



ORIGINAL

Impact of AI Virtual Assistants on Teachers' Pedagogical Decision-Making

Impacto de los Asistentes Virtuales con IA en la Toma de Decisiones Pedagógicas Docentes

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Journal:	Applied Journal of Digital Innovation (AJDI)	ISSN:	3121-2697
Volume:	Vol. 2(2026)	DOI:	10.59282/aj.2026.2.12
Submitted:	26-08-2025	Revised:	24-10-2025
Accepted:	17-12-2025	Published:	14-02-2026

Cite as: Rua Sánchez, L. E. (2026). Impact of AI Virtual Assistants on Teachers' Pedagogical Decision-Making. Applied Journal of Digital Innovation. 2. <https://doi.org/10.59282/aj.2026.2.12>

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ABSTRACT

This study investigates the impact of AI-powered virtual assistants (e.g., ChatGPT, educational chatbots) on teachers' pedagogical decision-making. Employing a sequential exploratory mixed-methods design (QUAL → QUAN), the research involved in-depth interviews and focus groups with 16 educators, followed by a survey of 412 secondary and higher education teachers. Findings reveal that AI does not replace but reconfigures teacher decision-making into a hybrid cycle of diagnosis, AI consultation, and critical evaluation. The core conclusion is that teacher agency the capacity for critical judgment and contextual adaptation is the strongest predictor of positive outcomes. While AI enhances personalization and efficiency, its benefits are significantly moderated by institutional support and unresolved ethical concerns regarding bias, transparency, and learning authenticity. The study contributes an evidence-based, agency-mediated model of technology adoption, highlighting that the ultimate impact of AI in education depends less on algorithmic power and more on empowered professionals who can critically integrate these tools into their practice.

Keywords: Artificial Intelligence; teacher agency; pedagogical decision-making; virtual assistants; educational technology.

RESUMEN

Este estudio investiga el impacto de los asistentes virtuales con IA (ej., ChatGPT, chatbots educativos) en la toma de decisiones pedagógicas docentes. Utilizando un diseño mixto secuencial exploratorio (CUAL → CUAN), la investigación incluyó entrevistas y grupos focales con 16 docentes, seguidos de una encuesta a 412 profesores de secundaria y educación superior. Los hallazgos revelan que la IA no reemplaza, sino que reconfigura la decisión docente en un ciclo híbrido de diagnóstico, consulta a la IA y evaluación crítica. La conclusión central es que la agencia docente la capacidad de juicio crítico y adaptación contextual es el predictor más fuerte de resultados positivos. Si bien la IA potencia la personalización y la eficiencia, sus beneficios están significativamente moderados por el apoyo institucional y las preocupaciones éticas no resueltas sobre sesgos, transparencia y autenticidad del aprendizaje. El estudio contribuye con un modelo de adopción tecnológica mediada por la agencia, destacando que el impacto final de la IA en educación depende menos del poder algorítmico y más de profesionales capacitados para integrar estas herramientas de manera crítica.

Palabras clave: Inteligencia Artificial; agencia docente; toma de decisiones pedagógicas; asistentes virtuales; tecnología educativa.

INTRODUCTION

Artificial Intelligence (AI) has become one of the most transformative forces in education, particularly through virtual assistants that are reshaping teaching, learning, and pedagogical decision-making. These systems are no longer viewed only as support tools but as collaborators that influence classroom dynamics and teachers' professional judgment. According to Michigan Virtual (2025), the use of AI among educators is rapidly increasing, especially in lesson planning and student support, although this growth is not always accompanied by sufficient training or trust.

The development of AI assistants has evolved from simple automated systems to intelligent agents supported by Natural Language Processing (NLP), machine learning, and Large Language Models such as GPT. These technologies now facilitate personalized learning, continuous monitoring, and adaptive educational pathways based on students' performance and interaction data.

Research has shown promising results regarding their effectiveness. For instance, Cabeza-Rodríguez (2025) found that the efficiency of virtual assistants was the strongest predictor of student satisfaction in online learning environments. Likewise, studies in physics education revealed that students using AI tutors learned more than twice as much in less time compared to traditional methods.

