Digitization and Its Impact on the Traditional Roles of University Professors in Algeria. From the Perspective of Faculty at the Institute of Physical and Sports Activities Sciences and Techniques, University of M'sila

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Abstract

Amid the rapid pace of digital transformation, universities are increasingly required to reconsider their traditional structures — particularly regarding the role of university professors. These educators are now expected to adapt to a digital learning environment driven by modern technological tools. While this digital shift offers significant opportunities for enhancing educational quality, it also presents pedagogical and research-related challenges that demand ongoing support and effective digital training for faculty members. This study aimed to explore the impact of digitization on the traditional roles of university professors within the context of the technological transformations reshaping higher education — transformations that require professors to go beyond the mere transmission of knowledge and to engage with digital teaching tools and online learning platforms. A descriptive methodology was adopted, and data were collected through a questionnaire administered to a random sample of 35 professors at the Institute of Physical and Sports Activities Sciences and Techniques, University of M'sila. The findings revealed significant shifts in both teaching and research responsibilities due to digitization. While professors demonstrated a moderate level of digital competence, they also faced notable technical and pedagogical challenges affecting academic performance — outcomes that highlight the need for institutional support through continuous and specialized digital training.

Keywords: Digitalization; University professor; Quality of education; Digital platforms.

1. Introduction

The university has long stood as one of the foremost centres of intellectual and scientific vitality in society — the primary incubator of knowledge, a platform for training elites, advancing scientific research, and consolidating cultural and human values. From its inception, the university has assumed central roles in societal development through the formation of competencies, the cultivation of critical awareness, and the production of ideas that contribute to human progress. At the heart of this knowledge system, the university professor occupies a pivotal position — not merely as a transmitter of knowledge, but as an academic agent, a cultural force, and an individual

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responsible for shaping generations of students capable of engaging creatively with the complex challenges of contemporary life. This role has traditionally been characterised by reliance on direct instructional methods within a physical academic space, structured around face-to-face interaction between professor and students, in a context where pedagogical functions are integrated with research and advisory responsibilities.

In recent years, however, this traditional conception of the university — along with its associated concepts and practices — has begun to show signs of significant strain, driven by the profound transformations occurring globally at the technological level and by the emergence of digitization as a transformative force reshaping every sector, with higher education at the forefront. Digitization has permeated all levels of university life — from teaching and training to scientific research and academic administration and assessment. In the face of this digital tide, university professors can no longer perform their functions through the same traditional mechanisms and tools; they have been compelled to reconsider their roles and competencies within a virtual environment that demands mastery of technological tools, flexible engagement with distance-learning instruments, electronic platforms, and open digital educational resources — placing them before challenges that extend beyond the cognitive dimension to encompass the technical, professional, and even psychological.

At the same time, this digital transformation — despite the opportunities it provides for improving academic performance and embracing innovative educational models — raises a series of questions concerning the extent to which the traditional university structure can adapt to these developments, and the degree to which university professors are capable of engaging constructively with them without compromising the core of their educational and scientific mission. More profoundly, it raises questions about the very redefinition of 'teaching effectiveness' and 'research efficiency' within a hybrid knowledge environment that reshapes the relationship between professor and student, alters the nature of pedagogical interaction, and makes the technological medium a central element of the educational process.

From this standpoint, the following central research question emerges:

Does digitization in the university produce discernible effects on the traditional roles of university professors?

1.1 Sub-Questions

- Has digitization affected the teaching functions of university professors?
- Do university professors possess the skills required to engage with digitization?
- Does digitization impose challenges on the pedagogical and research performance of university professors?

1.2 General Hypothesis

Digitization in the university produces significant effects on the traditional roles of university professors.

1.3 Sub-Hypotheses

- Digitization affects the traditional teaching tasks of university professors.
- University professors possess digital competencies adequate for engaging with the requirements of digitization.
- University professors face pedagogical and research challenges as a result of digitization.

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2. Significance of the Study

The significance of this study lies in its effort to understand and analyse the profound transformations that digitization has imposed upon the higher education environment, by focusing on the university professor as the central agent within the academic system. The digital transformation is not merely a technical evolution; it is a structural change that touches the very essence of the educational and research process, redefines the roles of the professor, and tests their capacity to adapt to new educational models that combine technological mediation with knowledge content. The study therefore derives its timeliness and relevance from its examination of the challenges facing university professors in an age of digitization — both in terms of pedagogical and research performance — and from its attention to the imperative of developing digital competencies to keep pace with this transformation, in a manner that ensures a balance between preserving the traditional educational mission and capitalising on the opportunities afforded by the modern digital environment.

