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Acceptance of Educational Artificial Intelligence by Teachers and Its Relationship with Some Variables and Pedagogical Beliefs

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Abstract: This study explores teachers' acceptance of artificial intelligence in education (AIEd) and its relationship with various variables and pedagogical beliefs. Conducted at the Universidad Técnica Particular de Loja (UTPL, Ecuador), the research surveyed 425 teachers across different disciplines and teaching modalities. The UTAUT2 model analyzed dimensions like performance expectations, effort expectations, social influence, facilitating conditions, hedonic motivation, usage behavior, and intention to use AIEd. Results showed a high level of acceptance among teachers, influenced by factors like age, gender, and teaching modality. Additionally, it was found that constructivist pedagogical beliefs correlated positively with AIEd adoption. These insights are valuable for understanding AIEd integration in educational settings.

Keywords: artificial intelligence; higher education; teacher; pedagogy



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1. Introduction

Teachers' perceptions regarding artificial intelligence in the educational field (AIEd) is a topic of growing interest and has been extensively addressed in several studies. These investigations provide a comprehensive understanding of teachers' beliefs and attitudes towards AIEd, underlining the importance of considering various factors influencing its acceptance and use in different educational settings.

In general, it should be noted that the integration of information and communications technology (ICT) in the educational process has constituted a relevant axis of analysis within didactic research [1], evolving towards studies focused on specific aspects such as the influence of the TPACK model on the incorporation of ICT in teaching [2], the perception of the effectiveness of video in language teaching [3], the decision to integrate or not ICT in educational practice [4,5], how perceptions of technological competencies affect their integration [6], the potential of ICT to support the learning of students with dyslexia [7], its effectiveness and applicability at initial educational levels [5], and its viability in various disciplines [8].

To summarize the importance of teachers' beliefs about the application of ICT, the conclusions of Tondeur, van Braak, Ertmer, and Ottenbreit-Leftwich [9], derived from a meta-analysis on this topic, indicate (1) the existence of a reciprocal relationship between pedagogical beliefs and the concrete use of ICT; (2) the identification of certain beliefs as perceived obstacles; (3) the correlation between specific beliefs and specific types of ICT use; (4) the significant role of beliefs in teachers' professional development; and (5) the relevance of the school context in shaping beliefs about ICT.

The notable advance of AI, especially after the introduction of ChatGPT3 in the educational field, has encouraged research on attitudes, levels of acceptance, available training, and the impact of beliefs about teaching on students' use or rejection of AI in educational practice. It is crucial to highlight the importance of teachers being trained in the use of AI, both in teaching and in research [10–13].

These beliefs are influenced by factors such as the age of the teachers. A study by Yuk and Lee [14] explored the perceptions, experiences, knowledge, concerns, and intentions to use Generative AI (GenAI) among Generation Z (Gen Z) students and teachers from Generation Y (Gen Y) in higher education.

The findings of various investigations highlight the importance of teachers' beliefs in teaching artificial intelligence (AI).

According to Adekunle, Temitayo, Adelana, Aruleba, and Sunday [15], teachers' confidence in their ability to teach AI significantly predicts their intention to integrate AI into their teaching practice, underscoring their perception of its usefulness and educational relevance. This phenomenon is not homogeneous but varies depending on the discipline taught and the academic level at which teachers practice their profession [16].

Uygun [17] conducted a literature review to examine teachers' beliefs about using AI in education. They identified key factors influencing teachers' acceptance of this technology, highlighting the need to understand their perspectives for effective adoption in educational settings.

Various empirical studies have shown that teachers' acceptance of AI is influenced by various factors. For example, Ma and Lei [18] conducted a study in China that analyzed the factors influencing teachers' acceptance of AI. Similarly, Bacci and Caviezel [19] also investigated how teachers perceive and accept AI in the educational context, using ClarityTutor as a case study.

Additionally, several studies have integrated theoretical technology acceptance models to better understand faculty attitudes toward AI. Al Darayseh [20] applied the Technology Acceptance Model to examine teachers' acceptance of AI-based educational systems. Likewise, An et al. [21] proposed an integrative model that considers various factors that affect the acceptance of AI in teaching.

Other studies have applied psychological theories to examine teachers' acceptance of AI in specific educational contexts. Chocarro et al. [22] integrated the Technology Acceptance Model and Social Cognitive Theory to examine the acceptance of AI in primary education. Furthermore, teachers' acceptance of AI may vary depending on the educational context and specific technology characteristics, as demonstrated by the studies of Ayanwale et al. [23] and Crompton and Burke [24] at different educational levels.