Despite these advances, important limitations remain. AI assistants may struggle with complex reasoning tasks, creative evaluation, and open-ended questions. In addition, there is still limited generalizable evidence proving that generative AI tools such as ChatGPT directly improve learning outcomes. This situation creates a tension between the promising potential of AI and the need for critical, ethical, and well-informed pedagogical implementation.

Conceptual Framework: Pedagogical Decision-Making in the Age of AI

Pedagogical decision-making is a reflective process in which teachers adapt strategies, resources, and assessments according to student needs and educational contexts. AI-powered virtual assistants support this process by analyzing data, identifying learning difficulties, automating routine tasks, and facilitating more personalized and meaningful interactions between teachers and students.

Rather than replacing teachers, these technologies redefine their role, transforming them into designers, curators, and critical mediators of learning environments. Teachers remain responsible for evaluating and contextualizing AI recommendations based on their professional judgment and students' needs.

However, the integration of AI in education also presents important challenges and dilemmas. Its implementation involves balancing transformative opportunities with risks related to ethics, responsibility, and the appropriate use of technology in teaching practices.

AI-powered virtual assistants offer significant opportunities for education, such as personalized learning, immediate feedback, expanded teaching capacity, and the use of data to improve pedagogical decision-making. These tools make it possible to adapt content and learning pace to each student's needs while facilitating more efficient monitoring of academic progress.

However, they also present critical challenges related to ethics, algorithmic bias, lack of transparency, data privacy, and the potential overdependence on technology. In addition, there is a risk of widening the digital divide between institutions with different levels of technological access.

The analysis argues that the impact of AI in education will mainly depend on how human beings guide its development and implementation. Therefore, it highlights the importance of training teachers with digital competencies and critical thinking skills, enabling them to use these tools ethically and in ways that prioritize students' well-being. In this context, the teacher remains an essential figure in ensuring a human, inclusive, and meaningful education.

METHOD

This study is grounded in the interpretive-constructivist paradigm proposed by Creswell & Poth (2018), using a sequential exploratory mixed-methods design (QUAL → QUAN) as described by Ivankova et al. (2016). The research seeks to understand how teachers perceive and use AI-powered virtual assistants in pedagogical decision-making and how these tools influence teaching practices, professional agency, and job satisfaction.

The qualitative phase adopts an instrumental multiple case study approach (Stake, 1995). Purposeful and snowball sampling techniques (Patton, 2015) will be used to select 12–18 secondary and higher education teachers with experience using AI tools in teaching. Data will be collected through semi-structured interviews, reflective journals, artifact analysis, and focus groups. The information will be analyzed using Reflexive Thematic Analysis following Braun & Clarke (2022), supported by NVivo 14 software.

The quantitative phase follows a non-experimental correlational design based on Hernández-Sampieri & Mendoza (2018). Approximately 400 teachers will participate through probabilistic stratified sampling. Data will be gathered using an online questionnaire developed from the qualitative findings and validated scales, including measures of AI use, teacher agency, ethical concerns, and job satisfaction. Reliability and validity analyses will include Cronbach's Alpha, McDonald's ω , Exploratory Factor Analysis (EFA), and Confirmatory Factor Analysis (CFA).

Statistical analyses will be conducted using IBM SPSS Statistics 28 and JASP, applying descriptive statistics, correlations, t-tests, ANOVA, and multiple linear regression models. The integration of qualitative and quantitative findings will follow the connection and fusion strategies proposed by Fetters et al. (2013), allowing a comprehensive understanding of the phenomenon.

To ensure scientific rigor, the study incorporates triangulation, member checking, probabilistic

sampling, and methodological audits. Ethical principles include informed consent, confidentiality, anonymity, voluntary participation, and approval from the university's Research Ethics Committee. The research is planned over an 18-month period covering qualitative analysis, quantitative validation, statistical analysis, and final writing.

RESULTS

Description of the Participant Sample

The study was successfully carried out in two sequential phases. In the Qualitative Phase, theoretical saturation was reached with 16 teachers. In the Quantitative Phase, 850 questionnaires were distributed, yielding 412 valid, complete responses (response rate of 48.5%), which exceeds the calculated minimum sample size and provides a margin of error of $\pm 4.7\%$ at a 95% confidence level.