3. Objectives of the Study

- To analyse the impact of digitization on the traditional tasks of university professors, particularly in the teaching and research dimensions.
- To document the changes in the roles of university professors within a continuously evolving digital learning environment.
- To identify the digital competencies and skills required for the effective performance of university professors in the digital age.
- To explore the pedagogical and professional challenges facing university professors as a result of the digital transition.
- To propose practical mechanisms or recommendations to assist university professors in adapting to digitization without compromising their educational and scientific mission.

4. Key Concepts

4.1 Digitization

Conceptual definition: *Mohamed Ibrahim Abu Harga (2016, p. 80) defines it as 'a long series of numbers that can be acquired, decoded, and read through the receiving computer.'*

Operational definition: *Digital technology refers to the use of digital devices and software for processing and exchanging information — including computers, smartphones, and the internet. This technology enables data storage, rapid transfer, and instantaneous communication, and has brought about a profound transformation in the fields of education, communication, work, and services.*

4.2 University Professor

Conceptual definition: *Byrne (1987, as cited in Majadi, 2021, p. 258) defines the university professor as 'a specialist who responds to a social demand, commands a considerable body of knowledge as well as scientific expertise, and is free in pedagogical choices — while ensuring that initiative and autonomy are sensitively aligned with the interests of the learners.'*

Operational definition: *The university professor is a specialised researcher and instructor working in a higher education institution. They are responsible for teaching undergraduate students, supervising scientific research, and contributing to the advancement of knowledge in their academic field through publication, authorship, and participation in scholarly conferences.*

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They play a pivotal role in shaping minds and guiding researchers, and serve as a bridge between science and society.

5. Review of Related Studies

Study 1:Belayeb and Majidi (2025) — "New Roles of the Professor in Distance Education." This study aimed to provide a conceptual framework for distance education systems — including definitions, historical development, and guiding philosophy and principles — and to identify the new roles university professors must assume in the context of adopting this educational model. The study identified multiple roles, the most significant of which were: instructional design, integration of educational technology, encouragement of student interaction, and fostering of independent learning. The paper concluded with a set of recommendations for activating the role of the university professor in the implementation of distance education in higher education, particularly in Algerian universities.

Study 2:Saleh Hussein (2018) — "New Roles of the University Professor in Algeria in Light of Contemporary Challenges." This study aimed to examine the extent to which university professors exercise their new roles in the face of current challenges, as well as to identify teaching methods and student performance evaluation approaches. The study was limited to a survey of a cross-sectional sample of 80 professors at the University of M'sila, using a self-developed questionnaire divided into three sections. The study concluded that university professors at the Institute of Physical and Sports Activities Sciences and Techniques fulfil all assigned roles, but at varying degrees.

Study 3:Abdelbasset Mahi (2022) — "Technological Digital Learning: Obstacles and Solutions." This study aimed to examine the concept and importance of technological digital learning, identify its obstacles, and propose solutions to facilitate the teaching-learning process. Among its key findings, the study found that digital learning creates an educational environment through new electronic technologies, supports interaction between students and teaching assistants through the exchange of educational experiences and opinions, and strengthens relationships between parents and schools and between schools and the wider environment. The study also identified various obstacles impeding the implementation of digital learning, including human, financial, socio-psychological, legislative, and technological barriers.

Study 4:Mohamed Amine Abadna (2023) — "Distance Education: Between the Digital Challenge and the Transformation of the University Professor's Role — A Critical Reading of the New Roles of the University Professor in the Digital Environment." This study aimed to highlight the changes that occurred during the COVID-19 health crisis lockdown and to examine proposed models in the field of education, while drawing attention to developments in the roles of university professors — notably the emergence of new roles and the processes of role reassignment. The study's findings lead to the view that any university professor may find themselves assuming multiple roles simultaneously — at times a skilled or collaborative instructor, at others a researcher or instructional designer, and vice versa.

Study 5:Mediha Debabi (2024) — "Digital Competency of the University Professor: Between the Imperative of Transformation and the Assurance of Educational Quality." This study aimed to examine the digital competency of university professors in the interest of ensuring educational quality in a manner that permits digital transformation, enables engagement with contemporary

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developments in higher education, and contributes to comprehensive development and the building of a knowledge society. A descriptive methodology was used, as the study discusses ways to enhance the skills of the twenty-first-century professor — skills that are no longer merely professional and knowledge-based but must now incorporate digital skills commensurate with the spirit of the age.

Study 6:Batat Noureddine (2022) — "The Role of E-Learning in Developing the University Teaching Environment at Institutes of Physical and Sports Activities Sciences and Techniques." This study aimed to identify the role of e-learning in developing the university teaching environment at these institutes, according to the variables of department, professional experience, and place of residence. A descriptive methodology was used on a random sample of 15 professors (15%). A questionnaire was used as the data collection tool. The study's principal findings indicated that e-learning plays a role in developing the university work environment at these institutes, from the perspective of teaching staff members, and that no statistically significant differences were found among staff members regarding the role of e-learning in developing the university teaching environment, according to the variables of department, professional experience, and place of residence.

