

Exploring Digital Transformation in Algerian Higher Education: A Mixed Methodology Approach of Current Practices and Future Needs.

دراسة استكشافية للتحويل الرقمي في الجامعات والمدارس العليا بالجزائر: الممارسات الحالية والاحتياجات المستقبلية.

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Article abstract:

This study investigates the techno-pedagogical practices at universities and higher schools in Algeria. Using a mixed methodology approach, the research relies on a questionnaire, answered by 34 participants including faculty members, administrators, and IT support staff across different universities and higher schools in Algeria. The data gathered is analysed thematically following Braun and Clarke (2006, 2022). The aim is to examine how universities and higher schools conceptualizes and implements digital tools for teaching and learning. The study identifies key challenges such as uneven access to infrastructure, lack of targeted professional development, and limited institutional strategies for AI and educational technology adoption. It sheds light on the need for coordinated national policies, institution-specific capacity building, and context-sensitive digital pedagogy models that bridge systemic inequalities.

Keywords: Algerian Higher Education; AI-Enhanced Instruction; Digital Pedagogy; Institutional Capacity-Building; Professional Development; Techno-pedagogical Practices.

ملخص المقال:

تناول هذه الدراسة الممارسات التكنولوجية البيداغوجية في الجامعات والمدارس العليا بالجزائر. تعتمد الدراسة منهجًا مختلطًا يجمع بين الاستبيان أجاب عليه 34 مشاركًا من بينهم أساتذة وإداريين وكذا موظفي الإعلام الآلي وتكنولوجيا المعلومات في مختلف الجامعات والمدارس العليا عبر التراب الوطني. الهدف من الدراسة هو استكشاف كيفية استعمال المؤسسات التعليمية للأدوات الرقمية وتوظيفها في عمليتي التعليم والتعلم. يتم تحليل البيانات التي تم جمعها من الاستبيان تحليلًا قائمًا على المواضيع (Thematic Analysis) وفقًا لنموذج براون وكلارك (2006, 2022). وقد أفرزت النتائج جملة من التحديات الأساسية، أبرزها تفاوت فرص الوصول إلى البنية التحتية، وغياب برامج التطوير المهني الموجه، ومحدودية الاستراتيجيات المؤسسية المتعلقة باعتماد تطبيقات الذكاء الاصطناعي في المجال التربوي. وانطلاقًا من ذلك، تدعو الدراسة إلى ضرورة وضع سياسات وطنية منسقة، وإرساء آليات لبناء القدرات تتناسب مع خصوصية كل مؤسسة، واستحداث نماذج بيداغوجية رقمية مراعية للسياق، قادرة على معالجة أوجه التكافؤ الهيكلي.

الكلمات المفتاحية: 1. لتعليم العالي في الجزائر؛ التدريس المعزز بالذكاء الاصطناعي؛ البيداغوجيا المعتمدة على التكنولوجيا؛ القدرات المؤسسية؛ التنمية المهنية المستمرة؛ الممارسات التكنولوجية البيداغوجية.



Introduction

Since the COVID-19 pandemic in 2020, human interaction has undergone a significant transformation, making a pivotal shift in social dynamics; particularly through heightening reliance on online communication (Khalidi & Aissaoui, 2022). In response to the digital transition, higher education globally questioned traditional classrooms and shifted towards remote and digital learning modes (Murphy, 2020). In Algeria, this shift led to the compelling of higher education institutions to adapt to the use of blended learning. Blended learning is based on blending pedagogical strategies and technological tools; also labeled as techno-pedagogy which has emerged as a key component of modern instruction. However, the effectiveness of its implementation varies greatly across different academic contexts, with disparities often arising due to faculty support, digital infrastructure and pedagogical integration of technology. Therefore, this paper sheds light on how two major pillars of post-secondary education in Algeria; being public universities and higher schools, are implementing the new instructions of techno-pedagogy. Since, both institutions are tasked with producing skilled graduates capable of participating in a digitally connected world. Yet, anecdotal evidence and preliminary observations suggest that these institutions differ significantly in their readiness in digital and pedagogical innovation which remains underexplored in Algerian Universities and Higher Schools.

Amidst this shift and to support the digitization process within Algerian Universities and Higher schools, the Ministry of Higher Education and Scientific Research (MHESR) launched a training program in 2016 (Decree No. 932 of July 28, 2016) aimed at university professors in Information and Communication Technologies (ICT's) and pedagogy. This training initiative, entrusted to a team of trainers from Frères Mentouri University of Constantine (UFMC), is considered techno-pedagogical support for newly recruited teachers. Its primary objective is to equip these teachers with skills in digital pedagogy, thereby ensuring high-quality education that fosters competencies and skills in educational technologies among university students (Benmahammed & Boumokrane, 2024, p. 2). In the meanwhile, contributing in building, and enhancing an effective digital landscape of Algerian Universities and higher schools.

Issue of the study/ Research Gap

While several studies such as Zourz (2022), Kariman (2025), and Benmahammed & Boumokrane (2024) shed light on how technology is being used to support teaching and learning in Algerian universities, they tend to focus mainly on public institutions, especially in areas like language education and teacher training. These works provide important insights, but they overlook a crucial part of the picture: the experiences of higher schools (grandes écoles and specialized institutes). These institutions often operate differently from universities, with unique challenges, priorities, and opportunities when it comes to integrating technology into teaching. As a result, there's a noticeable gap in the research. This study aims to explore both what is happening at universities and higher schools and gather data to explore the way technology is being used by teachers, administrators and IT staff. The main objective of this exploratory study is to contribute to forming a view on the techno-pedagogical development across Algeria's higher education system. The strategies of integration of technologies raises critical questions: In what ways are digital technologies integrated into pedagogical practices within Algerian higher education institutions? What institutional and individual factors influence their implementation? And what needs to be done to enhance its use at all levels?

1. Review of Literature

1.1 Techno-pedagogical Practices in Algerian Context:

In Algerian higher education, the idea of technopedagogy, the blending of technology with teaching has only recently begun to take shape. As defined by the Office québécois de la langue française (2021), technopedagogy goes beyond simply using digital tools in the classroom. It's about creating a learning environment where technology actively supports and enhances the teaching process (Benabdeljalil, 2023). The goal is to make lessons more effective, engaging, and meaningful for students.

Experts like Lameul (2015) and Percolab (2022) emphasize that this approach involves more than just technical tools, it requires thoughtful planning that connects teaching methods, student motivation, and skill-building with the appropriate digital resources. That's why it's important not to confuse technopedagogy with ICTs (Information and Communication Technologies). ICTs refer to the actual devices or platforms used, while technopedagogy is about how those tools are used strategically to improve learning.

