| RESEARCH ARTICLE

Metaverse Integration in Moroccan Schools: A Quantitative Study of Educator's Perspectives

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| ABSTRACT

This research revolves around the examination of Moroccan teachers' attitudes to the integration and day-to-day use of the metaverse in educational settings such as the classroom. This research is particularly concerned with educators in both public and private schools within Morocco. Utilizing quantitative research methods and including statistical techniques such as Analysis of Variance (ANOVA) and T-tests, this study aspires to unhide the motivations and aspirations driving Moroccan teachers to embrace the use of metaverse technology in the classroom. It also aims to investigate whether these teachers harbour reservations or anticipations regarding metaverse' seamless integration in educational settings. The study uncovers variations in teachers' enthusiasm for metaverse integration, as well as a plethora of concerns or anticipations regarding its implementation and feasibility in different classroom settings. This research's attempts to uncover patterns of readiness or resistance among teachers in public and private schools, which will undoubtedly providing insights into the factors that shape their perspectives and facilitating the identification of areas for potential professional development. The outcomes of this study offer valuable insights for policymakers, assisting in the development of effective training and teaching designs and concepts for teachers as well as students.

| KEYWORDS

Metaverse Integration, Virtual Reality, Educator Perspectives, Moroccan Education, Quantitative Analysis, Teacher Training

1. Introduction

The past thirty years have witnessed important technological innovations that have shifted the economic, political and social paradigm beyond recognition. As a case in point, the 1990s witnessed the evolvement of computers, the 2000s the web, the 2010s the smart phone revolution and the buzzword of the 2020s is the Metaverse and other forms of virtual reality (VR).(Duan et al., 2021) Though popular in terms of interest and innovations, in academia, the Metaverse is still restrained in terms of discourse and theorizing.

The surge in interest towards the Metaverse started around one year after the onset of the Covid-19 pandemic, in April 2021 after the rebranding of Facebook Inc. to Meta and the subsequent acquisition of Oculus and the reduction in terms of pricing of VR gears.(Y.-C. Lee et al., 2021) Indeed, the technological development of virtual reality has been ongoing for past years; nonetheless, with the surge in popularity and interest after the rebranding of Facebook Inc. and the adoption of a realistic avatar in an immersive virtual space, educational interest around the Metaverse surged as well. In fact, according to many scholars, with the immersive nature of the Metaverse and the integration of virtual platforms into educational programs, the Metaverse is bound to transcend traditional and often confined 2D-based online courses and classrooms. Such technological advancements and immersive VR hold the promise of augmenting students' participation and involvement in learning while increasing the practical application of online

teaching and learning. However, the transition of teaching and learning to the Metaverse require comprehensive guidance for both educators and students alike.(H. Lee & Hwang, 2022). This will undoubtedly increase the seamless adoption of the technology.

Moreover, the shift to Metaverse learning and teaching holds immense value for educators, students and, organizations and persons investing in education since it not only offers instantaneous communication between different interactors, which is conducive to better learning through expert guidance and engagement, but it also has large cost benefits as well. Indeed, with the Metaverse, the cost of digital spaces and classrooms is highly reduced compared to physical learning infrastructures such as laboratories and specialized classrooms.(MacCallum et al., 2019) Moreover, Metaverse and VR educational technologies do not suffer some of the drawbacks of online and distance education such as a decrease in terms of involvement from students, personal connections to the learning environment and collaborations between participants in the learning process which negatively affect the educational experience and outcomes. Moreover, with digital technologies and open source concepts, the sharing of digital classroom designs can even bring this cost more and offer better accessibility to underfunded schools and learning institutions to better serve students and increase their immersion in learning.(Damar, 2021) Not only that, but the Metaverse offers various avenues for learning since it caters to different learning styles and needs, such as visual, auditory, and kinesthetic modalities.

