI tools, creating effective learning environments.

Since we are living in a world that relies merely on ICT, schools should be equipped with the latest technological tools in order to facilitate the integration of ICT in the teaching and learning process. In addition to classroom equipment, while working on reforms, curriculum designers and policy makers should take into consideration the digital shift and the learning style of learners that is oriented towards technology.

V. Conclusion

In today's rapidly evolving world, technology has become an integral part of our daily lives. In the realm of education, it's undeniable that teachers play a crucial role in the success of the teaching and learning process. As such, it is essential for teachers to be equipped with the latest technologies in order to create a successful learning environment. According to the findings of this research, teachers generally hold a positive attitude towards the use of artificial intelligence in their teaching practices. However, despite their willingness to integrate AI into their teaching, the research also found that teachers lack proper understanding in AI. This is mainly due to the lack of training and awareness on how to effectively integrate AI into their teaching. This brings to light the urgent need to provide continuous professional development programs where teachers will be introduced to AI and will be monitored to effectively using AI into their classrooms.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

H.F, M.L, N.E analyzed and interpreted the data. K.E.K, and L.A supervised the work. Also, H.F wrote the paper. All authors had approved the final version.

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