In this context, the interaction of multiple factors influences the intention to continue using AI in education. Zulkarnain et al. [25] investigated the factors influencing teachers' continuing intention to use AI education systems, integrating the Expectation Confirmation Model and the Task Technology Adjustment Model.

Furthermore, it has been shown that teachers' beliefs about the conceptions of learning significantly influence how and how often they use information and communications technology (ICT) in teaching. Research has been carried out addressing both the general use of ICT [4,26–28] and specific technologies such as mixed reality [29], the Moodle platform [28], or the digital whiteboard [30]. These investigations highlight the complexity of the factors that affect technology integration in educational environments, showing that teachers' pedagogical beliefs play a crucial role in adopting and effectively using technological innovations in education.

In the psychoeducational field, two predominant paradigms are recognized regarding conceptions of learning and teaching: behaviorism and constructivism. While behaviorism suggests that knowledge is transmitted directly to the student, constructivism proposes that the learner actively constructs knowledge through personal experience and social interaction [28]. In this context, Choi, Jang, and Kim [31], identified that teachers with a

constructivist orientation are more likely to incorporate AI in education than those with a more traditional or transmissive approach.

In some way related to the theme of beliefs, we find the work carried out on the “degree of acceptance of technologies” by teachers. Furthermore, in this regard, the models used to analyze the degree of acceptance of a technology by its potential users have been different. The first of them was the TAM model (“Technology Acceptance Model”) formulated by Davis [32], which postulates that the intention to use technology is influenced by two main dimensions, perceived usefulness and perceived ease of use, which influence the attitudes one has about ICT, which will determine their intentions to use and its use. The model has been used for the analysis of different technologies, such as virtual training [33], augmented reality [34], or immersive reality [35].

Against this model, Venkatesh et al. [36], unifying different proposed acceptance models, including TAM, formulated their “Unified Theory of Acceptance and Use of Technology” (UTAUT). This model seeks to explain the acceptance and use of technology, which depends on four large dimensions: performance expectations, effort expectations, social influence, and facilitating conditions. The model that was reformulated by Venkatesh, Thong, and Xu [37] with the so-called UTAUT2 incorporates three new dimensions: hedonic motivation or pleasure achieved in its use, the value of the price, and the degree to which a person automatically uses that technology. This model, as different authors have suggested [38,39] in the bibliographic studies they have carried out, is increasingly used by researchers compared to previous proposals.

It should be noted that in our study, we have only considered the first of the new variables incorporated in the UTAUT2 since, for the objectives that were sought to be achieved, the relevance of the variables price and automatic use of technology was not considered, leaving the model configured as presented in Figure 1.

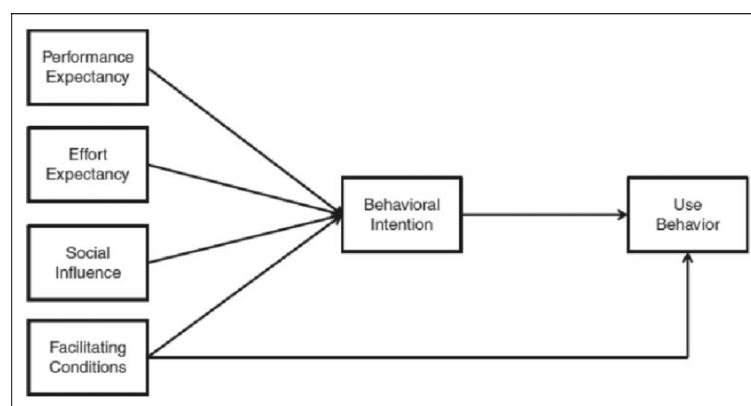


Figure 1. UTAUT2 model used in this study.

According to various studies [40,41], “performance expectations” are understood as the level at which an individual considers that the use of artificial intelligence in education (AIEd) contributes to improving their performance in the activities they carry out. “Effort expectations” refer to the degree to which it is believed that the AIEd will not require excessive effort to use. “Social influence” implies the degree of influence the close environment (family, friends, and colleagues) exerts on the individual to adopt AIEd. “Facilitating conditions” encompass the level and volume of available resources and support that make adopting and using AIEd easier. “Hedonic motivation” relates to the pleasure or enjoyment of using AIEd. “Intention to use” is defined as an individual’s purpose in using the AIEd in their educational practice. At the same time, “usage behavior” indicates the extent to which the person uses the AIEd in their professional teaching activity.