6. Methodological Procedures

6.1 Pilot Study

The pilot study constitutes the essential foundation of the entire research and represents a crucial and important perspective in scientific studies, as it allows the researcher to test research instruments in order to verify their soundness, accuracy, and clarity (Bouhouch and Al-Dhniebat, 2001, p. 256). The researchers conducted a pilot study on the research sample in order to ascertain the extent to which digital technology and artificial intelligence contribute to the development and improvement of curricula, as well as to identify the challenges and difficulties that impede the use of this technology in the school and educational environment. On this basis, the questionnaire was distributed to a group of 5 professors, who were subsequently excluded from the main study sample.

6.2 Research Methodology

Al-Rashidi (2000, p. 59) defines the descriptive methodology as 'a set of research procedures that are integrated to describe a phenomenon or subject through the collection, classification, and sufficiently precise analysis of facts and data in order to extract their significance and arrive at results or generalisations regarding the phenomenon or subject under study.' The present study adopted the descriptive methodology, as it is most appropriate for the nature of the subject and most widely used in the humanities and social sciences, constituting an investigative process focused on educational phenomena.

6.3 Study Population

The study population consists of all elements of the phenomenon under study, which may include the residents of a city or a group of individuals (Al-Naimi et al., 2015, p. 77). Accordingly, the study population is understood to comprise individuals who possess the characteristics of the phenomenon under study and upon whom the study's findings may be generalised. In this study, the population consists of a number of professors at the Institute of Physical and Sports Activities Sciences and Techniques, University of M'sila, totalling approximately 120 professors.

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6.4 Study Sample

The study sample is 'that portion of the population selected according to scientific criteria such that it accurately represents the population' (Al-Turkiti and Al-Ubaidi, 2012, p. 16). A sample of 35 professors was selected after excluding the 5 who formed the pilot study sample.

6.5 Study Domains

Human domain: The study covered a number of professors at the Institute, University of Mohamed Boudiaf, totalling 35 professors.

Spatial domain: The fieldwork was conducted at the Institute of Physical and Sports Activities Sciences and Techniques, Mohamed Boudiaf University, M'sila.

Temporal domain: The study was conducted from 10 October 2025 to 25 October 2025, during which the research instrument was constructed, distributed, retrieved, and its results statistically analysed using SPSS.

6.6 Study Variables

Independent variable: Digitization.

Dependent variable: Traditional tasks of the university professor.

6.7 Research Instrument

The research instrument was designed and developed by the researchers and took the form of a questionnaire comprising three axes. The first axis examined the impact of digitization on teaching tasks; the second addressed the professor's competencies in dealing with digitization; and the third examined pedagogical and research challenges. Each axis consisted of 5 items.

6.8 Scoring

A five-point Likert scale was used, with scores assigned as follows: Strongly Agree = 5; Agree = 4; Neutral = 3; Disagree = 2; Strongly Disagree = 1.

Table 1: Scale of Scores and Responses for Questionnaire Items

Questionnaire Items	*Strongly Agree*	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
AXIS 1 ITEMS	5	4	3	2	1
AXIS 2 ITEMS	5	4	3	2	1
AXIS 3 ITEMS	5	4	3	2	1

Source: Compiled by the researchers based on questionnaire data and SPSS v26 output.

7. Scientific Properties of the Instrument

7.1 Validity

'A valid test is one that measures what it was designed to measure. Validity is essential because the aim is to measure a specific phenomenon and not another' (Obaidat et al., 1984, p. 159).

Internal Consistency Validity

This type of validity yields construct validity through logical examination of the instrument's components and precision in measuring the target attribute and its correlation with other elements. It was calculated by estimating the correlations between each item's score and the total score of its axis, and between each axis score and the overall questionnaire score.

Correlations between items and the total score of Axis 1 were estimated using the Pearson correlation coefficient.

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Table 2: Pearson Correlation Matrix — Axis 1 Items with Total Questionnaire Score

Item No.	Item	Pearson Correlation Coefficient	Significance Level	Result
01	Digitization has affected the way lectures are delivered at the university.	0.982	0.003	Significant
02	Reliance on traditional teaching methods has decreased.	0.885	0.046	Significant
03	Digital media have become an essential component of the educational process.	0.942	0.017	Significant
04	Digitization has changed the relationship between the student and the professor.	0.955	0.012	Significant
05	Digitization has imposed new teaching patterns.	0.992	0.001	Significant

Source: Compiled by the researchers based on questionnaire data and SPSS v26 output.