Nissen, (2019) asserted that in Algeria, technopedagogical practices began gaining attention during the COVID-19 pandemic, when the shift to hybrid learning—combining in-person and online teaching—became necessary as cited in Benmahammed and Boumokrane (2024). However, efforts to train university faculty in these methods actually started earlier, around 2012, with institutions like UFMC offering training programs for new professors.

This understanding of technopedagogy is at the heart of the study "Bridging the Gap in Digital Pedagogy." The research investigates how universities and higher schools in Algeria are using (or not using) these methods. While some universities have started to adopt structured, intentional technopedagogical practices often thanks to early training initiatives many higher schools are still catching up. They might have access to digital tools, but lack the pedagogical strategies to use them effectively.

This gap reveals a broader issue: access to technology isn't enough. Without proper guidance on how to integrate it into teaching in a meaningful way, the potential of technopedagogy remains untapped. The study highlights the need for more consistent training, better infrastructure, and stronger support across all educational institutions to ensure students everywhere can benefit equally from digital learning.

In the overall, digital education is making a real difference in Algerian context. It not only improves the overall quality of learning but also makes it easier for students and teachers to connect and interact. With its flexible and innovative approach, it creates a more engaging learning experience. On top of that, it helps students develop the tech skills they'll need to succeed in today's competitive job market.

1.2 Common Technological Practices in Algerian Context:

A range of technological tools has reshaped language teaching and learning, with computers standing out as foundational to many instructional applications. These include computer-based learning, multimedia instruction, web-based platforms, and intelligent tutoring systems (Fletcher, 2003). Over time, this led to the development of approaches such as Computer-Assisted Language Learning (CALL), Computer-Supported Learning (CSL), and Computer-Mediated Communication (CMC), all of which highlight how technology can complement or even redefine traditional teaching models (Benbunan-Fich & Stelzer, 2002).

In Algeria, particularly in universities, computers have become increasingly integrated into language instruction, especially during the shift to hybrid and online learning environments prompted by the COVID-19 pandemic. This aligns with Saeed's (2015) observation that computer technology plays an expanding role in language education globally. Additionally, as Nunan (1999) points out, computers provide interactive visual tools that enhance engagement and instructional quality in foreign language learning.

However, successful implementation relies not just on access to technology, but also on the readiness and attitude of educators. Sabzian, Gilakjani, and Sodouri (2013) stress that teachers must not only feel confident using these tools but also be supported by relevant pedagogical frameworks. This is especially pertinent in the Algerian context, where a gap still exists in training and technopedagogical preparedness between universities and higher schools.

Interactive Whiteboards (IWBs) also represent a significant advancement in teaching technology. Functioning like regular whiteboards but with touch-sensitive interactivity linked to a computer, IWBs have proven effective in enhancing student engagement and facilitating collaborative work (Türel & Johnson,

2012; Harlow et al., 2011). In Algeria, while many universities have adopted such tools, their use in higher schools remains limited, further contributing to the digital divide in educational practices.

Another traditional yet evolving tool is the language laboratory, which has shifted from analog cassette-based setups in the 1960s to modern, digitally enhanced environments. These labs offer structured support for English as a Foreign Language (EFL) instruction, though their availability and use vary widely across Algerian institutions.

Furthermore, tools like blogs have introduced new opportunities for learner autonomy and interaction. Blog-Assisted Language Learning (BALL), as discussed by Ward (2004), enables students to extend their language learning beyond the classroom through reflective writing and peer communication. While such tools are increasingly used in Algerian universities, their integration in higher schools remains minimal, often due to limited infrastructure or lack of training.

Other commonly used digital tools include email, messaging platforms, video conferencing, e-learning software, digital journals, and multimedia presentations (Kasapoğlu-Akyol, 2010; Merç, 2015). These resources support a broad range of educational activities and have become essential components of modern pedagogy.

Overall, while Algerian universities are progressively incorporating these technologies into their teaching practices; many higher schools continue to face barriers related to access, training, and pedagogical alignment. This uneven adoption highlights the core issue addressed in this study: the need to bridge the gap in digital pedagogy across different levels of Algerian higher education.

1.3 AI Enhanced Instructions in Algerian Universities

In recent years, artificial intelligence (AI) has begun to influence higher education in Algeria, offering both promising opportunities and significant challenges. While AI has proven its value in enhancing research creativity, particularly through tools like machine learning and natural language processing (Achili & Zerrouki, 2024), its role in instruction remains a developing area. AI technologies can personalize instruction, adapt to different learning styles, and support innovative assessment methods (Ghimire et al., 2024). Studies conducted across several Algerian universities suggest that faculty members are cautiously optimistic about AI integration in teaching and learning.

However, many educators remain hesitant, often due to limited training, outdated curricula, and lack of institutional support (Zerqi & Bouzriâ, 2025). Interviews and surveys reveal that while researchers are beginning to adopt AI tools in academic writing and data analysis often to maintain originality and avoid plagiarism there is still a gap in its instructional use (Boutkhil & Sahraoui, 2023). Concerns have also been raised about overreliance on AI, reduced creativity, academic dishonesty, and the risk of superficial learning (Guéclair, 2024). These findings point to the urgent need for comprehensive training programs, ethical guidelines, and updated policies to support teachers in responsibly integrating AI into their pedagogical practices. Without such measures, the full potential of AI-enhanced instruction in Algerian universities is unlikely to be realized (Fletcher, 2003)

In conclusion, Algerian higher education is undergoing a gradual digital transformation, with universities adopting techno-pedagogical and AI tools more readily than higher schools. While technologies like computers, interactive whiteboards, and AI offer great potential, challenges such as limited training, infrastructure gaps, and ethical concerns remain. Bridging this digital divide is essential for ensuring equal access to quality, tech-enhanced education across all institutions.

2. Methodology

The study is both qualitative and quantitative and aims to bridge the gap in digital pedagogy through an analysis of techno-pedagogical practices at universities and higher schools in Algeria. It is quantitative and data is collected using a questionnaire, and qualitative following a thematic analysis of the questionnaire using Braun and Clarke's (2006, 2022).

2.1 Data Collection and Sampling

Data was collected using a questionnaire and targeted faculty members, administrators, and IT support staff across different universities and higher schools in Algeria. Participants' selection was random, and the questionnaire was distributed using social media platforms "Facebook groups" and LinkedIn which makes the participants anonymous. The total number of the participants is 34. The number of participants working within higher schools was very small which made a comparative study inadequate in this case. The study is then an analysis of the techno-pedagogical practices at universities and higher schools in Algeria following thematic analysis.

