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Artificial intelligence: innovative educational revolution in Higher Education

Inteligencia artificial: revolución educativa innovadora en la Educación Superior

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ABSTRACT
It is a reality that, in the university, educational innovation and artificial intelligence are closely related. There are several benefits resulting from integrating AI into teaching practice, as well as improving the teaching-learning process. This research is based on a quantitative methodology, through a questionnaire comprising three different scales (previously validated) on teaching practice, educational innovation and consideration of artificial intelligence by university professors. A sample of 159 teachers from the University of Huelva was formed; with the aim of exploring their opinions on AI, their attitudes towards educational innovation and its relationship with teaching practices. The results revealed that factors such as gender are significant in the attitude towards innovation. Furthermore, it was observed that the age of the teachers influenced the attitude towards AI, so that the youngest teachers are those who use AI the most in the classrooms and also tend to be the ones who innovate the most. In general, teachers have a more positive opinion on the use of AI in research than in teaching, where there is still some reluctance.

RESUMEN
Es una realidad que, en la universidad, la innovación educativa y las inteligencias artificiales están estrechamente relacionadas. Son múltiples los beneficios resultantes de integrar la IA en la práctica docente, así como la mejora el proceso de enseñanza-aprendizaje. Esta investigación se plantea desde una metodología cuantitativa, a través de un cuestionario formado de tres escalas diferentes (previamente validadas) sobre la práctica docente, la innovación educativa y la consideración hacia las inteligencias artificiales por parte del profesorado universitario. Se obtuvo una muestra de 159 docentes de la Universidad de Huelva; con el objetivo de explorar sus opiniones sobre la IA, sus actitudes hacia la innovación educativa y su relación con las prácticas docentes. Los resultados revelaron que factores como el género son significativos en la actitud hacia la innovación. Además, se observó que la edad del profesorado influye en la actitud hacia la IA, de forma que el profesorado más joven es el que más utiliza las IA en las aulas y también tiende a ser el que más innova. En general, el profesorado tiene una opinión más positiva sobre el uso de la IA en investigación que en docencia, donde aún se localizan ciertas reticencias.

KEYWORDS · PALABRAS CLAVES
Artificial intelligence, higher education, educational innovations, teaching practice, research
Inteligencia artificial, enseñanza superior, innovación educacional, práctica pedagógica, investigación

1. Introduction

Since the seventies and eighties, with the onset of the technological revolution, society has been immersed in a constant wave of changes and advances in the digital age. From this metamorphosing situation, the fourth industrial revolution emerges with the breakthroughs of artificial intelligence or AI (Andión & Cárdenas 2023). Different international organisations cite its use, linking it with a positive effect in various social areas, as well as higher education, as it provides the opportunity to promote innovation, productivity and even quality of life (Dogru *et al.*, 2023); Faraj, 2022; Kelly *et al.*, 2023). This information makes us ask ourselves the following question: Are we facing a new educational revolution?

It is true that it was not until the recovery of post-pandemic in-person academic activities that Artificial Generative Intelligence (AGI) began to appear for the first time. Multiple precursor tools emerged at the academic level in terms of educational management, governance and strategic development policies (Cedeño *et al.*, 2024; Regalado-López *et al.*, 2024), forming part of a technological innovation that would mark a turning point in this context (Galent-Torres *et al.*, 2023). However, not everything around AI is positive, as it gives rise to a gap in opinions, combining enthusiasm and mistrust regarding its impact and its use as part of teaching practice or its consideration as an educational innovation (Flores-Vivar and García-Peñalvo, 2023).

Currently, AI as an educational tool contributes to the achievement of the fourth SDG proposed by the UN by promoting inclusive, equitable and quality education that also prepares us to face the current and future requirements of the society (Sanabria and Cepeda, 2016). Also, it helps personalise learning experiences and offers significant potential in terms of teaching practices and educational innovation (Bucea-Manea-Tonis *et al.*, 2022; Chen *et al.*, 2020). Teaching practices that favour the teaching and learning process in higher education include personalised learning (Jiménez-García *et al.*, 2024; Murtaza *et al.*, 2022), the adaptation of content and strategies to optimise learning outcomes (Kabudi *et al.*, 2021), intelligent tutoring (Mousavinasab *et al.*, 2021) or automatic grading, data analysis and curriculum design (Chen *et al.*, 2020). Regarding its limitations, it is necessary to consider ethical and privacy issues (Botelho, 2021), the lack of human interaction, downplaying critical thinking (Jara & Ochoa, 2020) and the lack of training (Corica, 2020).