It should be noted that both the UTAUT and UTAUT2 models have been used to examine the degree of acceptance of various technologies. Research based on the UTAUT has explored the acceptance of the metaverse [41], mobile devices [42], and virtual real-

ity [43]. On the other hand, UTAUT2 has been applied in the analysis of technologies such as augmented reality [44], the metaverse [45], virtual training platforms [46], and the use of artificial intelligence [40], including its educational application [47].

Our study aims to understand whether teachers want to use artificial intelligence in education (AIEd), whether they use it, and what factors influence these decisions, such as their friends' opinions, previous experience, perceived usefulness and ease of use, and pedagogical beliefs.

2. Materials and Methods

2.1. The Research Carried Out

Research Objectives

The research was conducted during the 2023–2024 academic year with faculty members from the Private Technological University of Loja (Ecuador). The study aimed to achieve several overarching objectives:

- (a) Investigate whether teacher variables such as gender, age, teaching modality, and area of knowledge influence teachers' scores on dimensions including performance expectations, effort expectations, social influence, facilitating conditions, hedonic motivation, usage behavior, and intention to use AI in Education (AIEd).
- (b) Examine how teacher variables, including gender, age, teaching modality, and area of knowledge, influence teachers' constructivist and transmissive pedagogical beliefs.
- (c) Explore the impact of teachers' constructivist and transmissive pedagogical beliefs on their "usage behavior" regarding AIEd.

An "ex post facto" study was developed to address these objectives [48].

2.2. The Sample

Four hundred and twenty-five teachers participated in the research, of whom two hundred and thirty-three were men (54.8%) and one hundred and ninety-two were women (45.2%). Their age is presented in Table 1.

Table 1. Age of teachers.

Years	Percentage
Less than 25 years	0.2
25–30 years	7.1
31–40 years	38.4
41–50 years	36.9
51–60 years	14.4
More than 60 years	3.1

The teachers belonged to different areas of knowledge (Table 2).

Table 2. Area of knowledge where the teachers taught.

Years	Percentage
Arts and Humanities	18.4
Sciences	16.0
Health Sciences	12.7
Social and Legal Sciences	36.2
Engineering and Architecture	15.3

The teachers carried out their professional activities in different teaching modalities at the UTPL (Table 3).

Table 3. Modality in which teaching was carried out.

Modality	Percentage
From distance	47.3%
Both	26.8%
In-person	25.9%

Teachers were asked to rate themselves from 0 to 10 on the technical and didactic mastery that they considered they had regarding ICT. They reached an average score of 8.04 regarding technical mastery, with a standard deviation of 1.41, and 7.96 concerning the didactic domain, with a standard deviation of 1.48.

2.3. The Information Collection Instrument

The data collection instrument comprised three main components. First, items were included to collect information on the respondent's characteristics: gender, age, academic affiliation, and the perception of technical and didactic skills in using information and communications technology (ICT). Secondly, their level of acceptance of artificial intelligence in education (AIEd) was evaluated. For this purpose, a scale was adapted from the instruments developed by Huang et al. [44,45,47]. Moreover, the third study investigated the teachers' pedagogical beliefs using a scale inspired by the work of Choi, Jang, and Kim [31], which differentiated between transmissive and constructivist approaches to teaching.

The second and third parts of the questionnaire were constructed using a Likert-type scale, with seven response options ranging from 1 (extremely unlikely/disagree) to 7 (extremely likely/agree).

The questionnaire used in the study comprised 30 items, divided into three sections: the first consisted of 5 items, the second of 25 items, and the third of 10 items. The survey was carried out electronically through an online platform.

Cronbach's alpha and McDonald's omega [49] obtained the instrument's reliability, reaching the values presented in Table 4.

Table 4. Reliability of the instrument: Cronbach's α and McDonald's Ω .

	Cronbach's Alpha	Omega McDonald
Usage behavior	0.931	0.898
Intention to use	0.937	0.912
Effort expectations	0.920	0.899
Facilitating conditions	0.729	0.721
Hedonic motivation	0.936	0.925
Performance expectations	0.937	0.928
Social influence	0.835	0.800
Total UTAUT	0.957	0.935
Transmissive pedagogical beliefs	0.935	0.920
Constructivist pedagogical beliefs	0.871	0.829

According to Mateo et al. [50,51], when the values obtained exceed 0.7, all the values achieved suggest that the instrument is reliable both in its overall manner and in the dimensions that define it.