2.2 Research Question and Hypothesis:

The study attempts to answer the following questions: In what ways are digital technologies integrated into pedagogical practices within Algerian higher education institutions? What institutional and individual factors influence their implementation? And what needs to be done to enhance its use at all levels?

The hypothesis: The effective integration of digital technologies into pedagogical practices in Algerian higher education institutions is significantly influenced by both institutional factors (such as infrastructure and administrative support) and individual factors (such as faculty training and teaching experience).

2.3. Data Analysis Procedure

Data was conducted using a questionnaire in English language, data is gathered using a thematic analysis following Braun and Clarke's (2006, 2022) six-phase model; familiarization, coding, theme generation, review, definition, and reporting. this later collects data on:

- Demographics: Institution type, Role, age, teaching experience.
- Digital Infrastructure and Access to Technology.
- Faculty Support and Professional Development.
- Pedagogical Integration of Technology.
- Institutional Strategies and Support for Technology.

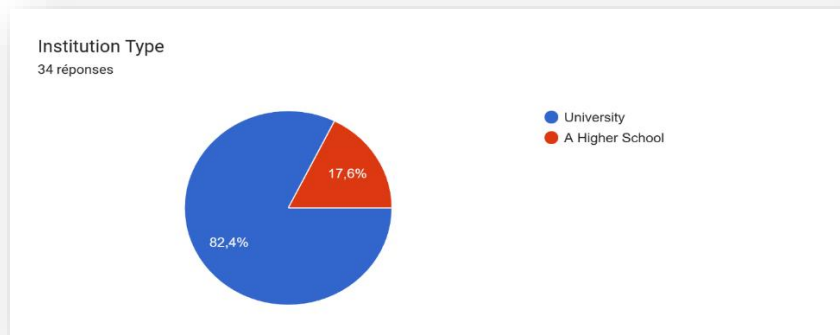
To enhance the credibility of the findings, preliminary interpretations were shared with a subset of participants to validate interpretations.

3. Results and Discussion

The results of the study, following the data collected using the questionnaire, are explained in detail in the following paragraphs.

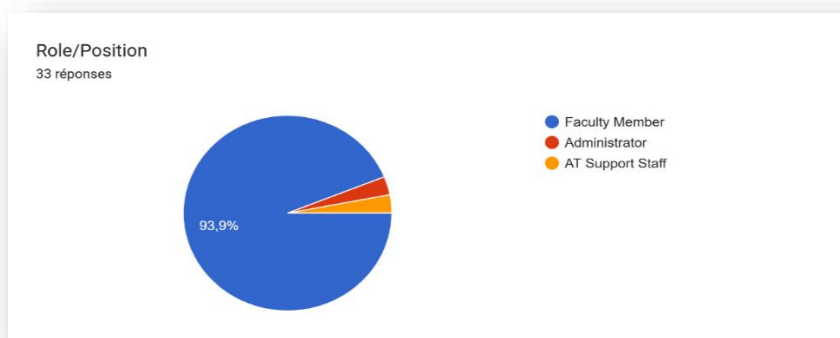
The questionnaire targeted faculty members, administrators, and IT support staff at universities and higher schools in Algeria. What is noticed is that out of 34 answers on the questionnaire, only 17.6% of the answers are working in a higher school. The first problem is the access to these participants which is quite hard despite the wide spread of the questionnaire via different platforms (social media, LinkedIn, and via email).

Figure 1: Type of the Institution



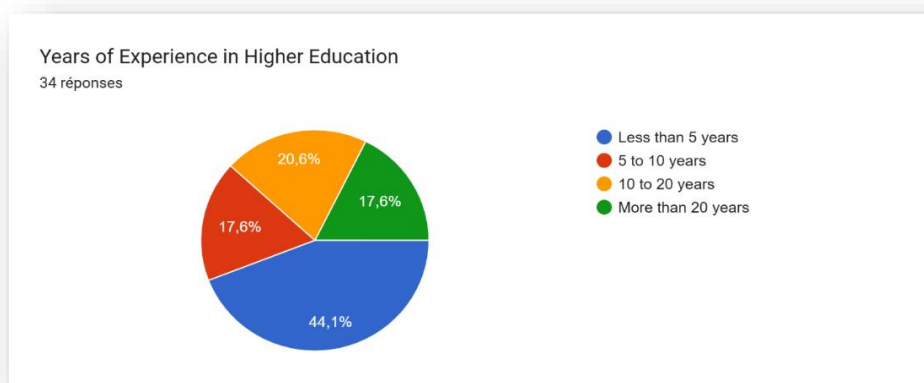
The participants roles are faculty members, administrators or IT support staff. Only one Administrator and one from the IT Support staff answered the questionnaire. When digging further, administrators and IT support staff asserted that they do not master English and could have been comfortable answering it if it was in Arabic and some of them added French too. This point uncovers a big problem that would face our universities and higher schools in Algeria. In fact, the training and language proficiency programs should include all university and higher school staff and it must be compulsory. This way, the shift will include the entire system and not only teaching staff.

Figure 2: Roles of participants



As shown in the diagram 4 below, the participants' experience within higher education varies considerably; 41.1% have less than 5 years of experience, 20.6% have between 5 and 10 years of experience, 17.6% have 10 to 20 years of experience, while another 17.6% have more than 20 years of experience within higher education. The difference in years of experience of the participants shows that the study gathers diverse ranges of experienced workers who have lived through the development of their university or higher school which would make the answers more reliable.

Figure 3: Years of Experience in Higher Education

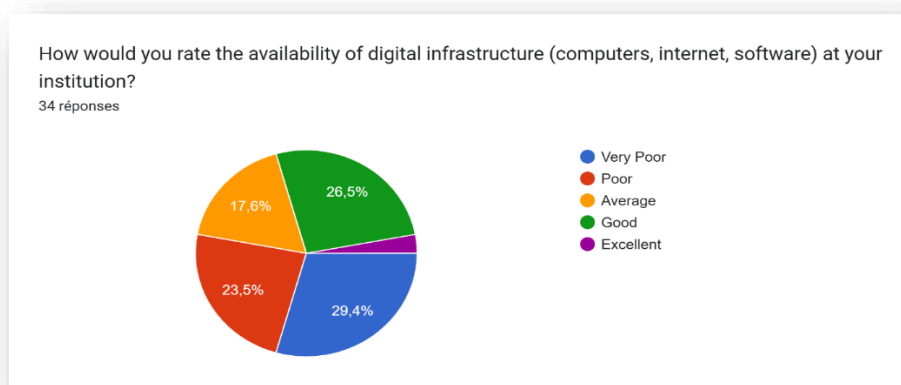


3.1. Digital Infrastructure and Access to Technology

This part of the analysis deals with the availability of infrastructure and the access to technology in universities and higher schools in Algeria. It demonstrates the digital tools used by teachers and evaluate access to them.