It should be noted that in recent years the use and application of AI has registered greater informative interest in the scientific area. In the international scope, there are studies that have established a direct relationship between teachers with positive attitudes towards innovation and the use of AI in the classroom, resulting in the individual innovation of those making an important contribution to the correct implementation of artificial intelligence technologies in education (Uzumcu & Scilmis, 2023). Other studies suggest that gender is a determining variable in the use of AIs in teaching, with female teachers being those with the greatest knowledge of this technology and who apply it most (Al- Awfi & Al- Rahili, 2021; Alissa & Hamadneh, 2023). At national level, there is research that explains that there are more teachers who have used AI to prepare their classes than to integrate it with their students in the classroom and that it is perceived as a tool to improve teaching and learning, as well as to facilitate research and the preparation of educational materials (Del Sánchez, 2023; González *et al.*, 2024). Furthermore, Ayuso-del Puerto and Gutiérrez-Esteban, (2022) clarify that AI tools enrich learning environments in the Higher Education context and awaken interest and pleasure in using them in their professional future.

2. Methodology

2.1. Goals

- Analyse the practice and interest in innovation and the opinion on AI of the teaching staff of the University of Huelva.
- Identify existing associations between the application of innovative teaching practices and the use of AI.
- Explore the impact on teaching practice and innovation of variables such as gender or the field of knowledge to which teachers belong.

2.2. Hypothesis

- Teaching staff at the University of Huelva diversify their teaching practices, show interest in applying teaching innovation strategies and have a positive opinion towards the possibilities offered by AI.
- Teachers who innovate in teaching and have a positive vision of AI also tend to use it in the teaching and learning process.
- Gender and knowledge area are variables that influence the type of teaching practice used by teachers and the interest in teaching innovation.

2.3. Method

This work is based on a survey-type methodology, with transversal application in the university teaching community.

2.3.1. Sample

The target population is the teaching group of the University of Huelva for the 2023/2024 academic year. The participating sample was 159 professionals and, considering the population size (N= 896), it was possible to work with a confidence level of 93% and a margin of error of ±7%. The procedure used was incidental sampling and the availability and acceptance to complete the questionnaire by the teaching staff hired during the second semester was taken as a selection criterion. The sample characteristics classify it as 52.2% men and 47.8% women, with an average age of 46.9 years and an experiential background on average of 17.06 years. Table 1 shows the distribution in the different professional categories (spread among 36 knowledge areas and 9 Faculties).

Table 1

Professional category of university teachers

Professional category	Percentage
Assistant lecturer	3.8%
Temporary lecturer	12.6%
Full professor	33.3%
Professor	10.7%
Substitute Teachers	30.2%
Associate Lecturers	5.7%
Staff in training	3.8%
Total	100%

Source: Own creation.

2.3.2. Instrument

An ad hoc instrument was created based on the questionnaire by Santos Rego *et al.* (2017) on teaching practice and attitude of university professors towards innovation (CUPAIN). Along with it, a version of a validated instrument intended to elicit knowledge of AI in university teachers was included (Silva-Sánchez, 2022). Both instruments are originally composed of 3 subscales, but the decision was taken to use the content of two subscales of each of them (consisting of 12 and 11 items for the first and 5 items each for the second, respectively).

The first of the scales is intended to evaluate the frequency of use of various teaching strategies by university lecturers (a 5-point Likert scale is used, 1 being never and 5 always). Considering the psychometric properties collected by the cited authors, it was decided to use a total of 12 of the 18 items, as they are the ones with the best factor loading; Specifically, 3 factors are integrated into this subscale:

- Factor I: Designated external involvement in teaching and includes those activities applied by the teacher in their subject with the aim of learning going beyond what is addressed in the classroom (items: 2, 7, 8, 12).
- Factor II: Focused on the role that students play in the teaching process (items 4, 5, 6, 11).
- Factor III: Defined as the strategies or methodologies used by the teacher in the classroom (items: 1, 3, 9, 10).

The second scale is intended to evaluate the interest of university lecturers towards a series of learning activities (a 5-point Likert scale is used, 1 being not at all and 5 being very much). Considering the psychometric properties of the reference study, it was decided to use the original scale composed of two factors:

- Factor I: Includes the set of learning activities used by teachers and focused on students (items 1, 2, 3, 4, 5, 6).
- Factor II: Integrates a set of learning activities focused on interactions (items 7, 8, 9, 10, 11).