While existing literature praise the beneficial effects of the Metaverse and VR technology on teaching and learning across different educational levels and specialization,(H. Lee & Hwang, 2022; Y.-C. Lee et al., 2021; MacCallum et al., 2019; Marini et al., 2022; Suh & Ahn, 2022) critics observe that the integration of students and teachers to this platform remain challenging. In fact, assessing the readiness levels of educational practitioners and the adoption of this technology in educational settings remain of the utmost importance for its seamless integration.

It is within this context that this study aims at evaluating Moroccan teachers' attitudes toward the adoption and implementation of Metaverse technology in educational settings. The rapid adoption of VR and Metaverse technology around the world, especially with the large investments made in this technological sector and Facebook's shift to becoming a Metaverse-centric company highlight the urgent exploration of the integration of such immersive technologies in various learning environment, especially in Morocco. The lack of literature, especially vis-à-vis Moroccan educators, accentuates the significance of this exploratory study, positioning this research as a pioneering effort to fill a research gap within this novel technological and academic endeavor.

To collect and analyze data, this research adopts the Technology Acceptance Model (TAM) (Davis, 1989), which highlights the critical determinants of technological adoption, mainly the perceived usefulness and ease of use. More importantly, this conceptual framework provides this study with a model by which to assess the acceptance of Metaverse technology within Moroccan public and private schools, most importantly, by educators.

This study aims at (1) contributing to the field of teaching and education by providing Moroccan teachers' attitudes toward this novel and potentially transformative technology, (2) identifying training objectives in order to facilitate the adoption of not only Metaverse technology, but also other VR systems and thus improving the experience of teachers and immersing students in a captivating learning environment, (3) addressing a considerable research gap in Morocco, which is rarely discussed and finally (4) it aims at advancing and reinforcing Davis' (1989) TAM conceptual framework by applying it to the Moroccan context in relation to the Metaverse.

In this regard, this study aims to answer the following research question: What are the perceptions, readiness levels, and challenges faced by Moroccan teachers, whether in public or private schools, regarding the integration and adoption of the Metaverse in educational settings?

The structure of this study is as follows, first, the research focuses on a literature review by bringing the arguments of different scholars on this novel technology, it then discusses the methodological considerations and framework it uses to collect and analyze data, subsequently, the findings of this research will be presented and discussed and finally, an discussion of the research implication, limitations and avenues for future research will be examined.

2. Literature Review
The rapid widespread of VR technology and the Metaverse sparked an immediate interest in their potential for educational purposes and for enriching learning environments for students and teachers alike. Academic resources have been produced to explore the various aspects of these technologies in different educational environments, ranging from their usability, effectiveness and acceptance to adoption.

As exemplified by Marini et al. (2022), the potential of VR and augmented reality (AR) technologies in science classes is immense since technologies such as the Metaverse yield particularly satisfactory results with students. The authors developed and employed

the Metaverse Technology Acceptance Model scale to explore learners' intentions and acceptance of this technology. Their findings highlight the importance of understanding and exploring students' perceptions and attitudes toward this novel technology. Indeed, different studies, such as Akour et al., (2022) have explored students results in VR and Metaverse learning as well and noted the capabilities such technologies possess to influence students' motivation and increase their engagement.

In this regard, Park and Kim (2022) note the shifting attitude of students towards the Metaverse and the increased engagement with the implementation of such technologies in their learning environment. They argue that the Metaverse offer a tool for content-centered learning and sharing experiences. Their research focuses on the creation of rich 3D virtual classes by teachers where formal and informal learning takes place. Indeed, the adoption of these platforms by teachers allows for a tailored learning experience for students which increases immersion and comprehension. In this regard, the Metaverse becomes a hands-on learning environment. Suh and Ahn (2022) share similar results, however, their experiments concerned elementary school students. They concluded that the rich, learner-centered virtual environment offers students a rather new and constructive pedagogy, in this regard, they emphasize the vital necessity to align technological advances with pedagogical approaches to offer better and more effective learning opportunities and experiences for students.