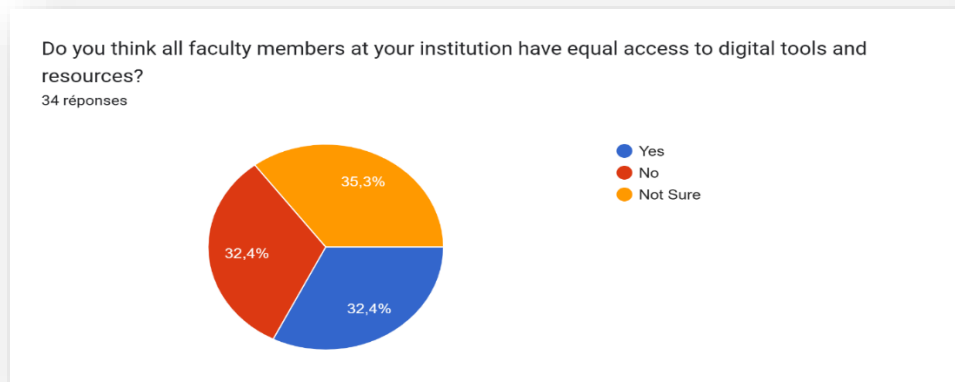
Participants of the study answered different to the question “how would you rate the availability of Digital Infrastructure in your institution?”. As shown in Figure 5 below, 29.4% of the participants described their institution as being very poor, while 26.5 confirmed that their institutions have good access digital infrastructure, 23.5% rated it as being poor, 17.6% asserted that their institutions have an average access to digital infrastructure, and finally 1.9% affirmed that the institution he/she works for rated the availability of digital infrastructure as being excellent. So, means that at least 52.9% of the participants described the availability of the digital infrastructure as being poor; which is more than half of the participants in the study while 28.4% of the participant confirmed its availability. This shows that infrastructure is indeed being put into place gradually into different institutions.

Figure 4: Availability of Digital Infrastructure



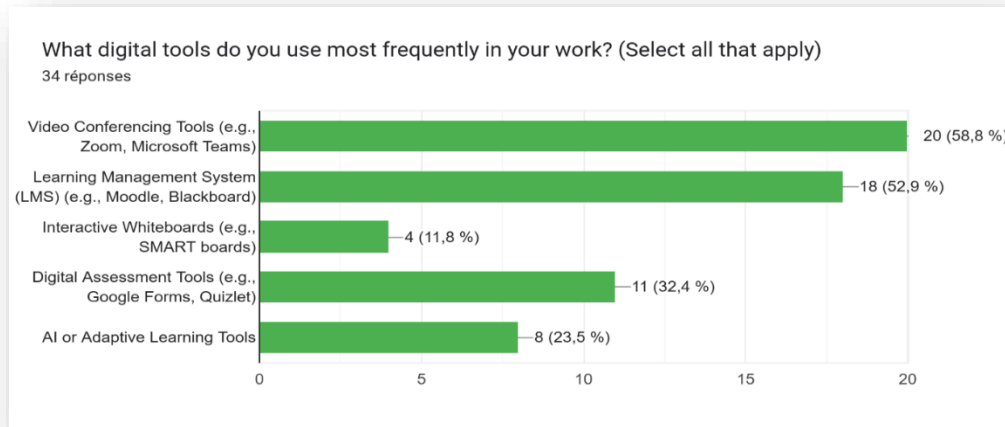
The following figure illustrates views of participants regarding the equal access of faculty members to digital tools and resources across higher schools and universities in Algeria. 35% of the participants opted for not answering this question as they were not sure about the fact that there is an equal access to all faculty members of their institutions to digital tools and resources. The rest of the participants were divided in half, one half answered positively while the other half answered negatively. The fact that there was a difference in the answers confirms that the previous answers regarding the availability of the digital infrastructure in first place. The previous question already set the differences and this question confirmed the previous results.

Figure 5: Access to Digital Tools by Faculty Members.



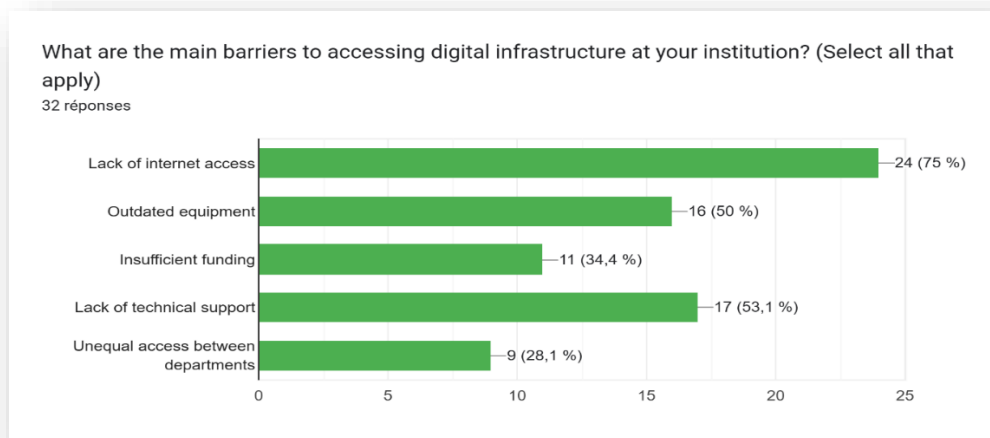
The following figure illustrates the answers of the question dealing with the frequency of use of Digital tools within different universities and higher schools. What is noticeable and also predictable is that video conferencing tools (Zoom, Microsoft Teams, Google Meet...), and learning management systems (Moodle) were the ones which were mostly used by participants. However, digital assessment tools like google forms, which is very easy to use, were not very used along with AI or adaptative learning tools. When it comes to AI, not everyone can use it properly because not everyone knows how to use it. Nevertheless, as mentioned in (Achili & Zerrouki, 2024), faculty members are cautiously optimistic about AI integration in teaching and learning. The least digital tool used is the interactive whiteboards like smart boards as not a lot of universities or higher schools are equipped with such technology.

Figure 6: Digital Tools Frequently Used in the Workplace.