The third scale is designed to assess the potential that AI has in higher education. The correct answers from the original instrument (designed through a multiple-choice scale) were used and a 5-point Likert scale was drawn up (1 being not at all and 5 being very much) to assess:

- Factor I: Possibilities of AI tools for education (items 1, 2, 3, 4, 5).
- Factor II: Contribution of the application of AI tools in the classroom and teaching Activities (items 6, 7, 8, 9, 10).

The instrument comprises 33 items, with scales previously validated in studies such as those by Lorenzo *et al.* (2019), Silva-Sánchez (2022) or Varea *et al.* (2018), based on the opinion of the university teaching community and which provide an in-depth assessment of the contents addressed in this work, both reasons for their selection as reference materials. Furthermore, the Likert-type scales used in the questionnaire met the requirements of tau-equivalence, unidimensionality and continuous measurement scale (Raykov & Marcoulides, 2017), and therefore its reliability was calculated through Cronbach's Alpha statistic for the complete instrument (α=.90) and for each scale (α=.80; α=.85 and α=.93, respectively). An instrument with high reliability was obtained.

3. Analysis and results

3.1. Procedure and data analysis

Application of the instrument included the period from February to May 2024, being administered through the institutional e-mail including the link to the Google Forms platform, where was hosted the objective of the research, as well as the anonymous and voluntary nature of the survey, to ensure the application of ethical principles such as those indicated or the confidentiality of the responses.

After information collection, a database was created in the SPSS 21 software and a screening procedure was applied whereby possible missing data were identified, multivariate atypical cases were eliminated, a central tendency analysis was carried out, the normality distribution of the data and possible correlations between variables of interest were proposed, the internal consistency and reliability of the scale were reviewed and, finally, contrast analyses were carried out. The α value for the analyses performed was .05.

Finally, the data distribution was analysed to identify whether or not there was a normal behaviour. The Shapiro Wilk and Kolmogorov-Smirnov tests were applied and the results obtained for all cases were p <.000, which suggested that the data did not follow a normal distribution (George & Mallery , 2001) and hence non-parametric procedures were used;

Specifically, correlations between variables were developed, applying the Phi Coefficient (dichotomous variables) and the Biserial Coefficient (dichotomous and interval variables); Contrasts were also carried out between groups through the Mann-Whitney U (gender; the use or not of AI in classrooms and research or its favourable/unfavourable conception as an innovative tool) and the Kruskal-Wallis H (fields of knowledge) tests to find differences in equal populations and test the null hypotheses.

3.2. Results

3.2.1. Descriptive analysis

Firstly, some items were analysed that investigate variables that offer a vision of innovation in teaching practice and also of the use of AI. In this sense, it was found that, in relation to teaching practice, 88.1% acknowledged taking training courses to improve and update it and thus 81.8% recognise that they develop innovative teaching practices in their classes; on the other hand, in relation to the use of AI, 74.8% stated that they did not use it in their classes and 54.1% did not use it as a support tool for their research; although 87.4% did share that they considered AI an innovative tool to support university teaching. In response to the question on knowledge of different proposed AIs, ChatGPT reached 18.9% of the responses, followed by the combination of ChatGPT, Deepl and Copilot at14.5% up and the None option with 10.7%.

Next, the descriptive analysis related to the variables that make up the 3 scales used is provided.

3.2.1.1. Teaching practice scale

The first scale assesses the frequency of use of the teaching practices expressed (Table 2). Specifically, if we look at the items that judge those activities applied by the teacher in their subject with the aim of taking learning beyond what is addressed in the classroom (items: 2, 7, 8, 12), it is the items intended for the teacher's organisation of activities, whether in the classroom or outside (2,8), that obtain a lower average compared to those that focus on promoting more self-responsible work by the students and not directly related to being organised by the teacher.

Secondly, if we focus on the role played by students in the teaching process (items 4, 5, 6, 11), high average scores are obtained (especially in the framework of promoting interpersonal relationships). although for the item in which the student's experience is used as a strategy to integrate it into the subject content, the average is lower.

Finally, this scale also focuses on evaluating the strategies or methodologies used by the teacher in the classroom (items: 1, 3, 9, 10), and here the scores are positioned in the middle of the frequency of use scale, pointing to an occasional use of strategies such as practical cases, continuous assessment, teamwork or use of ICT.