As shown in the table above, examining Pearson correlation coefficient values reveals that two items — items 1 and 5 — were statistically significant at the 0.01 level of significance, while the remaining items were significant at the 0.05 level. Correlation values ranged from a high of 0.992 (item 5) to a low of 0.885 (item 2). Overall, it may be concluded that Axis 1 demonstrates validity, as all its items are mutually consistent and consistent with the axis to which they belong.

Correlations between items and the total score of Axis 2 were estimated using the Pearson correlation coefficient.

Table 3: Pearson Correlation Matrix — Axis 2 Items with Total Questionnaire Score

Item No.	Item	Pearson Correlation Coefficient	Significance Level	Result
06	I possess the basic skills for using digital media.	0.984	0.002	Significant
07	I find it easy to use educational platforms.	0.981	0.003	Significant
08	I receive ongoing training in the digital domain.	0.987	0.002	Significant
09	I am able to adapt to the requirements of digital education.	0.981	0.003	Significant
10	I keep up with technological changes in education.	0.915	0.030	Significant

Source: Compiled by the researchers based on questionnaire data and SPSS v26 output.

As shown in the table above, four items — items 6, 7, 8, and 9 — were statistically significant at the 0.01 level, while item 10 was significant at the 0.05 level. Correlation values

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ranged from a high of 0.987 (item 8) to a low of 0.915 (item 10). Overall, Axis 2 demonstrates validity, as all its items are mutually consistent and consistent with the axis to which they belong.

Correlations between items and the total score of Axis 3 were estimated using the Pearson correlation coefficient.

Table 4: Pearson Correlation Matrix — Axis 3 Items with Total Questionnaire Score

Item No.	*Item*	*Pearson Correlation Coefficient*	*Significance Level*	*Result*
11	I find it difficult to interact with students in digital education.	0.982	0.003	Significant
12	I encounter technical problems during teaching.	0.953	0.012	Significant
13	Effective communication with students decreases compared to traditional education.	0.949	0.014	Significant
14	Digitization negatively affects the quality of academic supervision of students.	0.962	0.009	Significant
15	I find some difficulty in using digital media in scientific research.	0.938	0.018	Significant

Source: Compiled by the researchers based on questionnaire data and SPSS v26 output.

As shown in the table above, items 11 and 14 were statistically significant at the 0.01 level, while the remaining three items (12, 13, and 15) were significant at the 0.05 level. Correlation values ranged from a high of 0.982 (item 11) to a low of 0.938 (item 15). Overall, Axis 3 demonstrates validity, as all its items are mutually consistent and consistent with the axis to which they belong.

Table 5: Pearson Correlation Matrix — Questionnaire Axes with Overall Total Score

Axis	*Pearson Correlation Coefficient*	*Significance Level*	*Result*
AXIS 1	0.997	0.000	Significant
AXIS 2	0.997	0.000	Significant
AXIS 3	0.999	0.000	Significant

Source: Compiled by the researchers based on questionnaire data and SPSS v26 output.

All axes demonstrated statistically significant correlations with the overall questionnaire score. The Pearson correlation coefficients were: Axis 1 — 0.997; Axis 2 — 0.997; Axis 3 — 0.999. It may therefore be concluded that the questionnaire is valid, as all its axes are mutually consistent and consistent with the questionnaire as a whole.

7.2 Reliability

Reliability is 'the degree of consistency or stability that a test demonstrates when applied more than once under similar conditions; it is considered a measure of the extent to which the instrument is free of random error' (Obaidat, 2004). A reliable scale is one that yields the same

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results when administered to the same individual on multiple occasions on the same day or on different days.

Table 6: Questionnaire Reliability — Cronbach's Alpha Coefficient

Questionnaire Axes	*Cronbach's Alpha*		*No. Of Items*
AXIS 1	Impact of Digitization on Teaching Tasks	0.964	05
AXIS 2	Professor's Digital Competencies	0.977	05
AXIS 3	Pedagogical and Research Challenges	0.961	05
Overall Questionnaire		0.888	15

Source: Compiled by the researchers based on questionnaire data and SPSS v26 output.

As shown in the table above, Cronbach's alpha coefficients were: Axis 1 — 0.964; Axis 2 — 0.977; Axis 3 — 0.961; Overall questionnaire — 0.888. These values indicate that the questionnaire exhibits a high level of reliability.

7.3 Statistical Tools

The Statistical Package for Social Sciences (SPSS v26) was used, employing the following statistical techniques:

- Frequencies and percentages to describe the characteristics of the study population.
- Cronbach's alpha reliability coefficient to assess the consistency of questionnaire items.
- Arithmetic mean to measure the centrality of responses.
- Standard deviation to measure the degree of agreement and dispersion of responses.