According to Figure 8 below, the lack of internet access is signalled many times of the participants followed by the lack of technical support. The majority of institution have access to internet in the administration and not elsewhere while technical assistances is missing the whole university or higher school as the IT support staff presence is minimal with one or two workers who cannot deal with every technical problem or provide assistance to everyone in need. Another struggle is related to the outdated equipment as some institutions have indeed equipment but cannot use it as it is outdated and hardly usable. These struggles mostly aroused due to insufficient funding in most institutions. Another problem is the fact that some department have indeed access to digital technologies while other were judged as being less in need of such tools.

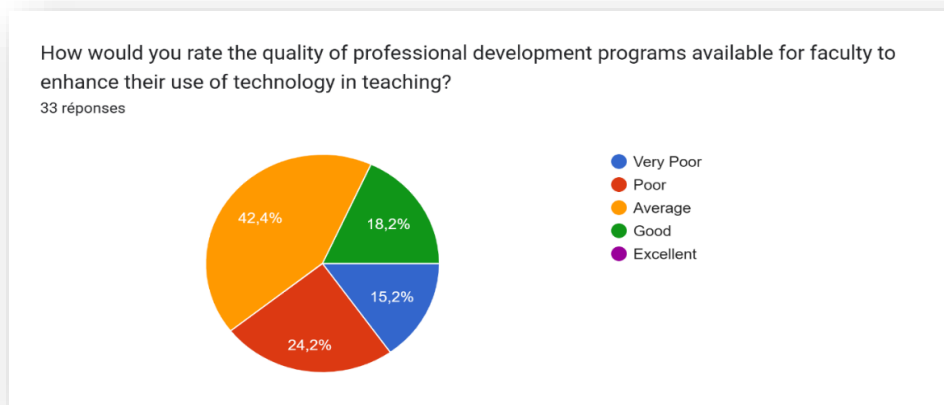
Figure 7: Barriers for accessing Digital Infrastructure



3.2. Faculty Support and Professional Development

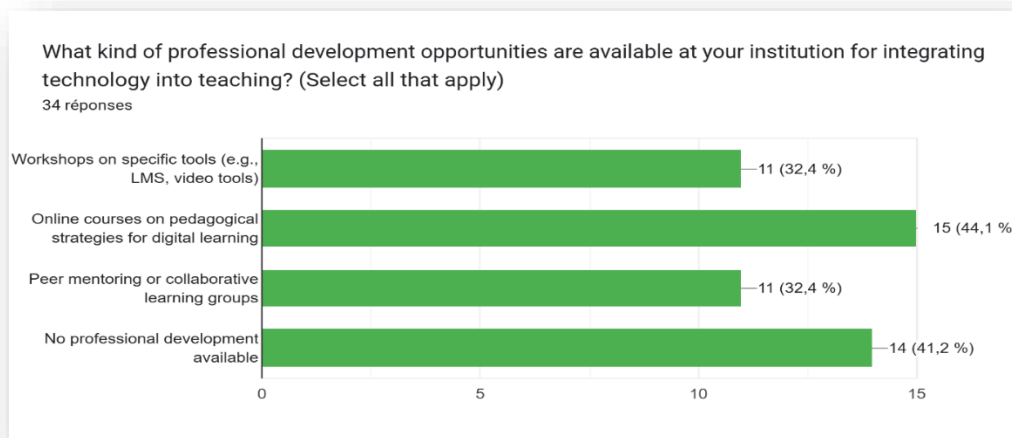
The following Figure illustrates the quality of professional development programs of faculty members according to the participants of the study. 39.4% of the participants described it as being poor or very poor. 42.4% described it as being average while 18.2% confirmed it was good and none of them opted for excellent. These results show graduality of implementation of the professional programs for faculty members. There is still work to be done but the fact that there is some development within institutions is already a jump towards the right bath.

Figure 8: Professional Development programs available for faculty



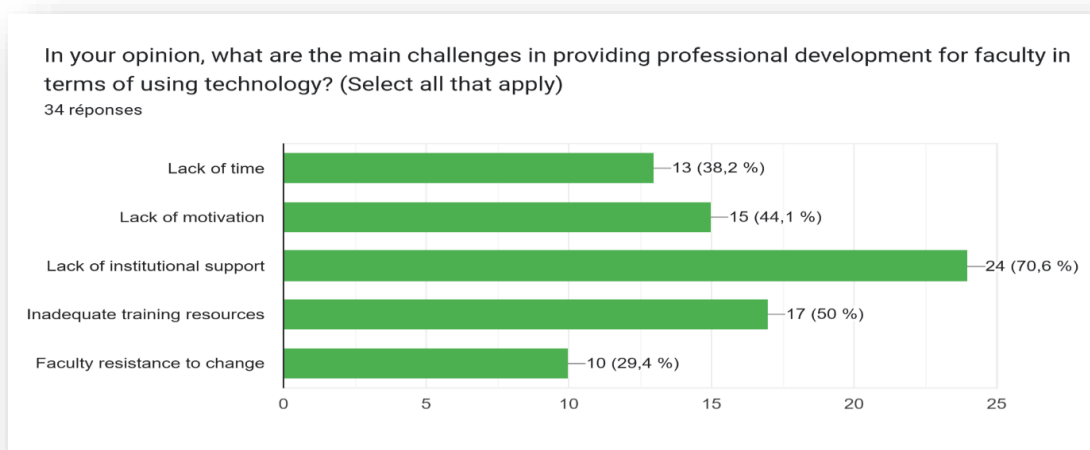
The figure below shows that the majority of participants asserted that their institutions have accessible workshops (32.4%), online courses on pedagogical strategies for digital learning (44.1%), and peer mentoring or collaborative learning groups (32.4). While 41.2% of them affirmed that there are no such opportunities in their institutions. This entails that 58.8% of the participants asserted that at least one of the development opportunities already mentioned are available in their institutions.

Figure 9: Development Opportunities available within the Institutions



According to the following Figure, the lack of institutional support is signalled by 70.6% of the participants of the study making it the biggest problem faced in their respective institutions. The second challenge is the inadequate training resources (50%). The third one is the lack of motivation (44.1%) which is followed by the lack of time (38.2%). The last challenge is the faculty resistance to change (29.4%). The first two challenges are directly related to the lack of digital infrastructure and adequate training programs while the lack of motivation is a result of these two challenges. The lack of time which is due to the tasks that teachers are assigned to do can also lead to the lack of motivation to take part in such programs. Finally, resistance to change is mainly due to the resistance to changing old and traditional teaching methods which is again due to the unfamiliarity with new digital technologies.