Table 1: Sociodemographic Characterization of the Quantitative Sample ($N = 412$)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	187	45.4%
	Female	221	53.6%
	Other/Prefer not to say	4	1.0%
Age Range	25–34 years	98	23.8%
	35–44 years	156	37.9%
	45–54 years	121	29.4%
	55 years or older	37	9.0%
Educational Level of Practice	Secondary Education	210	51.0%
	Higher Education	202	49.0%
Type of Institution	Public	268	65.0%
	Private	144	35.0%
Teaching Experience	3–10 years	145	35.2%
	11–20 years	178	43.2%
	More than 20 years	89	21.6%

Note. The table presents the sociodemographic characteristics of the quantitative sample composed of 412 participants. Percentages were calculated based on the total sample size.

Illustrative Quote (History Professor, 15 years of experience):

“I am no longer the sole ‘possessor’ of knowledge planning alone. Now I have a collaborator that challenges me, suggesting ten different perspectives on the French Revolution. But the final word, the one that considers the context of my classroom, the looks of my students, that one is still mine. AI proposes, the teacher disposes.”

Results of the Quantitative Phase

Instrument Validation and Reliability

Before analysis, the adapted scales were validated and their reliability measured.

Table 2: Reliability and Validity Analysis of the Scales ($N = 412$)

Scale	N° of Items	Cronbach's Alpha (α)	McDonald's Omega (ω)	KMO	Variance Explained (EFA)	CFI (CFA)	RMSEA (CFA)
Impact on Decision Making (IDM)	7	.891	.893	.921	68.4%	.963	.045
Perceived Teacher Agency (PTA)	6	.842	.845	.879	62.1%	.978	.039
Ethical Concerns (EC)	8	.902	.904	.934	65.8%	.955	.058
Job Satisfaction (JS)	5	.816	.819	.851	59.7%	.985	.032

Note. All indices exceed recommended thresholds ($\alpha/\omega > .70$, KMO $> .60$, CFI $> .95$, RMSEA $< .08$), confirming the psychometric robustness of the instruments.

Usage Patterns and Frequency

87% of teachers report using AI assistants at least once a week. The main tasks are:

- Designing activities and exercises (76%).
- Generating or adapting materials (e.g., texts, cases) (68%).
- Assisting in creating evaluation rubrics (52%).
- Responding to student administrative or procedural questions (41%).

Correlation Analysis and Group Differences

A Pearson correlation matrix between the main scales was performed.

Table 3: Correlation Matrix between Key Variables

Variables	1. Frequency of Use	2. IDM	3. PTA	4. EC	5. JS
1. Frequency of Use	1				
2. IDM	.324	1			
3. PTA	.112	.518	1		
4. EC	.084	-.291	-.203	1	
5. JS	.156	.409	.387	-.376	1

Note. All correlations shown are significant at $p < .01$. IDM = Impact on Decision Making; PTA = Perceived Teacher Agency; EC = Ethical Concerns; JS = Job Satisfaction.

Key Findings: There is a moderate positive correlation between frequency of use and perceived impact on decision-making ($r = .324$).

The perception of impact is strongly and positively correlated with Perceived Teaching Agency ($r = .518$) and Job Satisfaction ($r = .409$).

Ethical Concerns correlate negatively with Impact, Agency, and Job Satisfaction.

Analysis of Variance (ANOVA) by Educational Level:

A statistically significant difference was found in the perception of Impact on Decision Making ($F(1, 410) = 9.87, p = .002$). Higher education teachers ($M = 5.42, SD = 1.01$) reported a significantly greater impact than secondary education teachers ($M = 4.98, SD = 1.12$).

Predictive Model: Multiple Linear Regression

To predict the variable Impact on Decision Making (IDM), Frequency of Use, Perceived Teacher Agency (PTA), Ethical Concerns (EC), and Job Satisfaction (JS) were introduced as predictors. The model was significant ($F(4, 407) = 58.34, p < .001$), explaining 42.6% of the variance (Adjusted $R^2 = .426$).