Table 2

Descriptive statistics

	N	Mean	Std. Dev.
2. I usually invite professionals from outside the university to present their work.	159	2.52	1,102
7. I recommend that my students visit exhibitions or attend events that are related to the subject.	159	3.62	1,101
8. I promote and organise complementary activities outside of school hours (visits, conferences, etc.).	159	2.58	1,171
12. I encourage my students to attend activities or seminars in other subjects.	159	3.47	1,054
4. The students actively participate in my classroom sessions.	159	4.02	.759
5. I promote activities that encourage critical thinking (debates, questions in class, etc.).	159	4.21	.741
6. I use the students' experiences to relate them to the subject.	159	3.77	.907
11. I try to ensure that in my classes there is a good climate of interpersonal relationships.	159	4.60	.675
1. I analyse and present practical cases to support student learning.	159	3.89	.928
3. I do continuous assessment (essays, reports, portfolios, etc.).	159	3.92	1,088
9. I use teamwork as a teaching strategy.	159	3.74	1,080
10. I use technologies to encourage student participation and interactivity (remote tutorials, virtual classrooms, forums, etc.).	159	3.57	1,065

Source: Own creation.

3.2.1.2. Teaching practice scale

This second scale assesses the degree of interest in variables that focus on teaching innovation (Table 3). Firstly, taking into account the set of learning activities used by teachers and focused directly on students (items 1, 2, 3, 4, 5, 6), it is worth highlighting the result of item 6, with the lowest average, showing that teachers are more indifferent when it comes to organising activities that connect students with the community (SD=1.06), whereas in the rest of the initiatives there is a high interest in activities that place the focus of attention on the students.

Secondly, interest in a set of learning activities focused on interactions at various levels is evaluated (items 7, 8, 9, 10, 11). Specifically, the results show that interest in activities close to the environment (item 11), communication in a foreign language (item 8), the promotion of leadership or entrepreneurship (item 10) are those that reached a lower average score, although showing a high standard deviation. For their part, the teaching staff did show a lot of interest in permanent development and interdisciplinary work (items 7 and 9).

Table 3

Descriptive statistics

	N	Mean	Std. Dev.
1. Activities that promote a problem-solving methodology	159	4.28	.797
2. Activities that encourage student participation.	159	4.50	.625
3. Activities that develop the critical capacity of students.	159	4.57	.545
4. Update methodological activities.	159	4.03	.907
5. Activities that promote autonomous learning.	159	4.26	.724
6. Activities that foster relationships with the community.	159	3.75	1,067
7. Activities that promote permanent development.	159	4.12	.852
8. Activities that encourage communication in a foreign language.	159	3.21	1,288
9. Activities that promote interdisciplinary work.	159	4.01	1,061
10. Activities that foster employability, leadership, initiative and the entrepreneurial spirit.	159	3.69	1,044
11. Activities that develop sensitivity towards environmental issues.	159	3.76	1,150

Source: Own creation.

3.2.1.3. AI knowledge scale

This scale assesses the degree of teachers' knowledge of AI (Table 4). First, the possibilities offered by AI tools for education are presented (items 1, 2, 3, 4, 5) and it should be noted that the average scores obtained are not particularly high (averages between 3.5 and 3.7); the lowest value is related to the analytical or predictive capacity of the AI to understand learning patterns (item 3). In a second instance, it is a little more specific and the contribution of the applications of AI tools to the classroom and teaching activities is evaluated (items 6, 7, 8, 9, 10); here it should be noted that there are two items (6 and 8) with lower scores, which are related to the ability of AI to promote interaction, either with the student by the teacher or through the development of teamwork, but also (item 10) highlights the interest in the ethical and privacy protection aspects that working with AI can entail.

3.2.2. Correlational analysis

The database was explored with the aim of finding significant correlations between the sociodemographic variables and the content of the scales used. Firstly, it was found that carrying out innovative teaching practices in classes correlates positively, albeit with low values, with the development of training courses to improve teaching practice and keep up to date (phi= .17, p=.02), as well as with considering AI an innovative teaching support tool (phi= .21, p=.00). Secondly, positive associations, although low, were also found among those who consider AI as an invoking tool to support teaching and therefore use it in their classes (phi= .17, p= .02) and also in their research (phi= .15, p=.04). Finally, the association between age and the conception of AI was low (rb = -.18, p=.02), so that the youngest teachers were those who positioned themselves most favourably towards these positive properties of AI.