Figure 10: Challenges in Providing Professional Development for Faculty.

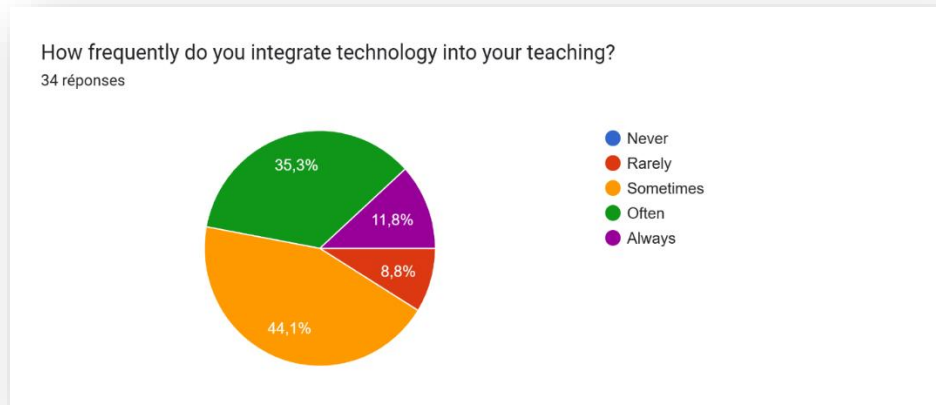


3.3. Pedagogical Integration of Technology

This part deals exclusively with the pedagogical integration of Technology into classes and their influence on students learning outcomes.

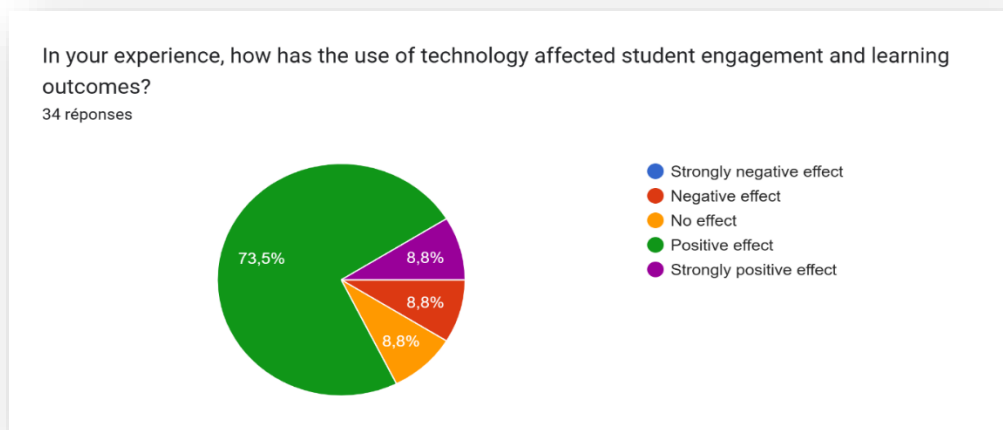
The following figure illustrates how often teachers integrate any kind of technology into their teaching practises. All those who answered the questionnaire use technology at different rates. What is interesting is that 47.8% of the participants use it often while 44.1% use it sometimes which means that all the participants use the technology somehow in their classes.

Figure 11: *Technology Use in Teaching*



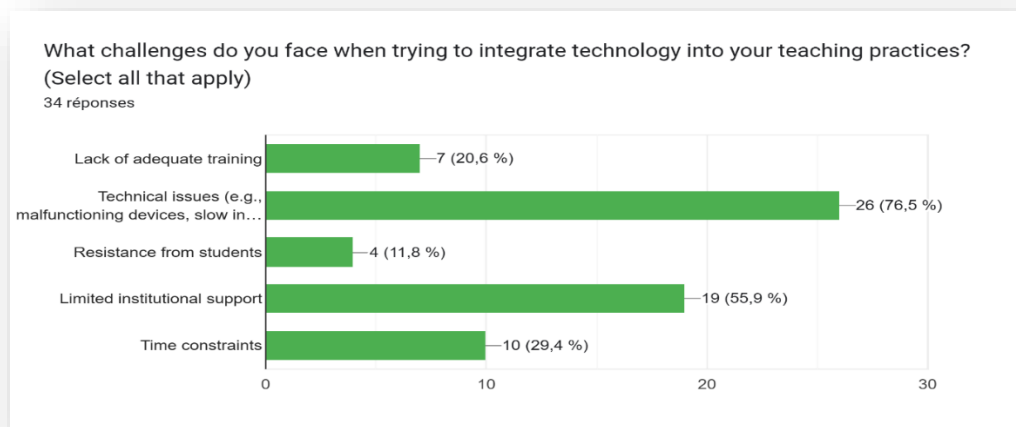
The effect of the use of technologies on students' learning development as demonstrated in figure 13 below illustrates the positive effect it has on student as 73.5% of the participants confirmed that it had a positive effect on their students' engagement and learning outcomes. The rest of the participant are equally distributed across strongly positive effect, no effect, and negative effect with 8.8% each. this means that the results strongly suggest the integration of technologies into teaching.

Figure 12: *Technology Use and Students' Learning Development*



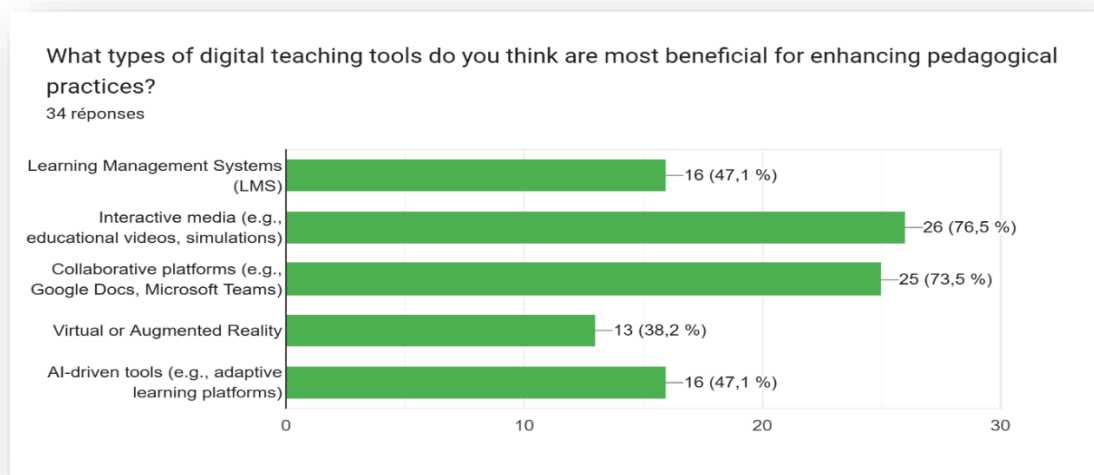
When it comes to challenges facing technology integration in teaching, figure 14 below confirms that technical issues are the biggest challenge faced by the majority of participants (76.5%). The second challenge has to do with the limited institutional support, the third is the time constraints which can be a result of the previously mentioned challenge "lack of technical support" that leads to wasting time. What comes next is the lack of adequate training programs as not all programs reflect the needs of the participants and need to be revisited. As we mentioned resistance from teachers, there is resistance from students as well, unfortunately some students tend to lean on to what they are familiar with which goes with traditional teaching methods.