3. Results and Discussion

Initially, the means and standard deviations in the different dimensions that made up the instrument will be presented (Table 5).

Table 5. Means and standard deviations of the dimensions of the degree of acceptance.

	M	SD
Performance expectations	5.81	1.188
Effort expectations	5.87	0.951
Social influence	5.30	1.328
Facilitating conditions	4.85	1.294
Hedonic motivation	5.64	1.329
Usage behavior	5.25	1.424
Facilitating conditions	4.85	1.294

In all cases, the mean scores exceeded the threshold of 3.5, indicating a significantly high level of acceptance of AIEd by teachers. This finding suggests a marked predisposition towards its implementation, as evidenced by the high average score in the “intention to use” dimension with a mean value of 5.75. However, it should not be forgotten that the high value reached in the standard deviations demonstrates a high dispersion of the data.

Table 6 shows the average scores obtained in the dimensions related to the analysis of the teachers’ constructivist and transmissive pedagogical beliefs.

Table 6. Means and standard deviations of the dimensions referring to teachers’ pedagogical beliefs.

	M	SD
Constructivist pedagogical beliefs	6.49	0.733
Transmissive pedagogical beliefs	3.63	1.972

As can be seen, there is predominantly a tendency among teachers to adopt constructivist positions for the development of training actions, with an average score of 6.49, in contrast to transmissive positions, which obtained an average score of 3.63. However, it is also essential to highlight the high score achieved in the standard deviation found in the transmissive option, which implies a notable dispersion in the answers provided by the teachers.

The scores obtained for analyzing the proposed hypotheses are detailed below. We used non-parametric statistical tests such as Mann–Whitney U and Kruskal–Wallis H. Additionally, an average rank analysis was carried out in cases where these tests indicated the presence of significant differences between the groups [52]. Before this analysis, it was verified that the sample distribution did not follow a normal distribution. This verification was carried out through a kurtosis study and the Kolmogorov–Smirnov test ($p = 0.000$). An exhaustive review of the data distribution was carried out to ensure the validity of the results. In addition to the methods mentioned above, a visual analysis of the histograms and an examination of possible outliers were carried out. These additional measures were taken to ensure the statistical findings’ robustness. This additional verification process strengthens confidence in interpreting the results obtained in the statistical analysis.

It should be noted that in all cases, the following hypotheses were formulated:

Null hypothesis (H0): There are no significant differences between the variable “x” and “y”, with an alpha risk of being wrong of 0.05.

Alternative hypothesis (H1): There are significant differences between the variable “x” and “y”, with an alpha risk of being wrong of 0.05.

- (a) There are significant differences, at the 0.05 significance level, depending on the teachers’ gender in the dimensions of the UTAUT2 referred to the AIEd.

In this case, the Mann–Whitney U statistic was applied to analyze the significant differences, achieving the results shown in Table 7.

Table 7. Mann–Whitney U for the gender variable and the UTAUT2 dimensions.

	Mann–Whitney U	W Wilcoxon	Z	Asymptotic Significance
Performance expectations	22,351.500	49,612.500	−0.013	0.989
Effort expectations	21,825.500	49,086.500	−0.433	0.665
Social influence	21,688.000	48,949.000	−0.542	0.588
Facilitating conditions	20,550.500	39,078.500	−1.446	0.148
Hedonic motivation	21,219.000	48,480.000	−0.926	0.354
Usage behavior	21,743.500	49,004.500	−0.499	0.618
Intention to use	21,992.500	49,253.500	−0.303	0.762

The results did not allow us to reject H0 at a significance level of $p \leq 0.05$. Consequently, it can be noted that there were no significant differences in the different dimensions identified in the formulated UTAUT2 model.

- (b) There are significant differences, at the 0.05 level of significance, depending on the gender of the teachers in terms of their constructivist pedagogical beliefs and transmissive pedagogical beliefs.

To analyze whether there were significant differences in teachers based on gender regarding the constructivist or transmissive beliefs they had regarding teaching, the Mann–Whitney U was applied again, achieving the results presented in Table 8.

Table 8. Mann–Whitney U for the gender variable and teachers’ pedagogical beliefs (note: ** significant $p \leq 0.01$).

	Mann–Whitney U	W Wilcoxon	Z	Asymptotic Significance
Constructivist pedagogical beliefs	18,002.500	45,263.500	−3.628	0.000 (**)
Transmissive pedagogical beliefs	19,278.500	37,806.500	−2.456	0.014 (**)

The results obtained allowed us to reject the H0, which refers to the non-existence of significant differences. Consequently, it can be said that teachers’ transmissive and constructivist pedagogical beliefs differed depending on their gender.