Table 4

Descriptive statistics

	N	Mean	Std. Dev.
1. Natural language processing is an AI technique used to analyse and understand human language and can be used in education to develop virtual learning assistants.	159	3.75	1,025
2. Virtual learning assistants, recommendation systems and educational chatbots are some of the AI tools that can be used in education.	159	3.76	1,003
3. Learning analytics is an AI technique used to analyse and understand students' learning patterns, and can be used in education to improve teaching and learning.	159	3.60	.982
4. Educational chatbots are AI programs that are used to interact with students and provide answers to their questions.	159	3.61	1,012
5. Personalisation of learning, instant feedback and efficiency in time management are some of the advantages of using AI tools in education.	159	3.64	1,070
6. Artificial intelligence can be used to improve classroom teaching by developing educational chatbots to interact with students and provide instant feedback.	159	3.55	1,101
7. AI can be used to improve student assessment by using data analysis tools to evaluate student performance and provide personalised feedback.	159	3.65	1,086
8. AI can be used to encourage collaboration and teamwork in the classroom by creating team chatbots that help coordinate and communicate with students on team projects.	159	3.51	1,043
9. AI can be used to develop technological skills in students by developing educational simulations and games that teach AI and programming concepts.	159	3.92	.991
10. Ethical and social challenges that must be taken into account when using AI in education are student privacy and data protection, justice and equity in education, social and ethical responsibility	159	4.33	.868
Valid N (per list)	159		

Source: Own creation.

3.2.3. Analysis of contrasts between groups

In another order, Table 5 offers a contrast analysis between the groups into which the teaching staff is divided, taking into account the variables related to the use of innovative teaching practices and the use of AI in classes, with respect to the averages of the scales used. In all cases, the effect size is analysed (Hedges ' g), is considered small (Tomczak & Tomczak, 2014) and in favour of those who are positive towards the use of innovative teaching practices and the use of AI in classes. The formula used is as follows, with $\bar{y}1\ e\ \bar{y}2$ the means of samples 1 and 2 respectively and Sp being the combined standard variation.

$$g = \frac{\bar{y}_1 - \bar{y}_2}{s_p}$$

Table 5

Contrast analysis and effect size

			N	Mean	Std. Dev.	t	gl	Sign.	Hedges'g
I implement Artificial Intelligence in my classes.	P.S.	Yeah	40	43.78	4.77	3,665	157	.000	,066975
		No	119	39.71	6.43	4,239	90,010	.000	
	ID	Yeah	40	44.11	3.96	4,330	157	.000	,079146
		No	119	39.63	6.12	5,326	104,322	.000	
I carry out innovative teaching practices in my classes.	P.S.	Yeah	130	41.94	5.70	5,543	157	.000	,113828
		No	29	35.36	6.09	5,315	39,694	.000	
	ID	Yeah	130	41.45	5.67	3,184	157	.002	,065387
		No	29	37.65	6.39	2,948	38,417	.005	

Source: Own creation.

Continuing with the data analysis, two non-parametric tests were used: the Mann-Whitney U (gender variable) and the Kruskal-Wallis H (fields of knowledge). In both cases, the analyses showed significant differences in the independent variables depending on the teaching practices carried out (PD) and the interest shown in teaching innovation (DI).

In the case of the gender variable, Table 6 shows the items in which significant differences (p≤.05) were found in the scores obtained, revealing how the variables associated with teaching innovation present a greater degree of contrast compared to the independent variable; and if we look at which group the differences are generated towards, we can see in Table 7 how in all cases the female gender is the one that achieves the highest scores in the average ranges.

Table 6

Mann-Whitney U test

	Mann-Whitney U	asymptotic sig.
V4.PD	7,689	.006
V6. P.S.	4,223	.040
V2.ID	5,671	.017
V4. ID	6,603	.010
V5. ID	6,759	.009
V6. ID	4,416	.036
V7. ID	6,250	.012
V9. ID	8,894	.003
V10. ID	12,002	.001

Source: Own creation.