It is important to note that several research were carried out to evaluate students and teachers' attitudes towards the implementation of the Metaverse and other VR technologies in learning environments (Akour et al., 2022; Almarzouqi et al., 2022; Chen, 2016; George Reyes, 2020; H. Lee & Hwang, 2022; MacCallum & Parsons, 2019; Mustafa, 2022) and argue that such the adoption of such technologies in the classroom offer satisfactory results in classes. Nonetheless, a notable gap exists in the academic literature towards the attitude of teachers' vis-à-vis the Metaverse and other VR technologies. As a case in point, Yakubova et al. (2022) argue that prior knowledge, training, and with technical and financial motivation are of paramount importance in influencing teachers' adoption and use of VR technologies inside their classrooms. This not only demonstrates the importance of training and technical knowhow in the implementation of the Metaverse and other VR technologies in the classroom, but it also sheds light on the necessity for the positive attitude of teachers in the successful implementation of this technology in educational settings.

However, despite the number of academic publications exploring students' attitudes and experiences with the Metaverse and other VR systems in educational settings, the shortage of academic resources exploring the attitudes of teachers toward Metaverse use is flagrant. This research aims to bridge this gap and shed light on the perspectives and readiness of both private and public school Moroccan teachers toward the use of Metaverse in educational settings.

3. Methodology
This research uses a quantitative methodology to gather and analyze data from participants regarding their attitudes towards the adoption and use of the Metaverse. The main data collection instrument utilized in it is the "Teachers' Attitude Scale Towards Metaverse Use" which is an instrument developed by Çengel and Yildiz (2022). This scale comprises three dimensions which are: "Perceived Benefit," "Readiness," and "Satisfaction" to assess teachers' readiness to adopt and use the Metaverse in educational settings in Türkiye.

3.1 Research Design
This study uses a cross-sectional survey design to collect and analyze data at a specific point in time, thus facilitating the exploration of relationships or distinctions between various demographic variables and Moroccan teachers' perceptions and readiness regarding the uses and adoption of the Metaverse within the classroom environment. Moreover, the main research approach this study uses is correlational. Indeed, this study aims at discerning and ascertaining connections between multiple variables regarding this novel technology in educational settings from a sampled population (Moroccan teachers in the region of Fez-Meknes) to broader educational contexts.

3.2 Adaptation of the Çengel and Yildiz scale
Given participants' proficiency in English (most are English or information technology teachers), no translation or adaptation of the scale's items was deemed necessary. The questionnaire was pre-tested using Google Forms and filled by a limited number of participants in an initial stage to assess functionality within the new context and population (Moroccan teachers), which resulted in no noteworthy issues that could affect the scale's performance.

3.3 Participants and Sampling
A total of 166 private and public teachers from the Fez-Meknes region took part in this research. Participants were recruited via snowball and purposive sampling methods to ensure adequate representation from diverse and varied school types and demographics. The recruitment of participants was done through the use of social media platforms like Facebook and using Facebook Messenger, email, and WhatsApp to send participation requests and to deliver the Google Forms link to be filled.

3.4 Ethical Considerations

Ethical considerations were highly focused on and were paramount in the realization of this research and throughout this study. In this regard, prior to engaging and filling in the questionnaire, participants were presented with a consent text detailing the study's objectives, clarifying the concept of the Metaverse, and assuring them of anonymity, confidentiality and the deletion of their participation in filled information at their request and before the publishing of the results of the study.

3.5 Research Tool and Data Analysis

The acquired data went through different stages, from extracting textual data from Google Forms to coding in Microsoft Excel and quantitative analysis in IBM SPSS 26. Statistical techniques including T-tests, ANOVA, and correlation analysis were used to discern differences between groups (e.g., gender, school types), explore variance among groups, and uncover associations between different variables. In addition, different descriptive statistics were also used to profile participants' demographics.