Since H0 was rejected in both cases and H1 was accepted, with a risk of $p \leq 0.05$ of being wrong, and to know in favor of which gender the most significant differences occurred, the range test was applied, achieving the results offered in Table 9.

Table 9. Rank test for the gender variable and teachers’ pedagogical beliefs.

	Gender	N	Average Range
Constructivist pedagogical beliefs	Male	233	194.26
	Female	192	235.74
Transmissive pedagogical beliefs	Male	233	226.26
	Female	192	196.91

The values achieved in the range test allowed us to point out that female teachers have a greater tendency to have constructivist pedagogical beliefs. On the contrary, male teachers present a tendency towards transmissive pedagogical beliefs.

- (c) There are significant differences, at the 0.05 level of significance, depending on the teachers’ age in the dimensions of the UTAUT2 referred to as the AIED.

To determine if there were significant differences at the significance level of $p \leq 0.05$ concerning the different dimensions of the UTAUT2 depending on the age of the teachers, the Mann–Whitney test was applied, obtaining the values presented in Table 10.

Table 10. Mann–Whitney test for the relationship between the age of the teachers and the dimensions of the UTAUT2 (note: ** significant $p \leq 0.01$).

	Mann–Whitney U	W Wilcoxon	Z
Performance expectations	2.520	5	0.773
Effort expectations	18.165	5	0.003 (**)
Social influence	2.512	5	0.775
Facilitating conditions	8.850	5	0.115
Hedonic motivation	17.409	5	0.004 (**)
Usage behavior	5.318	5	0.378
Intention to use	3.055	5	0.691

The results achieved did not allow us to reject H0 at the level of $p \leq 0.05$ in the dimensions of “performance expectations”, “social influence”, “facilitating conditions”, “usage behavior”, and “intention to use”. Consequently, it can be noted that the age of the teachers did not influence the evaluations made regarding the citation dimensions.

On the contrary, the scores achieved allowed us to reject H0 and accept H1 with a risk $p \leq 0.05$ of being wrong in the case of the dimensions “expectations of effort” and “hedonic motivation”. Next, to determine which age levels of the teachers where the differences occurred, we applied the range test again, reaching the values presented in Table 11.

Table 11. Rank test for the dimensions “effort expectations (EE)” and “hedonic motivation (HM)”, depending on the teachers’ age.

	Age	N	Average Range
Effort expectations	Less than 25 years	1	388.50
	25–30 years	30	243.08
	31–40 years	163	234.20
	41–50 years	157	201.35
	51–60 years	61	183.87
	More than 60 years	13	141.58
Hedonic motivation	Less than 25 years	1	299.50
	25–30 years	30	268.92
	31–40 years	163	224.54
	41–50 years	157	200.88
	51–60 years	61	203.40
	More than 60 years	13	124.00

The values achieved with the range test indicate that the youngest teachers (“less than 25 years old” and “25 to 30 years old”) obtained the highest scores in both dimensions. Scores decrease as the age of the teachers advances.

- (d) There are significant differences, at the 0.05 level of significance, depending on the teachers’ age in constructivist pedagogical beliefs and transmissive pedagogical beliefs.

To determine whether there were significant differences depending on the teachers’ age, we considered whether the teachers’ age impacted their beliefs. We applied the Kruskal–Wallis statistic, obtaining the values in Table 12.

Table 12. Kruskal–Wallis test for the relationship between teachers’ age and pedagogical beliefs.

	Kruskal–Wallis H	df	Asymptotic Significance
Constructivist pedagogical beliefs	6.098	5	0.297
Transmissive pedagogical beliefs	5.822	5	0.324

The data obtained did not allow us to reject any H0 at a significance level of $p \leq 0.05$. Consequently, it can be indicated that the age of the teachers did not influence the pedagogical, transmissive, or constructivist beliefs they had about teaching.

- (e) There are significant differences, at the 0.05 level of significance, depending on the modality the teacher teaches (face-to-face, distance learning, or both) in the dimensions of the UTAUT2, referred to the AIED.

To analyze whether there were significant differences at the level of significance at the level of $p \leq 0.05$ in the different dimensions of the UTAUT2 depending on the modality in which the teachers taught, the Kruskal–Wallis test was applied again, reaching the values that are presented in Table 13.