Figure 13: Challenges of Technology Integration into Teaching



According to Figure 15, interactive media like educational videos are the most beneficial for enhancing pedagogical practices (76.5%). Collaborative platforms are the second most beneficial tool (73.5%), while AI driven tools and learning management systems were chosen by participants at 47.1%. Virtual or augmented reality was chosen by 38.2% of the participants and is the least beneficial digital teaching tool for enhancing students' pedagogical practices.

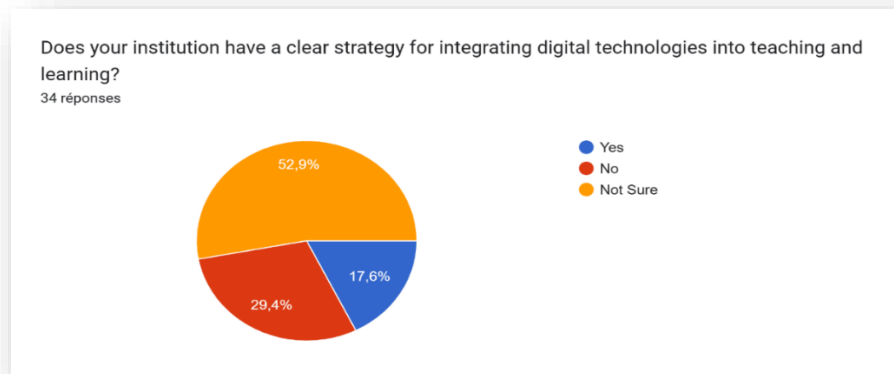
Figure 14: Digital Tools for Pedagogical Practices



3.4. Institutional Strategies and Support for Technology Adoption

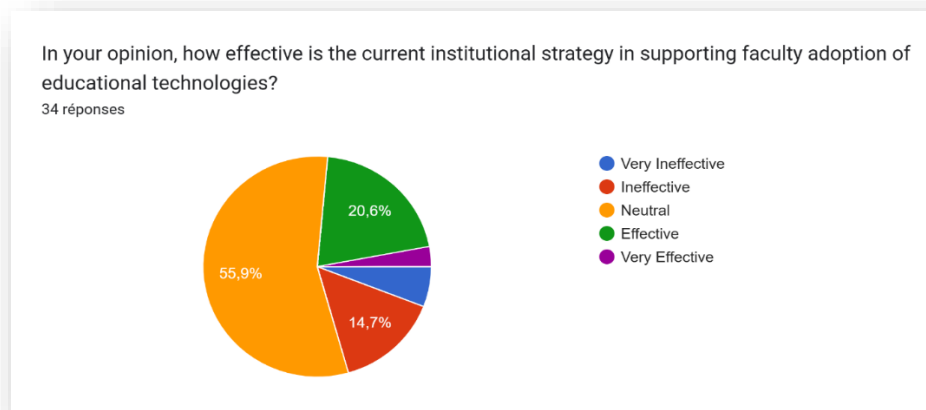
This part deals with the strategies used by institutions to support technology adoption. The following figure shows whether participants' institutions have a clear strategy for integrating digital technologies into teaching. 52.9% of the participants were not sure about the answer while 29.4% of them said "NO" and 17.6% answered by "YES". This means that the majority of the participants don't know anything about the strategy adopted by their institutions while few are familiar with it.

Figure 15: Strategy of Integrating Digital Technologies into Teaching



Concerning the effectiveness of the adopted strategies, figure 17 shows that participants chose to be “neutral” just like they opted for “not sure” in the previous question. 20.6% of the participants opted for “effective” and 2.9% described it as very effective, while 14.7% described it as ineffective and 5.9% as very ineffective. 23.5% positively answered regarding the effectiveness of the strategies while 20.6% answered negatively. These results show that effectiveness is still not where it should be and needs more time and adequate studies to be implemented as it should.

Figure 16: Effectiveness of the Institutional strategy in Supporting Educational Technologies



4. Main Results and Discussion

According to the previous answers, better technical support, increased funding for digital tools and infrastructure, more professional development opportunities, more collaboration between institutions between institutions, and stronger leadership and institutional strategies will all be helpful resources for improving the integration of technologies in higher education institutions.

4.1. Observed Technology Integration Initiatives (what is done)

1. Use of Moodle Platform:

- Widely adopted as a central learning management system.
- Teachers were motivated to create online courses due to added incentives (promotion/training points).

2. Online Teaching:

- Online courses were introduced during COVID-19 and proved highly effective.
- Some teachers effectively use videoconferencing tools like Zoom.

3. Language Learning Labs:

- New laboratories were created to teach the four skills of English.

4. Digital Tools and Platforms:

- Introduction of an online platform for digital text analysis in class.
- Use of AI tools to personalize learning and improve engagement in writing and research tasks.

5. Institutional Platforms:

- “Progrès” platform used to streamline administrative and pedagogical tasks.
- Social media groups created for each specialty to enhance communication.

6. Classroom Technology:

- Fixed projectors installed in all teaching classrooms.
- Use of datashow during lectures received positive feedback from students.
- Interactive boards and touchscreens available in many classrooms.
- Tablets used by teachers to explain Math and Physics, projecting content via datashow.
- Tools and resources provided to teachers to support technology integration for example AI technologies. Ghimire et al (2024) asserted that it can personalize instruction and adapt to different learning styles and support innovative assessment methods. Having said that, according to Guéclair (2024), overreliance on AI can be the reason behind reduced creativity, academic dishonesty, and the risk of superficial learning if it is misused.

4.2. Needs of Technology Integration in Algerian Higher Education (what needs to be done).

1. Infrastructure & Equipment

- Improve basic infrastructure first (e.g., access to water and sanitation in some institutions).
- Ensure availability of digital tools (laptops, smart boards, data shows, high-speed internet).
- Increase funding for technological equipment and digital infrastructure.
- Guarantee free and reliable internet access for both teachers and students.