8. Results

8.1 Results of Hypothesis 1

"Digitization affects the traditional teaching tasks of university professors."

Table 7: Results of Hypothesis 1

Items		*Strongly Agree*	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*	*Mean*	*Standard Deviation*	*Level of Agreement*	*Rank*
Item 01	F	18	10	02	03	02	4.11	0.96	High	4
	%	51.43	28.57	5.71	8.57	5.71				
Item 02	F	20	12	02	01	00	4.46	0.74	Very High	2
	%	57.14	34.29	5.71	2.86	00.00				
Item 03	F	08	19	03	05	00	3.86	0.94	High	5
	%	22.86	54.29	8.57	14.28	00.00				
Item 04	F	13	17	03	02	00	4.17	0.82	High	3

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	%	37.14	48.57	8.57	5.71	00.00				
Item 05	F	24	08	02	01	00	4.57	0.74	Very High	1
	%	68.57	22.86	5.71	2.86	00.00				
Overall mean of the first dimension							4.23	0.89	Very High	

Source: Compiled by the researchers based on questionnaire data and SPSS v26 output.

An examination of the data in Table 7 reveals the following:

- Item 5 recorded the highest mean (4.57) with a low standard deviation (0.74), indicating a high degree of consensus among respondents that digitization has imposed new teaching patterns. This reflects their awareness of the impact of digital transformation in reshaping teaching methods and the adoption of modern approaches that accommodate technological developments and support more interactive and flexible learning environments.
- Item 2 recorded a mean of 4.46 with a standard deviation of 0.74, indicating a very high level of agreement that reliance on traditional teaching methods has decreased — reflecting an awareness of the role of modern technology in enhancing lesson interactivity and improving educational efficiency through more advanced and relevant approaches.
- Item 4 recorded a mean of 4.17 with a standard deviation of 0.82, indicating a high level of agreement that digitization has changed the relationship between student and professor — reflecting awareness of the impact of digital educational applications in making this relationship more interactive, as these tools attract learners' attention and motivate them, thereby reinforcing the teacher's role as a facilitator and guide rather than the sole source of information.
- Item 1 recorded a mean of 4.11 with a standard deviation of 0.96, indicating a high level of agreement that digitization has affected the way lectures are delivered — as digital technology has made teaching methods more varied and interactive, accommodating individual differences among students and facilitating the presentation of content in flexible ways that meet diverse learner needs.
- Item 3 recorded a mean of 3.86 with a standard deviation of 0.94, indicating a high level of agreement that digital technology provides educational content suited to students' interests and needs — reflecting awareness of digitization's role in offering flexible and customisable learning resources that enhance motivation and accommodate individual differences.
- Axis 1 as a whole recorded a mean of 4.23 with a standard deviation of 0.89, indicating a very high level of agreement that digitization affects the traditional teaching tasks of university professors. Digital technology contributes effectively to a transformation of the professor's role — from transmitter of information to facilitator of learning — and supports the delivery of interactive education that meets learners' needs. Accordingly, Hypothesis 1 is confirmed.

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8.2 Results of Hypothesis 2

"University professors possess digital competencies adequate for engaging with the requirements of digitization."

Table 8: Results of Hypothesis 2

Items		*Strongly Agree*	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*	*Mean*	*Standard Deviation*	*Level of Agreement*	*Rank*
Item 06	F	00	14	06	10	05	2.83	0.69	Moderate	3
	%	00.0	40.0	17.1	28.6	14.3				
Item 07	F	04	16	04	10	01	3.34	0.86	Moderate	2
	%	11.4	45.7	11.4	28.6	2.9				
Item 08	F	00	08	00	26	01	2.43	0.88	Moderate	5
	%	00.0	22.9	00.0	74.3	2.9				
Item 09	F	08	20	01	06	00	3.86	0.97	High	1
	%	22.9	57.1	2.9	17.1	0.0				
Item 10	F	00	10	05	15	05	2.57	0.65	Low	4
	%	00.0	28.6	14.3	42.9	14.3				
Overall mean of the second dimension							3.00	0.75	Moderate	

Source: Compiled by the researchers based on questionnaire data and SPSS v26 output.