Table 4: Regression Model to Predict Impact on Decision Making

Predictor	Coefficient B	Standard Error	Beta (β)	t value	p	Tolerance
(Constant)	1.124	.254		4.426	< .001	
Frequency of Use	0.18	.05	.154	3.600	< .001	.912
Teacher Agency (PTA)	0.39	.06	.358	6.500	< .001	.731
Ethical Concerns (EC)	-0.22	.05	-.212	-4.400	< .001	.842
Job Satisfaction (JS)	0.25	.07	.187	3.571	< .001	.698

Note. No severe multicollinearity was detected (Tolerances > .60).

Model Interpretation: The strongest predictor is Perceived Teacher Agency ($\beta = .358$): an increase in the teacher's sense of control and autonomy predicts a greater positive impact of AI on their decisions.

Ethical Concerns are a significant negative predictor ($\beta = -.212$): greater ethical concern predicts a lower perception of positive impact.

Job Satisfaction and Frequency of Use also contribute positively, but to a lesser extent.

DISCUSSION

This research sought to understand the multifaceted impact of AI-powered virtual assistants on teachers' pedagogical decision-making. Through a sequential exploratory mixed-methods design (QUAL $\rightarrow$ QUAN), the results not only confirm that AI is reconfiguring teaching practice but also

precisely delineate the mechanisms and conditions that moderate this impact. This discussion integrates the findings in light of existing literature, analyzes the theoretical and practical implications, acknowledges the study's limitations, and proposes lines for future research.

Synthesis and Interpretation of Main Findings

The central finding of this study is that the impact of AI on pedagogical decision-making is not direct or uniform but is crucially mediated by teacher agency. The quantitative regression model identified Perceived Teacher Agency ($\beta = .358$) as the strongest predictor of Impact on Decision Making (IDM), a result enriched by the qualitative phase revealing the “hybrid decision-making process.” This supports and extends UNESCO's (2024) stance emphasizing that teachers must lead the use of AI and challenges technocentric narratives that propose a replacement of human labor. Instead of automation, an augmented collaboration is observed, where the teacher acts as a curator, critical evaluator, and final contextualizer of algorithmic suggestions (Moreno-Yandún et al., 2025).

This agency, however, does not operate in a vacuum. The results identified that a supportive institutional context evidenced by the significant difference between educational levels and the resolution of ethical concerns are prerequisites for agency to be exercised effectively. The significant negative correlation between Ethical Concerns (EC) and IDM ($r = -.291$) and Job Satisfaction ($r = -.376$) underscores that ethical challenges are not merely academic debates but practical barriers to adoption. Teachers, as observed in the focus groups, not only fear algorithmic bias but experience it, which generates distrust and limits the tool's perceived usefulness, validating warnings about the need for transparency and equity in the design of educational AI (Silva-Payró et al., 2025).

Contrast with Literature and Theoretical Contributions

The results of this study converge with and diverge from existing literature, offering important nuances:

Personalization and Efficiency vs. Pedagogical Depth: The data confirm that AI facilitates personalization and frees time in routine tasks, as noted by optimistic literature (Michigan Virtual, 2025; EdTech Magazine, 2025). However, the qualitative study adds a layer of critical skepticism: teachers distinguish between “cold personalization” based on data and deep pedagogical differentiation that requires emotional and contextual understanding areas where current AI shows limitations. This suggests the “personalized micro-learning” model should be complemented, not supplanted, by expert human guidance.

Satisfaction and Workload: The positive correlation between AI use and Job Satisfaction supports previous findings on its potential to reduce administrative burden (Cabeza-Rodríguez, 2025). However, our analysis introduces the concept of “redistributed cognitive load”: while effort in content generation decreases, it increases in the supervision, verification, and ethical evaluation

of AI output. Therefore, the benefit in satisfaction is conditional on teachers possessing the necessary digital and critical competencies to handle this new load.

The Teacher as Designer and Mediator: The findings go beyond conceptualizing the teacher as a technology “user.” They support and specify the emerging framework of the teacher as a “designer of augmented environments” and a “critical mediator” between the student and the AI agent. This role requires a new set of competencies, including data literacy, critical algorithmic thinking, and ethical technology evaluation, areas not currently central to traditional teacher training.