3.6 Scale Reliability and Validity

Cronbach's alpha scores for the scale's dimensions were analyzed after the questionnaire were filled by participants and coded in the appropriate software. The scores are as follows: "Perceived Benefit" (α = .963), "Readiness" (α = .644), and "Satisfaction" (α = .776), demonstrating high degrees of internal consistency for "Perceived Benefit", and satisfactory degrees for "Readiness" and "Satisfaction".(Bryman, 2012; Creswell & Creswell, 2023; Pallant, 2016) To determine construct validity, both Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were conducted, moreover, the Kaiser Meyer Olkin (KMO) values resulting from EFA indicate adequate scale suitability within this context: .797 for "Perceived Benefit," .568 for "Readiness," and .818 for "Satisfaction."(Pallant, 2016)

3.7 Theoretical framework

To collect and analyze the data required for understanding the motivations and perceptions of Moroccan teachers vis-à-vis the Metaverse, this study employs the Technology Acceptance Model which was developed by Davis in 1985. (İbili et al., 2023) the motivation behind the use of the TAM theory is accredited to its wide adoption and use in regard to explaining individuals' acceptance and intentions of use towards technology. Indeed, according to TAM, individuals' intentions to adopt technology are mainly based on two major factors, as figure 1 shows, perceived usefulness and perceived ease of use.(Davis, 1989; İbili et al., 2023) As argued by this theory, users' attitude toward a technology adoption are mainly affected and influenced by "...*relationship networks between belief, attitude, intention, and behavior, but, on the other hand, intention and attitude are indirectly affected by other external factors by virtue of perceived usefulness and ease of use."*(İbili et al., 2023) From this, according the TAM model, users' attitudes toward technology adoption are based on how valuable said technology is but also how easy to use it is for users.
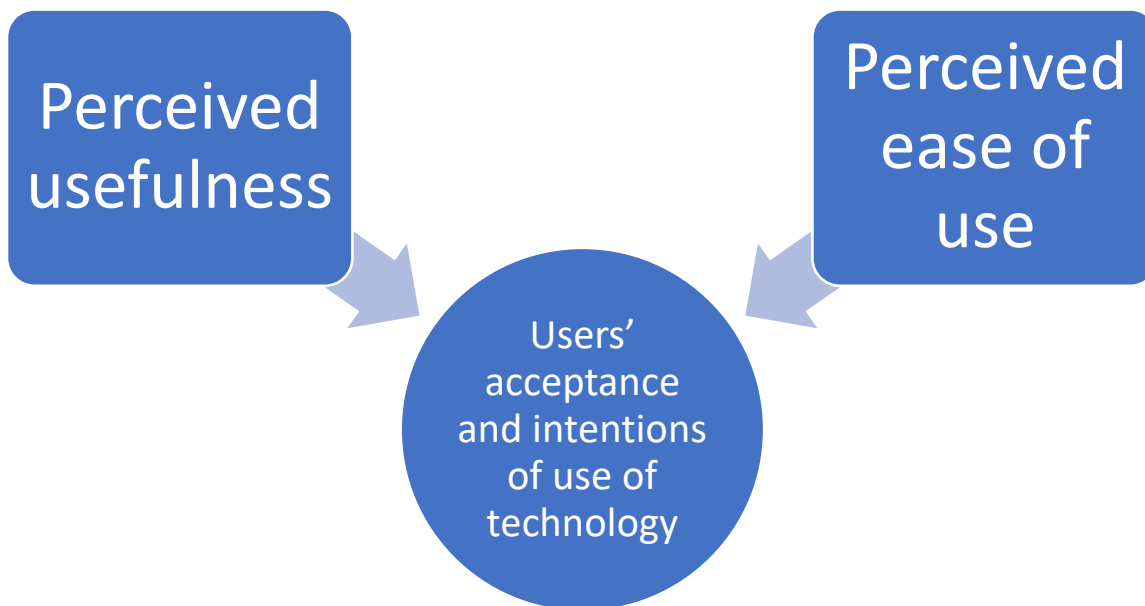

*Figure 1*A visualization of individuals' acceptance and intentions of use towards technology as conceptualized by TAM.
Based on the concept advanced by TAM, this study puts forward the following two hypothesizes:

H1 Perceived usefulness of the Metaverse technology by Moroccan teachers has a direct positive influence on their intentions of use.