An examination of the data in Table 8 reveals the following:

- Item 9 ranked first with a mean of 3.86 and a standard deviation of 0.97, indicating a high level of agreement. This reflects respondents' elevated capacity to adapt to the requirements of digital education and their readiness to engage with the modern technology-supported learning environment.
- Item 7 ranked second with a mean of 3.34 and a standard deviation of 0.86, indicating a moderate level of agreement — suggesting that respondents find a reasonable degree of ease in using educational platforms, while nonetheless requiring further skill development and technical support to ensure more effective use.
- Item 6 ranked third with a mean of 2.83 and a standard deviation of 0.69, indicating a moderate level of agreement — suggesting that respondents possess basic digital skills at an acceptable level, while needing to strengthen these skills to better meet the demands of digital education.
- Item 10 ranked fourth with a mean of 2.57 and a standard deviation of 0.65, indicating a low level of agreement — suggesting a limited capacity among respondents to keep pace with technological changes, which underscores the need to strengthen training and awareness to ensure the effectiveness of digital education.

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- Item 8 ranked fifth with a mean of 2.43 and a standard deviation of 0.88, indicating a low level of agreement — reflecting the inadequacy of ongoing digital training received by respondents, which highlights the need to expand training and qualification opportunities in the digital domain.
- The overall mean for Axis 2 ('Professor's Digital Competencies') was 3.00 with a standard deviation of 0.75, indicating a moderate level of agreement. This suggests that professors possess acceptable digital competencies but that these are insufficient for effective engagement with digital transformation. Particular weaknesses were identified in the areas of ongoing training and keeping pace with technological change, underscoring the need for regular training programmes to develop digital skills. Hypothesis 2 is accordingly confirmed.

8.3 Results of Hypothesis 3

"University professors face pedagogical and research challenges as a result of digitization."

Table 9: Results of Hypothesis 3

Items		*Strongly Agree*	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*	*Mean*	*Standard Deviation*	*Level of Agreement*	*Rank*
Item 11	F	20	12	02	01	00	4.46	0.74	Very High	2
	%	54.29	40.00	2.9	2.9	0.00				
Item 12	F	08	19	03	05	00	3.86	0.94	High	4
	%	22.9	54.3	8.6	14.3	0.00				
Item 13	F	13	17	03	02	00	4.17	0.82	High	3
	%	37.1	48.6	8.6	5.7	00.0				
Item 14	F	24	08	02	01	00	4.57	0.74	Very High	1
	%	68.6	22.9	5.7	2.9	00.0				
Item 15	F	10	12	06	07	00	3.71	0.96	High	5
	%	28.6	34.3	17.1	20.0	00.0				
Overall mean of the third dimension							4.15	0.84	High	

Source: Compiled by the researchers based on questionnaire data and SPSS v26 output.

An examination of the data in Table 9 reveals the following:

- Item 14 ranked first with a mean of 4.57 and a standard deviation of 0.74, indicating a very high level of agreement. Respondents perceive that digitization has a negative impact on the quality of academic supervision — possibly reflecting a sense of weakened communication or reduced personal follow-up between professor and student in the digital environment — and highlighting the need for improved electronic supervision tools and methods.

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- Item 11 ranked second with a mean of 4.46 and a standard deviation of 0.74, indicating a very high level of agreement. Respondents face clear difficulties in interacting with students within the digital education environment, reflecting a challenge in establishing effective communication and underscoring the need to develop interactive strategies and teaching technologies that support more effective digital communication.
- Item 13 ranked third with a mean of 4.17 and a standard deviation of 0.82 (note: the Arabic text gives 4.31 in the narrative; 4.17 is the table value), indicating a high level of agreement. Respondents acknowledge that effective communication with students is more limited in digital education than in traditional settings, reflecting a challenge in maintaining interaction quality and highlighting the importance of developing more effective and dynamic digital communication mechanisms.
- Item 12 ranked fourth with a mean of 3.86 and a standard deviation of 0.94, indicating a high level of agreement. A number of respondents encounter technical problems during teaching, which may affect the smooth conduct of digital education and confirms the need for ongoing technical support and improved digital infrastructure.
- Item 15 ranked fifth with a mean of 3.71 and a standard deviation of 0.96, indicating a high level of agreement. Respondents face some difficulties in using digital media for scientific research, which may reflect the need to strengthen training in this area and to provide supportive tools and technologies that facilitate digital research processes.
- The overall mean for Axis 3 ('Pedagogical and Research Challenges') was 4.15 with a standard deviation of 0.84, indicating a high level of agreement. Respondents clearly acknowledge the existence of significant challenges in digital education — in terms of student interaction, effective communication, and the use of digital media in scientific research — as well as recurrent technical problems affecting teaching quality. This underscores the need for ongoing technical and pedagogical support and the development of digital skills to ensure effectiveness in the digital teaching and research environment. Hypothesis 3 is accordingly confirmed.