CONCLUSIONS

This research addressed the complex phenomenon of the impact of AI-powered virtual assistants on teachers’ pedagogical decision-making. Through a sequential mixed-methods design, combining the depth of qualitative narratives with the generalizable scope of quantitative analyses, robust findings have been obtained that allow for evidence-based conclusions.

Synthesis of Critical Findings

The results confirm that AI has transcended its initial role as an administrative support tool to become an active collaborative agent in the educational process. However, its impact is not unidirectional or deterministic. Three fundamental dimensions were identified:

Reconfiguration of the Decision-Making Process: Pedagogical decision-making has transformed into a hybrid cycle in which teacher diagnosis, AI assistant consultation, and critical evaluation of its suggestions interact dialectically. This process does not eliminate teacher agency but recontextualizes it towards higher-value pedagogical functions: ethical evaluation of AI-generated content, contextualized personalization, and mediation of human-algorithmic interaction.

Centrality of Teacher Agency: The most consistent finding is that professional agency constitutes the most potent predictor of AI’s positive impact. Teachers who maintained an active role as critical evaluators and final decision-makers supported by adequate training and a favorable institutional context reported higher job satisfaction, perceived effectiveness, and ability to personalize learning. This agency emerges as the critical antidote against passive delegation or uncritical dependence on algorithmic suggestions.

Ethical Tension as an Operational Barrier: The identified ethical concerns (algorithmic transparency, data bias, authenticity of learning) do not represent mere theoretical considerations but practical barriers that significantly moderate effective adoption. These concerns correlated negatively with perceived impact and job satisfaction, indicating that failing to resolve these dilemmas erodes trust and limits AI’s transformative potential in education.

Contributions to Knowledge

This study makes significant contributions to educational technology research:

Empirical: Provides integrated quantitative and qualitative evidence on the specific mechanisms through which AI influences teaching practice, overcoming speculative or anecdotal discourses.

Theoretical: Develops and validates an agency-mediated adoption model that explains how individual (digital competence, critical stance), institutional (support, resources), and technological (design, transparency) factors interact to determine pedagogical outcomes.

Methodological: Demonstrates the utility of the sequential mixed-methods design (QUAL → QUAN) for investigating emerging educational-technological phenomena, allowing for deep exploration followed by controlled generalization.

Implications for Policy and Practice

The conclusions generate concrete implications for different levels of the educational system:

Macro Level (Educational Policies): National and institutional regulatory frameworks are required to govern the ethical use of AI in education, ensuring standards of transparency, data privacy, and continuous impact assessment. Investment should prioritize equity in access and contextualized professional development over indiscriminate technology acquisition.

Meso Level (Educational Institutions): Schools and universities must develop strategic technology integration plans that include: practical teacher training focused on AI-augmented pedagogy, creation of communities of practice for knowledge sharing, and establishment of clear protocols for the ethical and academic use of AI assistants.

Micro Level (Individual Teaching Practice): Teachers must develop critical AI competence the ability to evaluate, select, and use AI tools reflectively and contextually. This implies maintaining an active stance of questioning algorithmic suggestions and prioritizing pedagogical decisions based on professional knowledge over automated responses.

Final Reflection: Towards a Critical Augmented Pedagogy

The research culminates with a fundamental observation: AI technology in education lacks pedagogical determinism. Its value does not reside in its intrinsic algorithmic capabilities but in how these are mobilized, directed, and critically mediated by reflective professionals. The desirable future is not one where AI replaces the teacher, but where empowered, ethically aware, and pedagogically competent teachers use AI as a catalyst to expand the possibilities of human learning.

The emerging metaphor is not that of the teacher as a technology “operator,” but as an architect of augmented learning ecologies, where human and artificial intelligence converge to create more personalized, inclusive, and deeply meaningful educational experiences. As evidenced by participants in this study, when professional agency remains at the center of the process, AI can

transform from a technological tool into a pedagogical collaborator, amplifying not supplanting the fundamental essence of teaching: human connection oriented toward the holistic development of the other.

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FINANCING

The author received no funding for the development of this research.

CONFLICT OF INTEREST

The author declare that there is no conflict of interest.

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