Table 13. Kruskal–Wallis test for the relationship between the modality in which the teachers taught and the dimensions of the UTAUT2 (note: * = significant $p \leq 0.05$, ** significant $p \leq 0.01$).

	Kruskal–Wallis H	df	Asymptotic Significance
Performance expectations	10.143	2	0.006 (**)
Effort expectations	8.494	2	0.014 (**)
Social influence	8.017	2	0.018 (*)
Facilitating conditions	4.369	2	0.113
Hedonic motivation	2.815	2	0.245
Usage behavior	4.216	2	0.121
Intention to use	5.995	2	0.050 (*)

The values found did not allow us to reject H0 at the significance level of $p \leq 0.05$ in the following dimensions of the UTAUT2: “facilitating conditions”, “hedonic motivation”, and “usage behavior”. On the contrary, they did allow us to reject it at the level of significance indicated in the dimensions “performance expectations”, “effort expectations”, “social influence”, and “intention to use”.

Again, the range test was applied to determine where such differences were established in the accepted H1, reaching the values shown in Table 14.

Table 14. Rank test for the dimensions “performance expectations (PE)”, “effort expectations (EE)”, “social influence (SI)”, and “intention to use (BI)”, depending on the teaching modality.

	Modality in Which Teaching Is Carried Out	N	Average Range
Performance expectations	From distance	201	224.35
	Both	114	223.61
	In-person	110	181.25
Effort expectations	From distance	201	225.01
	Both	114	219.77
	In-person	110	184.03
Social influence	From distance	201	228.82
	Both	114	209.09
	In-person	110	188.14
Intention to use	From distance	201	222.63
	Both	114	219.37
	In-person	110	188.80

The values indicate that the teachers who, in some way, solely or in combination with face-to-face, work in the distance modality have higher perceptions in the four dimensions mentioned in the UTAUT2.

- (f) At the 0.05 significance level, there are significant differences depending on the modality in which the teacher teaches: constructivist pedagogical beliefs and transmissive pedagogical beliefs.

We again applied the Kruskal–Wallis test to determine whether the teachers differed depending on the teaching modality and their pedagogical beliefs (Table 15).

Table 15. Kruskal–Wallis test for the relationship between the modality in which the teachers taught and the dimensions of the UTAUT2 (note: * = significant $p \leq 0.05$).

	Kruskal–Wallis H	df	Asymptotic Significance
Constructivist pedagogical beliefs	5190	2	0.075
Transmissive pedagogical beliefs	6084	2	0.048 (*)

As can be seen from the two analyzed statistics, only H0 was rejected, at the significance level of $p \leq 0.05$, concerning transmissive pedagogical beliefs. Presented in Table 16 is the rank test for this accepted hypothesis.

Table 16. Rank test for the dimensions “transmissive pedagogical beliefs”, depending on the teaching modality.

	Modality in Which Teaching Is Taught	N	Average Range
Transmissive pedagogical beliefs	From distance	201	226.26
	Both	114	190.85
	In-person	110	211.74

Once again, the teachers who worked remotely offered the highest average range but at a very short distance from those who worked exclusively in person.

- (g) There are significant differences, at the 0.05 level of significance, depending on the area of knowledge where the teachers work in the dimensions of the UTAUT2 referred to as the AIEd.

Finally, we analyzed whether there were differences depending on the area of knowledge the teachers taught. In this case, the score achieved is presented in Table 17.

Table 17. Kruskal–Wallis test for the relationship between the area of knowledge and the dimensions of the UTAUT2 (note: * = significant $p \leq 0.05$, ** significant $p \leq 0.01$).

	Kruskal–Wallis H	df	Asymptotic Significance
Performance expectations	12.507	4	0.014 (**)
Effort expectations	11.814	4	0.019 (*)
Social influence	10.626	4	0.031 (*)
Facilitating conditions	11.866	4	0.018 (*)
Hedonic motivation	9.568	4	0.048 (*)
Usage behavior	14.145	4	0.007 (**)
Intention to use	5.503	4	0.239

The values allowed us to reject H0 at ≤ 0.05 for all dimensions, except for “intention to use”. Table 18 shows the values achieved in the cases of acceptance of H1 to determine the area of knowledge that stood out.

Table 18. Range test for the dimensions, depending on the area of knowledge.