2. Training & Capacity Building

- Provide adequate training for teachers on using digital platforms and interactive tools.
- Organize digital literacy workshops to upskill faculty.
- Support the integration of new platforms and tools (e.g., Google tools, virtual reality).

Any lack or gap in training programs, outdated curricula, and lack of institutional support, may lead to hesitation from many educators regarding the effective use or integration of digital tools into their classrooms (Zerqi & Bouzriâ, 2025).

3. Motivation & Incentives

- Offer motivational incentives (e.g., promotion points, salary bonuses, training abroad) to encourage technology adoption.
- Recognize that both the older and younger generations may require incentives to engage with technology.

4. Pedagogical Reform

- Update syllabi to integrate technology and make content more engaging and relevant for students.
- Promote a balance between students' digital lives outside university and the outdated methods still used inside.

5. Cultural & Institutional Change

- Shift mentalities and mindsets among staff, teachers, and administrators—resistance to change must be addressed.
- Encourage teacher involvement in decision-making, especially regarding the adoption of new technologies.
- Foster collaboration between institutions for support and resource sharing.

6. Learning Environment

- Build a conducive and stable environment that supports continuous technological progress in education.



Boutkhil and Sahraoui (2023) confirmed that there is still a gap in its instructional use of AI tools when it comes to maintaining originality and avoiding plagiarism. Fletcher (2003) added that without adequate measures, the full potential of AI-enhanced instruction in Algerian universities is unlikely to be realized.

Conclusion:

Algeria's higher education system is undergoing a gradual digital transformation, with universities making notable progress in adopting techno-pedagogical and AI-based tools. However, to realize the full potential of technology in education, the country must invest in infrastructure, train and incentivize faculty, reform curricula, bridge institutional gaps, and most importantly, shift mindsets. Only through a comprehensive, inclusive, and strategic approach can Algerian higher education provide students with a modern, engaging, and future-ready learning environment.

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Appendix

Questionnaire

Exploring Digital Transformation in Algerian Higher Education: A Mixed Methodology Approach of Current Practices and Future Needs.

This questionnaire is addressed to higher education faculty members, administrators or IT support staff in Algeria. Its aim is to gather data regarding techno-pedagogy at universities and higher schools in Algeria in order to know what needs to be done to enhance technology implementation at all levels.

1. Institution Type

- ☐ University
- ☐ A Higher School

2. Role/Position

- ☐ Faculty Member
- ☐ Administrator
- ☐ AT Support Staff

3. Years of Experience in Higher Education

- ☐ Less than 5 years
- ☐ 5 to 10 years
- ☐ More than 20 years
- ☐ 10 to 20 years

Digital Infrastructure and Access to Technology

4. How would you rate the availability of digital infrastructure (computers, internet,



software) at your institution?

- ☐ Very Poor
- ☐ Poor
- ☐ Average
- ☐ Good
- ☐ Excellent

5. Do you think all faculty members at your institution have equal access to digital tools and resources?

6. What digital tools do you use most frequently in your work? (Select all that apply)

- ☐ Yes
- ☐ No
- ☐ Not Sure
- ☐ Video Conferencing Tools (e.g., Zoom, Microsoft Teams)
- ☐ Learning Management System (LMS) (e.g., Moodle, Blackboard)
- ☐ Interactive Whiteboards (e.g., SMART boards)
- ☐ Digital Assessment Tools (e.g., Google Forms, Quizlet)
- ☐ AI or Adaptive Learning Tools



What are the main barriers to accessing digital infrastructure at your institution?

(Select all that apply)

- ☐ Lack of internet access
- ☐ Outdated equipment
- ☐ Insufficient funding
- ☐ Lack of technical support
- ☐ Unequal access between departments

Faculty Support and Professional Development

8. How would you rate the quality of professional development programs available for faculty to enhance their use of technology in teaching?

- ☐ Very Poor
- ☐ Poor
- ☐ Average
- ☐ Good
- ☐ Excellent

9. **What kind of professional development opportunities are available at your institution for integrating technology into teaching?** (Select all that apply)

- ☐ Workshops on specific tools (e.g., LMS, video tools)
- ☐ Online courses on pedagogical strategies for digital learning
- ☐ Peer mentoring or collaborative learning groups
- ☐ No professional development available

In your opinion, what are the main challenges in providing professional development for faculty in terms of using technology? (Select all that apply)

- ☐ Lack of time
- ☐ Lack of motivation
- ☐ Lack of institutional support
- ☐ Inadequate training resources
- ☐ Faculty resistance to change

Pedagogical Integration of Technology

11. **How frequently do you integrate technology into your teaching?**

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Often
- ☐ Always

12. In your experience, how has the use of technology affected student engagement and learning outcomes?

- ☐ Strongly negative effect
- ☐ Negative effect
- ☐ No effect
- ☐ Positive effect
- ☐ Strongly positive effect

What challenges do you face when trying to integrate technology into your teaching practices? (Select all that apply)

- ☐ Lack of adequate training
- ☐ Technical issues (e.g., malfunctioning devices, slow internet)
- ☐ Resistance from students
- ☐ Limited institutional support
- ☐ Time constraints

14. What types of digital teaching tools do you think are most beneficial for enhancing pedagogical practices?

- ☐ Learning Management Systems (LMS)
- ☐ Interactive media (e.g., educational videos, simulations)
- ☐ Collaborative platforms (e.g., Google Docs, Microsoft Teams)
- ☐ Virtual or Augmented Reality
- ☐ AI-driven tools (e.g., adaptive learning platforms)

Institutional Strategies and Support for Technology Adoption

15. Does your institution have a clear strategy for integrating digital technologies into teaching and learning?

- ☐ Yes
☐ No
☐ Not Sure

faculty adoption of educational technologies?

16. In your opinion, how effective is the current institutional strategy in supporting

- ☐ Very Ineffective
☐ Ineffective
☐ Neutral
☐ Effective
☐ Very Effective

17. What additional support or resources do you think would be most helpful to improve the integration of technology into teaching at your institution? (Select all that apply)

- ☐ Increased funding for digital tools and infrastructure
☐ More professional development opportunities
☐ Better technical support
☐ Stronger leadership and institutional strategies
☐ More collaboration between institutions



Open-Ended Questions

18. Please describe any innovative practices or initiatives you have observed at your institution that successfully integrate technology into teaching.

Do you have any recommendations for improving the integration of technology in Algerian higher education?