9. Discussion

9.1 Discussion of Hypothesis 1

The study's findings support the first hypothesis — that 'digitization affects the traditional teaching tasks of university professors' — with the data for Axis 1 yielding a high mean of 4.23 and a standard deviation of 0.89, falling within the 'very high agreement' range. This reflects a strong consensus among respondents that digitization has produced a notable transformation in the nature of the roles assumed by university professors within the educational environment. The results of the five items within this axis revealed a growing awareness of the importance of digital technologies in developing teaching performance: respondents indicated that digitization has imposed new teaching patterns (item 5, mean 4.57), contributed to a reduction in reliance on traditional methods (item 2, mean 4.46), and reshaped the student-professor relationship in ways that enhance interaction (item 4, mean 4.17). Digital media have also provided possibilities for content delivery responsive to individual differences and student interests (items 1 and 3).

These findings are consistent with those reported in prior literature. Belayeb and Majidi (2025) highlighted the necessity for university professors to adopt new roles such as instructional

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design, technology integration, and interaction promotion — findings that converge with those of the present study. Mahi (2022) similarly confirmed the importance of digitization in improving interaction and developing an active learning environment, despite accompanying obstacles. Abadna (2023) addressed the transformation of the professor's role under digital education, whereby the professor is no longer limited to instruction but is expected to become a designer, guide, and facilitator of learning — roles that were clearly reflected in the practices of the professors sampled. Saleh Hussein (2018) and Mediha Debabi (2024) likewise underscored the importance of digital competency for ensuring educational quality in the context of rapid technological change.

On the basis of the foregoing, it may be concluded that the present study's findings are substantially consistent with those of prior research, confirming that digitization is no longer merely a technical option but has become an active agent in reshaping teaching roles within the university — through the shift from a traditional educational model to one that is more interactive, flexible, and personalised. This strongly and substantively supports the validity of the first hypothesis.

9.2 Discussion of Hypothesis 2

An examination of the results pertaining to the second hypothesis — that 'university professors possess digital competencies adequate for engaging with the requirements of digitization' — reveals that the means for the items in this hypothesis ranged from a high level of agreement (item 9, mean 3.86) to moderate (items 7 and 6) and low (items 10 and 8). This indicates that the digital competencies of respondents are present at a moderate level, with an overall mean of 3.00 — that is, respondents possess basic digital knowledge but exhibit weaknesses in certain key areas, particularly ongoing digital training and keeping pace with rapid technological change, which necessitates the provision of specialised and permanent training programmes.

Comparing these findings with prior studies reveals convergence with Mediha Debabi (2024), who highlighted the importance of digital competency as a foundation for ensuring educational quality in the context of digital transformation, and with Abdelbasset Mahi (2022), who identified technological and human obstacles impeding effective implementation of digital education — factors that account for some of the weaknesses revealed in this study. Batat Noureddine (2022) supported the view that e-learning contributes to the development of the university environment while confirming the absence of significant differences by variable — a finding consistent with the present study's results regarding variability in competency levels without a clear relationship to experience or department. Studies addressing the new roles of university professors — such as Belayeb and Majidi (2025), Abadna (2023), and Saleh Hussein (2018) — focused on the importance of professors adopting new roles in digital education without directly examining the extent to which they possess the requisite digital competencies, which is precisely where the present study's findings serve as a complement. Hypothesis 2 is accordingly confirmed at a partial level: professors possess acceptable digital competencies, but these are insufficient to meet the demands of digitization as required, necessitating institutional intervention to develop these competencies through ongoing training and technical support.

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9.3 Discussion of Hypothesis 3

An examination of the results pertaining to the third hypothesis — that 'university professors face pedagogical and research challenges as a result of digitization' — reveals that the means for the items in this hypothesis ranged from very high agreement (items 14 and 11, with means of 4.57 and 4.46 respectively) to high agreement (items 13, 12, and 15). This reflects a clear awareness among respondents of the real difficulties imposed by the digital context. These challenges manifested in weakened quality of academic supervision, difficulties in student interaction, reduced effectiveness of communication compared to traditional education, technical problems during teaching, and difficulties in using digital media for scientific research. The overall mean for this axis was 4.15, indicating that digital challenges significantly affect the pedagogical and research performance of university professors — underscoring the need for ongoing technical and pedagogical support and the development of digital skills.

Comparing these findings with prior studies reveals convergence with Belayeb and Majidi (2025), who confirmed that distance education requires professors to assume new roles such as promoting interaction and designing digital education — roles that cannot be fulfilled without overcoming the communication-related challenges of digital interaction. The findings also align with Mahi (2022), who identified human and technological obstacles affecting the effectiveness of digital education — obstacles that were directly identified in the present study. Debabi (2024) reinforces this perspective through her emphasis that digital transformation demands high professional and digital competency from university professors, which constitutes a fundamental challenge. Batat Noureddine (2022) highlighted the role of e-learning in developing the university environment while not denying the existence of ongoing challenges — a position consistent with the technical and pedagogical difficulties identified in this study. Studies such as Saleh Hussein (2018) and Abadna (2023) focused on the multiplicity of the university professor's roles in the digital environment without adequately addressing the nature of the challenges that may impede the exercise of these roles — a gap that the present study complements by revealing these challenges in precise detail. Hypothesis 3 is accordingly confirmed at a high level.