H2 Perceived ease of use of the Metaverse technology by Moroccan teachers has a direct positive influence on perceived usefulness.

4. Findings

The study encompassed 166 teachers from the Fez-Meknes region in Morocco, incorporating both private and public school teachers. The age distribution of the participants varied significantly, ranging from 22 to 48 years old, the minimum age recorded in the survey. The average teaching experience among the participants stands at approximately 8.41 years. This showcases that most participants had a relatively lengthy teaching experience and it also demonstrates a varied representation of educators with varying levels of experience. Also, the most frequent age group among the participants was 29 years old, contributing to 14.5% of the overall sample recorded in the survey, while the majority of teachers fell within the age range of 26 to 46.

Regarding gender, the sample exhibits balance since 47% of the participants are males and 53% are females as showcased in table 1. This gender balance offers a wide perspective on the attitudes towards the adoption and use of the Metaverse across both male and female educators in the region of Fez-Meknes.

Table 1
Gender representation of the participants in the study.

	Frequency	Percent
Male	78	47.0
Female	88	53.0
Total	166	100.0

As far as sector of education, the gathered data indicate that 36.1% of the participants teach in private schools, while the remaining 63.9% were affiliated with public institutions as table 2 showcases. This distribution gives the study more insights into the adoption and inclusion of this novel technology in both private and public educational settings in Morocco.

Table 2
Institutional distribution of the participants.

	Frequency	Percent	Valid Percent
Private School	60	36.1	36.1
Public School	106	63.9	63.9
Total	166	100.0	100.0

To add more, the geographical distribution of the participants reveals that 22.3% of the teachers are located within rural areas, whereas a large portion of the participants, 77.7%, teach in urban settings. Such a distribution adds to the understanding of different teachers' perspectives vis-à-vis the integration and adoption of this technology. More importantly, it sheds light on potential bottlenecks regarding infrastructures in schools since many educational institutions in rural settings lack adequate internet coverage and power distribution.(Telquel.ma, 2020)

As a final note of the descriptive section of this article, a summary of teachers' digital literacy and utilization of digital resources in their pedagogical practices was recorded in the survey. 45.8% of teachers who participated indicate having received computer education; however, 54.2% of the educators participating in the survey indicate that they did not receive any computer education or training as table 3 shows.

Table 3
The reported answers of teachers when asked "Have You Taken Computer Education?"

	Frequency	Percent
Yes	76	45.8
No	90	54.2
Total	166	100.0

On the other hand, 76.5% of the educators in the survey incorporate digital materials into their lessons, however, only 28.3% reported developing digital materials themselves, this does indicate a lack of digital content creation in educational settings by teachers and may hinder the adoption and development of Metaverse specific immersive lessons and digital experiences.

In the next section of this findings rubric of this research, a multitude of Independent Samples t-Tests were performed to compare the means of the three dimensions of the Çengel and Yildiz "Teachers' Attitude Scale Towards Metaverse Use" between various different groups of teachers. The dimensions being measured in the questionnaire are: Dimension 1, "Perceived Benefit," Dimension 2, "Readiness," and dimension 3,"Satisfaction." These measurements resulted in various significant levels as reported in the following paragraphs.

4.1 Gender and Metaverse Use among Teachers:
Analyzing the influence of gender on educators' attitudes towards Metaverse integration, this research found no significant difference in Dimension I (Perceived Benefit) scores between male (M = 3.83, SD = 0.83) and female (M = 3.83, SD = 0.76) teachers (t(164) = -0.021, p = .983, 95% CI [-0.247, 0.242]). Similarly, for Dimension II (Readiness), no significant difference emerged between the two genders (t(164) = 0.485, p = .628, 95% CI [-0.126, 0.208]). However, in Dimension III (Satisfaction), a significant difference was found (t(164) = 5.517, p < .001, 95% CI [0.324, 0.685]). Female educators reported significantly lower satisfaction levels vis-à-vis the use of Metaverse in educational settings compared to their male counterparts. This suggests a gender-based divergence in satisfaction regarding the use of this novel technology in Moroccan schools and classrooms.