Table 7

Analysis of contrasts by average ranges

	Sex	N	Average range
V4. P.S.	Women	76	89.61
	Man	83	71.20
	Total	159	
V6.PD	Women	76	87.32
	Man	83	73.30
	Total	159	
V2. ID	Women	76	87.95
	Man	83	72.72
	Total	159	
V4. ID	Women	76	89.15
	Man	83	71.62
	Total	159	
V5.ID	Women	76	88.99
	Man	83	71.77
	Total	159	
V6. ID	Women	76	87.65
	Man	83	72.99
	Total	159	
V7. ID	Women	76	88.78
	Man	83	71.96
	Total	159	
V9.ID	Women	76	90.61
	Man	83	70.28
	Total	159	
V10.ID	Women	76	92.49
	Man	83	68.56
	Total	159	

Source: Own creation.

In the case of the field of knowledge variable, Table 8 displays the items in which significant differences (p≤.05) were found in the scores obtained, revealing how among the variables studied, approximately half of these, locates a degree of contrast with respect to the independent variable.

Table 8
Kruskal – Wallis H test

	Kruskal-Wallis H	gl	asymptotic sig.
V4. P.S.	22,107	10	.015
V5.PD	22,868	10	.011
V6.PD	24,257	10	.007
V8.PD	18,776	10	.043
V9.PD	20,594	10	.024
V2.ID	23,978	10	.008
V3.ID	25,277	10	.005
V4.ID	22,521	10	.013
V6.ID	30,502	10	.001

Source: Own creation.

If we look at which group the differences are generated towards, Table 9 has selected the 3 groups that have the highest scores in ranges for each of the variables associated with the scales used. Specifically, within the framework of teaching practices, the differences located in the knowledge fields of Law and Jurisprudence stand out (highlighting the promotion of critical thinking in students -V5.PD, in the use of students' experience to relate it to the subject -V6.PD; and in the use of complementary activities carried out outside of school hours V8.PD); cellular and molecular biology (emphasising the promotion of active participation of students -V4.PD) and political social sciences of behaviour and education (emphasising teamwork as a teaching strategy); although there are also other fields in which significant differences are seen between the variables analysed (Natural Sciences, Biomedical Sciences and Economic and Business Sciences).

For its part, in the scale relating to interest in teaching innovation, the differences in the knowledge fields that encompass the biomedical sciences appear as notable (they stand out for the interest in methodological updating -V4.ID and interest in the active participation of the students -V2.ID), followed by the field of cellular and molecular biology (highlighting its interest in the development of students' critical capacity) and law and jurisprudence (highlighting its interest in the creation of activities that seek the relationship with community -V6.ID). There are also other knowledge areas in which significant differences are seen between the variables studied (social sciences, political behaviour and education, chemistry; natural sciences, history, geography, art and philosophy, philology and linguistics).

Table 9

Analysis of contrasts by average ranges

Items	Knowledge field	Average range
V4. P.S.	Chemistry	86.42
	Cellular and molecular biology	107.25
	Political social sciences of behaviour and education	92.57
V5. P.S.	Cellular and molecular biology	95.00
	Natural Sciences	95.00
	Law and jurisprudence	106.00
V6. P.S.	Chemistry	97.50
	Cellular and molecular biology	116.50
	Law and jurisprudence	125.33
V8. P.S.	Cellular and molecular biology	95.50
	Political social sciences of behaviour and education	87.52
	Law and jurisprudence	103.00
V9. P.S.	Cellular and molecular biology	87.00
	Biomedical sciences	92.12
	Political social sciences of behaviour and education	94.24
V2. ID	Chemistry	88.67
	Biomedical sciences	96.31
	Political social sciences of behaviour and education	91.68
V3. ID	Cellular and molecular biology	111.50
	Biomedical sciences	93.73
	Natural Sciences	92.25
V4. ID	Biomedical sciences	103.38
	Law and jurisprudence	90.67
	History geography and art	100.88
V6. ID	Political social sciences of behaviour and education	94.06
	Law and jurisprudence	120.00
	Philosophy Philology and linguistics	100.00

Source: Own creation

Finally, teachers are grouped based on their response (positive or negative) to the three items that evaluate the use of AI in classrooms and research, as well as its conception as an innovative tool. In Table 10, when applying the Mann-Whitney U with the values associated with the scale on AI's potential, it is found that all the items mark significant differences ($p \leq .05$) and the average ranges contrasted in each variable show, clearly, that it is the teachers who make use of AIs or who have a vision of them as an innovative tool who most value their potential for use in university teaching.