9.4 Discussion of the General Hypothesis

The study's findings indicate that digitization has become a decisive factor in reshaping the traditional roles of university professors within the university — with the professor's mission no longer confined to instruction or knowledge transmission but now requiring adaptation to a multi-dimensional digital learning environment. The first hypothesis demonstrated that digital technology has contributed effectively to transforming teaching tasks — through the integration of new educational models, the enhancement of interaction, and the transition from traditional patterns to more flexible and personalised practices. Similarly, the second hypothesis revealed that university professors now possess digital competencies at an acceptable level that enable them to manage the basic requirements of digitization, although these competencies still require deepening and development — particularly in the areas of ongoing training and keeping pace with rapid technological change. The results of the third hypothesis highlighted the pedagogical and research challenges that have accompanied this transition: respondents identified difficulties in communication, academic supervision, and the use of digital media in research, in addition to technical barriers that continue to affect teaching quality.

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These findings converge with those of prior studies confirming the transformation of the university professor's role under digitization into a more diverse and complex one — requiring skills in digital instructional design, interaction promotion, and the overcoming of technical and pedagogical challenges. On the basis of this cumulative body of evidence, it may be concluded that the general hypothesis is confirmed: digitization produces direct and substantive effects on the traditional roles of university professors, which necessitates a fundamental reconsideration of how professors are prepared and qualified in alignment with the requirements of the digital university environment and the variables of contemporary education.

10. Key Findings

- Digitization has reshaped the traditional teaching tasks of university professors.
- Digitization has brought about a radical transformation in the nature of the university professor's educational roles — from traditional instruction to more interactive and innovative roles.
- Digital technology has contributed to the development of teaching performance and the improvement of learning quality within the university.
- The use of artificial intelligence has contributed to enhancing interaction between professor and students and to the design of educational content suited to individual differences.
- Professors possess basic digital competencies, but exhibit weaknesses in certain areas particularly ongoing training and keeping up with technological developments.
- There remains a disparity in professors' capacity to deploy digital media effectively in teaching and research practice.
- Professors face challenges related to academic supervision and pedagogical interaction in the digital environment.
- Technical and pedagogical difficulties exist that negatively affect teaching performance in the digital context.
- There is a shortage of professional and technical training aimed at professors in the field of digital education.
- Weak digital infrastructure within some university institutions impedes the effectiveness of digital education.
- Digitization has required university professors to adopt new roles — as designer, facilitator, and guide — in place of the traditional role based on instruction and transmission.
- Digital competency has become an essential prerequisite for ensuring the quality of university education and keeping pace with global transformations.
- Some university curricula remain inadequately prepared to accommodate modern technologies and the requirements of the digital environment.
- Digital transformation in the university requires comprehensive institutional intervention encompassing training, support, curriculum modernisation, and infrastructure.

11. Recommendations

- Develop continuous and specialised training programmes for professors in the use of technology and artificial intelligence.

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- Strengthen ongoing digital training for university professors through the organisation of specialised workshops in the use of digital education tools and artificial intelligence.
- Develop the digital infrastructure of universities to provide an integrated and effective electronic educational environment that supports teaching and scientific research.
- Revisit university curricula to ensure their alignment with the requirements of the digital environment, and integrate digital and interactive components into courses.
- Provide ongoing technical and pedagogical support for professors through specialised technical teams that help resolve technical problems and assist professors in using digital media.
- Encourage the use of interactive teaching strategies that are responsive to the characteristics of the digital environment and enhance interaction between professor and student.
- Establish units within university institutions specialising in digital transformation, tasked with overseeing the digitization of pedagogical and research practices.
- Motivate professors to adopt new educational roles through recognition and incentives for their efforts in keeping pace with digitization.
- Develop digital assessment and evaluation tools to enable genuine measurement of student and professor competencies in a digital environment.
- Work to narrow the digital gap between professors and students through joint training and pedagogical accompaniment.
- Encourage scientific research in the fields of digitization and digital education to enable ongoing study of the reality of digital higher education and to propose evidence-based solutions.
- Establish a culture of digital transformation within university institutions by embedding digitization in their educational policies and strategies.
- Launch international cooperation initiatives with universities at the forefront of digital education to benefit from their experiences and exchange best practices.

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