4.2 Educational Milieu and Metaverse Use
Examining the impact of teaching milieu, whether in private or public schools, and its impact on the perceptions of teachers' Metaverse integration in educational settings, this study revealed significant differences across all dimensions. For Dimension I, benefit (t(164) = -2.204, p = .029, 95% CI [-0.529, -0.029]), Dimension II, readiness (t(164) = 4.442, p < .001, 95% CI [0.205, 0.533]), and Dimension III, satisfaction (t(164) = 3.432, p = .001, 95% CI [0.146, 0.541]), in this regard, this study reveals that teachers from public schools exhibited significantly higher perceived benefit, readiness, and satisfaction (dimension I,II and III) compared to their counterparts working in private schools.

4.3 Educators' Location and Metaverse Use:
Concerning the influence of teachers' locations, rural or urban milieu, and their perspectives regarding Metaverse integration in educational settings, this study reveals noteworthy distinctions across two dimensions. For Dimension I (t(164) = 4.849, p < .001, 95% CI [0.399, 0.947]), Dimension II (t(164) = 1.214, p = .227, 95% CI [-0.077, 0.322]), and Dimension III (t(164) = 2.607, p = .010, 95% CI [0.075, 0.536]). In this regard and according to the results of this study, teachers who work in rural areas reported significantly higher perceived benefit (dimension I) and satisfaction (dimension II) compared to teachers working in urban locations, albeit similar readiness levels from the two groups.

4.4 Computer Training and Metaverse Use:
All teachers were inquired in the questionnaire regarding receiving computer training in the past and their readiness vis-à-vis Metaverse use in the classroom. In this regard, significant differences emerged in Dimension I (benefit) (t(164) = -2.796, p = .006, 95% CI [-0.578, -0.099]) and Dimension III (satisfaction) (t(164) = -3.754, p < .001, 95% CI [-0.548, -0.170]). This comparison of means demonstrates an inverse relationship between formal computer training and enthusiasm for Metaverse integration in educational settings in Morocco. According to these results, teachers without computer education exhibited higher perceived benefit and satisfaction than teachers who have received computer and information technology (IT) training in the past.

4.5 Digital Materials Use and Metaverse Use:
In analyzing teachers' use and integration of digital materials in their lessons, significant differences were observed in all three measured dimensions of the scale. As a case in point, for dimension I, benefit, the following observations were recorded: (t(164) = 3.923, p < .001, 95% CI [0.271, 0.821]). For dimension II, readiness: (t(164) = 3.480, p = .001, 95% CI [0.145, 0.525]), and for dimension III, satisfaction: (t(164) = 4.407, p < .001, 95% CI [0.270, 0.707]). These results show that teachers who integrate and use digital materials in educational settings expressed higher perceptions across all three dimensions of the scale compared to educators who did not integrate digital materials.

4.6 Teachers' Development of Digital Materials and Metaverse Use
Conducting statistical tests on the impact of teachers' development of digital materials on their perspectives towards Metaverse integration and use in the classroom, significant differences were found in perceived benefit (dimension I), (t(164) = 7.391, p < .001, 95% CI [0.643, 1.112]). This reveals that teachers who created digital materials reported significantly higher perceived benefit vis-à-vis the use of the Metaverse in educational settings than teachers who did not create digital materials. No significant

differences were found in the other dimensions, readiness (t(164) = 3.197, p = .002, 95% CI [0.111, 0.471]) and satisfaction (t(164) = 0.879, p = .381, 95% CI [-0.121, 0.314]).

4.7 Teaching Experience and the Integration of the Metaverse in Educational Settings in Morocco
Following are the findings of the Analysis of Variance (ANOVA) tested on different groups of teachers participating in the study according to their seniority.