	Knowledge Area	N	Average Range
Performance expectations	Arts and Humanities	78	191.99
	Sciences	68	216.72
	Health Sciences	54	175.21
	Social and Legal Sciences	154	232.64
	Engineering and Architecture	65	199.84
Effort expectations	Arts and Humanities	78	192.98
	Sciences	68	203.49
	Health Sciences	54	172.37
	Social and Legal Sciences	154	229.82
	Engineering and Architecture	65	221.55
Social influence	Arts and Humanities	78	201.35
	Sciences	68	196.67
	Health Sciences	54	186.53
	Social and Legal Sciences	154	234.62
	Engineering and Architecture	65	195.50
Facilitating conditions	Arts and Humanities	78	208.76
	Sciences	68	185.01
	Health Sciences	54	205.45
	Social and Legal Sciences	154	233.91
	Engineering and Architecture	65	184.76
Hedonic motivation	Arts and Humanities	78	194.01
	Sciences	68	205.75
	Health Sciences	54	204.18
	Social and Legal Sciences	154	232.15
	Engineering and Architecture	65	185.99
Usage behavior	Arts and Humanities	78	190.00
	Sciences	68	205.94
	Health Sciences	54	188.70
	Social and Legal Sciences	154	238.00
	Engineering and Architecture	65	189.61

The analysis of the range test allowed us to offer a series of conclusions; on the one hand, the teachers who worked in the knowledge area of “Social and Legal Sciences” obtained the highest scores in all the dimensions analyzed. Teachers from different areas occupied the second positions; thus, in “performance expectations”, the second position was occupied by those in Sciences, in “expectations of effort” by those in Engineering and Architecture, in “social influence” by those in Arts and Humanities, in “facilitating conditions” by those in Arts and Humanities, in “hedonic motivation” by those in Sciences, and finally in “usage behavior” by those in Sciences.

- (h) There are significant differences, at the 0.05 level of significance, depending on the area of knowledge where teachers work: constructivist pedagogical beliefs and transmissive pedagogical beliefs.

The Kruskal–Wallis test was applied to analyze this hypothesis, achieving the results presented in Table 19.

Table 19. Kruskal–Wallis test for the relationship between the area of knowledge where the teachers belonged and pedagogical beliefs (note: ** = significant $p \leq 0.01$).

	Kruskal–Wallis H	df	Asymptotic Significance
Constructivist pedagogical beliefs	6.654	4	0.155
Transmissive pedagogical beliefs	18.286	4	0.001 (**)

As shown in Table 19, H0 was rejected with an alpha risk of being wrong of $p \leq 0.01$ in the hypothesis referring to transmissive pedagogical beliefs. Furthermore, the results achieved after applying the range test to determine which area of knowledge such differences occurred in are presented in Table 20.

Table 20. Range test.

	Knowledge Area	N	Average Range
Transmissive pedagogical beliefs	Arts and Humanities	78	193.26
	Sciences	68	188.12
	Health Sciences	54	207.34
	Social and Legal Sciences	154	241.67
	Engineering and Architecture	65	180.15

- (i) There are differences between teachers' pedagogical beliefs and "usage behavior" regarding AIEd.

In this case, we applied the Spearman Rho statistical test to evaluate the relationship between the intentionality of use, the traditional teaching style, and the constructivist teaching style. The Spearman test does not depend on the normal distribution of the data. Furthermore, this test allows capturing any non-linear associations between these variables, which is crucial given the complexity of the interactions between the intentionality of use and traditional and constructivist teaching styles.

The test obtained the values presented in Table 21.

Table 21. Spearman correlation coefficient between pedagogical beliefs and "usage behavior".

Pedagogical Beliefs	Usage Behavior Spearman's Rho
Constructivist Teaching Style	0.406
Transmissive Teaching Style	0.178

The data obtained allowed us to point out two aspects: (a) that the correlations established between both types of beliefs and the teacher's "usage behavior" towards AIEd are positive and significant, and (b) that there is a greater tendency of teachers who can be considered constructivists, according to the instrument used, to use the AIEd than those considered transmissive.

4. Discussion and Conclusions

The conclusions derived from our research address various aspects, the first of which is the evaluation of the instrument's reliability. It was found that this instrument exhibits considerably high levels of reliability, which allows the analysis of not only the dimensions identified from the UTAUT2 model but also those used to explore constructivist and transmissive pedagogical perspectives. It is essential to highlight that, in this last case, the values obtained coincide with the findings of Choi, Jang, and Kim in their 2023 study.

This finding underlines the robustness and consistency of the measurement instrument used in our research, which confers validity to the study's results. The instrument's high reliability provides a solid basis for interpreting the data collected and, therefore, for the conclusions drawn from them.