Table 10

Analysis of contrasts by average ranges

Item	Cluster	Average range. I implement AI in my classes.	Average range. AI is an innovative tool to support teaching.	Average range. I use AI as a support tool in my research.
IA1	Yeah	104.45	83.37	89.93
	No	71.78	56.58	71.57
IA2	Yeah	108.64	85.15	89.43
	No	70.37	44.18	71.99
IA3	Yeah	101.55	84.96	89.27
	No	72.76	45.55	72.13
IA4	Yeah	106.76	84.47	88.90
	No	71.00	48.93	72.44
IA5	Yeah	105.05	84.55	93.21
	No	71.58	48.35	68.78
IA6	Yeah	104.95	85.89	86.99
	No	71.61	39.08	74.07
IA7	Yeah	103.23	85.83	92.04
	No	72.19	39.50	69.78
IA8	Yeah	96.35	85.27	86.67
	No	74.50	43.40	74.34
IA9	Yeah	101.70	85.49	91.29
	No	72.71	41.88	70.42
IA10	Yeah	93.20	83.14	88.55
	No	75.56	58.18	72.74

Source: Own creation.

4. Discussion and conclusions

Considering the first objective, we are faced with a sample of teachers who, in terms of teaching practice, acknowledge updating it and introducing innovative elements. However, there are some practices such as the organisation of complementary activities for the classroom or outside of it, or relying on the experience of the students to build content that does not have a high use, in contrast to the frequent use indicated in the literature (Jiménez-García *et al.*, 2024; Kabudi *et al.*, 2021; Murtaza *et al.*, 2022). Regarding teaching innovation, it is also advisable to reinforce some types of practice in which the teacher's interest wanes, such as preparation of activities that relate students to the community or in which initiatives focused on leadership or entrepreneurship, the environment or use of a foreign language are undertaken.

It should also be noted that the inclusion of AI in teaching practice is still far from reaching its full potential (to a lesser extent at research level), and there is a certain reluctance to grant it a predictive nature to contribute to the improvement of student learning or to promote classroom interaction. Nevertheless, it is recognised as a support tool for university teaching. This situation is related to the lack of specific training in AI use and application (Corica, 2020), since Ayuso-del Puerto and Gutiérrez-Esteban (2022) argue that it enriches learning environments and awakens interest in using it in practice.

This approach serves to respond to the second objective, where several associations were evident: on the one hand, between those who understand AI as support tools and their

use in classrooms and research (Kuleto *et al.*, 2021; Leoste *et al.*, 2021); on the other hand, there is a certain tendency for teachers who use innovative teaching practices and those who use AI in classrooms to be those who diversify teaching practices and those who are most committed to innovation (Kumar, 2023); and finally, those teachers who make use of AI are the ones who most value the potential of this tool for teaching, who in turn tend to be young teachers. Curtis and Bruch (1967) explained that younger teachers have a more positive attitude towards creativity in the classroom, a quality closely linked to teaching innovation.

Considering the third objective, gender appears as a variable that affects teaching practices linked to strengthening the role of students in the teaching/learning process (promotion of active participation and based on personal experiences for the construction of knowledge) and also in the degree of interest in innovation, whether at the level of promoting student-centred activities or those that focus on the framework of interactions. This fact is evidenced by other research that detected that teachers have a predominant attitude towards innovation and the use of ICT in education (Guerra *et al.*, 2010; Lane & Lyle, 2011) and are those who have greater knowledge of AI (Al-Awfi & Al-Rahili, 2021; Alissa & Hamadneh, 2023).

There are also certain knowledge areas, closer to the field of pure sciences, that are susceptible to the development of teaching practices and innovations aimed at proposing activities that focus on students as the centre of the teaching/learning process.

In conclusion, it can be stated that the proposed hypotheses were fulfilled, although there are certain connotations that mean that the relationship between the conceptions regarding AI and its impact on teaching practice and innovation are influenced by variables such as gender, knowledge field and age or the distrust they generate concerning its use as a tool to enhance various processes in the field of teaching and learning.

Authors' Contribution

Conceptualization and ideas: author 1. Data curation: author 1 and author 2. Formal analysis: author 2. Funding acquisition: author 2. Research: author 1 and author 2. Methodology: author 2. Project administration: author 1 and author 2. Resources: author 1. Software: author 2. Supervision: author 1 and author 2. Validation: author 2. Visualization: author 1 and author 2. Writing: author 1 and author 2.

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