4.8 Perceived Benefit Dimension
Analyzing the impact of years of teaching experience on educators' perceived benefit regarding Metaverse integration in Moroccan educational settings, significant differences were observed across all groups (p < .001).

As a case in point, teachers with varying teaching experiences exhibited substantial disparities and differences in their perceptions of the Metaverse. Specifically, those with 1 to 5 years differed significantly from educators with 6 to 10 years (Mdiff = 0.663, SE = 0.060, p < .001, 95% CI [0.503, 0.824]), 11 to 20 years (Mdiff = -0.439, SE = 0.154, p = .035, 95% CI [-0.857, -0.021]), and over 20 years (Mdiff = -1.337, SE = 0.060, p < .001, 95% CI [-1.497, -1.176]). Furthermore, a notable distinction was evident between educators with 6 to 10 years and those with over 20 years of teaching experience (Mdiff = -2.000, p < .001, 95% CI [-2.000, -2.000]).

4.9 Readiness Dimension
In regard to teachers' readiness to adopt and use the Metaverse in educational settings, the analysis of the collected data reveals significant differences among groups with different teaching experiences (p < .001).

As a case in point, educators with diverse teaching experiences exhibited distinctive readiness levels to adopt and use this novel technology in teaching and educational settings. More importantly, educators with 1 to 5 years teaching experience differ significantly from those with 6 to 10 years (Mdiff = 0.723, SE = 0.054, p < .001, 95% CI [0.577, 0.869]), 11 to 20 years (Mdiff = 0.170, SE = 0.108, p = .528, 95% CI [-0.122, 0.462]), and over 20 years (Mdiff = 0.223, SE = 0.054, p = .001, 95% CI [0.077, 0.369]). To add more, educators with 6 to 10 years demonstrated a significant difference from those with over 20 years teaching experience (Mdiff = -0.500, p < .001, 95% CI [-0.500, -0.500]).

4.10 Satisfaction Dimension
Teachers' satisfaction with Metaverse use significantly differed from one group to another (p < .001). As a case in point, educators with different teaching experiences displayed varying levels of satisfaction.

Specifically, educators with 1 to 5 years' experience significantly differed from those with 6 to 10 years (Mdiff = 1.250, SE = 0.051, p < .001, 95% CI [1.114, 1.386]), 11 to 20 years (Mdiff = -0.050, SE = 0.104, p = .997, 95% CI [-0.332, 0.232]), and over 20 years (Mdiff = 0.850, SE = 0.051, p < .001, 95% CI [0.714, 0.986]). Moreover, teachers with 6 to 10 years demonstrated significant differences from those with 11 to 20 years (Mdiff = -1.300, SE = 0.091, p < .001, 95% CI [-1.551, -1.049]) and over 20 years (Mdiff = -0.400, p < .001, 95% CI [-0.400, -0.400]).

The exploration of these variables, gender, educational milieu, geographic locations, training backgrounds, digital material integration, and teaching experience, contributed greatly to the findings made in this section. In the following section, a brief discussion of said findings will be briefly unveiled while a discussion of them in light of the conceptual framework of this research will attempt to shed light on how to best integrate the Metaverse in Moroccan educational settings by educators and what challenges it faces to its proper and seamless integration.

5. Discussion
5.1 Gender and Metaverse Use among Teachers
One of the findings of this research is concerned with the gender dimension of the Metaverse integration in Moroccan educational settings. In this regard, this research reveals that while no significant disparities were evident in Dimensions I and II, which are "perceived benefit" and "readiness", a notable distinction emerged in Dimension III, "satisfaction" respectively. Indeed, female teachers who participated in the survey report significantly lower satisfaction levels compared to their male counterparts. This does indeed delineate a gender-oriented divergence in perceptions towards Metaverse use in Moroccan educational settings when it comes to female teachers. This lower satisfaction score for female teachers opens up new avenues for research and must necessarily be better inquired through qualitative means to further understand the integration processes of this novel technology in Moroccan schools. More importantly, this gender-specific contrast in satisfaction underscores the necessity for tailored approaches to engage and support female educators in adopting and utilizing Metaverse technologies effectively, a statement also discussed by Matovu et al., (2023) who argue that such a technology must be well suited for both males and females in order to be accepted and better used for its educational purposes.