The average scores achieved in the dimensions that make up the UTAUT2 model and that indicate the level of acceptance of this technology by teachers are pretty high, and in the case of "usage behavior", which would determine the degree to which the teacher uses AIEd in their professional activity, notably exceed the central value of the distribution offered. It is essential to highlight that "intention to use" is the most significant and influential dimension concerning "usage behavior". Therefore, the intention of use fundamentally determines and directs its use by the teacher.

The average values achieved in the part of the instrument aimed at knowing whether the teachers tended to have a constructivist or transmissive belief in teaching indicate a solid constructivist orientation, which exceeds by almost double the score achieved by teachers with a tendency to a transmissive belief. This would imply that methodological changes are being promoted in teaching, where innovation and active methodologies are gaining traction [25].

The research has indicated that the teacher's gender is not a determining variable for the teacher's acceptance and use of AIEd, specifically in both the "usage behavior" and their "intention to use", which are the dimensions that would finally explain the degree of acceptance of AIEd by teachers. The results achieved are like those obtained by Alenezi, Mohamed, and Shaaban [10].

Although differences were found regarding gender and the tendency towards a transmissive or constructivist pedagogical belief, where female teachers tended to place themselves in a constructivist orientation, this differentiation was not found when the age of the teachers was considered.

The research has shown that the age of the teachers was not generally shown to be significant in the "usage behavior" and "intention to use" of the IAEA. Nevertheless, differences were obtained in "expectations of effort" and "hedonic motivation", where younger teachers achieved higher scores. These teachers consider that using AIEd will not require much effort and that its use will give them some enjoyment and pleasure.

Significant differences were found concerning the modality in which the teachers taught, and the teachers who taught in some way in the distance modality were those who presented a greater tendency in the dimensions "performance expectations", "expectations of effort", "social influence", and "intention to use". Then, it could be said that these teachers consider AIEd very useful for their professional activity, that its use will not require a great effort, and that they have a solid intention to use it.

It was found that there are apparent differences in teachers' acceptance of AIEd depending on the areas of knowledge the teacher taught in. Teachers in "Social and Legal Sciences" show greater acceptance and intention to use AIEd. At the same time, they tend to have transmissive pedagogical beliefs.

Our study's findings suggest that teachers with constructivist beliefs are more likely to integrate artificial intelligence in education (AIEd) into their teaching practice than those with transmissive orientations. This result is consistent with previous research conducted by Choi, Jang, and Kim [31], who also found a positive relationship between constructivist beliefs and teachers' willingness to adopt educational technologies. However, in their study, they used the Technology Acceptance Model (TAM) as a theoretical framework, not UTAUT2, which was used in this work.

It is important to note that, despite the consistency in the results, the specific context of AIEd integration in teaching may differ between the theoretical models used to analyze technology acceptance. In this sense, the constructivist approach can emphasize the importance of active learning, collaboration, and student construction of knowledge, which could influence teachers' willingness to adopt technologies that promote these principles.

Furthermore, regarding the expectation of effort, we observed that teachers with transmissive beliefs assigned higher scores, indicating a perception of greater difficulty in using AIEd. This result suggests that these teachers may perceive additional obstacles or greater complexity in implementing AIEd compared to their counterparts who hold constructivist beliefs. This difference can be attributed to different conceptions of the role of the teacher and the student in the teaching-learning process, as well as expectations of how AIEd can support or challenge these traditional roles.

The results of this study have implications of both practical and theoretical relevance regarding the knowledge of AIEd. Our review's contribution is that it is one of the first empirical works that addresses teachers' perceptions regarding AIEd through the UTAUT2 model. Other studies have been developed using the technology acceptance model (TAM) [31] or the UTAUT2 model, but with university students [47].

This study presents several limitations that should be considered in future research related to AIED Integration. First, the level of respondents' exposure to the use of AIED was not assessed. The lack of this information may limit the understanding of how prior experience with technology influences teachers' attitudes and practices.

Finally, it would be beneficial to include qualitative data in future research to explore further the determinants influencing teachers' acceptance of AIED. Qualitative methods like focus group interviews or nominal groups allow researchers to identify the underlying mechanisms in teachers' attitudes and perceptions toward AIED. This combination of quantitative and qualitative approaches could provide a more holistic and detailed understanding of the phenomenon studied.

5. Research Ethics

All subjects gave their informed consent for inclusion before they participated in the study. The study was conducted in accordance with the Declaration of Helsinki.

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