5.2 Educational Milieu and Metaverse Use

The study's exploration of teachers' environments, public and private schools as a case in point, uncovered intriguing disparities across all three measured dimensions of the Çengel and Yildiz scale. Indeed, according to the findings of the study. Teachers who work in public schools demonstrated significantly higher perceived benefit, readiness, and satisfaction regarding Metaverse integration in educational settings compared to their counterparts working in private schools.

This finding emphasizes the influence of the educational milieu on teachers' perceptions on all three dimensions and thus suggests a potential need for targeted training or adequate compensation (Yakubova et al., 2022), as discussed by H. Lee & Hwang (2022), teachers are key to the integration of this technology in educational settings, they compared them to gatekeepers, and their training and compensation could have a long lasting effect on the success of any implementation of this technology. To enhance Metaverse integration practices in private educational settings, teachers training and working condition must be revised.

5.3 Educators' Location and Metaverse Use

Amongst its many questions, this study asked teachers about their working milieu, whether they are working in a rural or urban located school. According to the results of the survey, educators working in rural areas significantly perceive higher benefit and satisfaction of using the Metaverse in educational settings compared to their urban counterparts. However, both groups exhibited relatively similar readiness levels.

This reveals a nuanced impact of geographical location on teachers' perceptions of the Metaverse use in educational settings in Morocco and necessitates further qualitative research into this topic. More importantly, this impact of geographical location on teachers' perception of benefit and satisfaction associated with the Metaverse in the classroom necessitate tailored strategies to bridge this gap and foster uniform Metaverse integration across diverse educational settings.

5.4 Computer Training and Metaverse Use

The study involved several questions and scales related to computer skills and training and its correlation with teachers' perspectives and perceptions towards Metaverse integration. It revealed noteworthy findings.

As a case in point, teachers lacking formal computer training exhibited higher perceived benefit and satisfaction in using the Metaverse. Indeed, compared to teachers who did not receive computer training, teacher who had computer lessons reported less enthusiasm for the integration of the Metaverse in educational settings. This unexpected inverse relationship underscores the importance of further exploring teachers' motivations and fear when it comes to this technology, it also emphasis the need for alternative educational approaches to enhance educators' confidence and enthusiasm in adopting novel technological tools in classroom settings.

5.5 Digital Materials Use and Metaverse Use

This research reveals that teachers who actively integrate and use digital materials in their lessons and teaching practices demonstrated higher perceived benefit, readiness, and satisfaction regarding Metaverse utilization in educational settings. This correlation underscores the potential role of digital and IT enthusiasm and previous adoption as a precursor to fostering a positive disposition towards Metaverse incorporation among educators in Moroccan classes.

It is also noteworthy that this finding validates the TAM model adopted for the interpretation of the results of this study. Indeed, according to the TAM conceptual framework, "perceived ease of use" is a predetermining of adopting a novel technology. Thus we could argue that teacher who already are using digital materials in the classroom perceive the ease of use of IT technology in educational settings and their comfort levels in using novel technologies is high. This also entails that they could potentially easily adapt the use of the Metaverse in educational settings if given the opportunity.

5.6 Teachers' Development of Digital Materials and Metaverse Use

Teachers involved in developing digital materials demonstrated significantly higher perceived benefit regarding Metaverse integration in educational settings, however, no substantial differences were found in the readiness and satisfaction dimensions. This finding underscores the potential influence of teachers' active engagement in digital material creation on enhancing their perceptions of Metaverse integration, suggesting avenues for targeted training programs focused on digital content creation.

5.7 Teaching Experience and the Integration of the Metaverse

The examination of teaching experience in terms of years spent and seniority revealed noteworthy distinctions across all three dimensions of this study. As a matter of fact, teachers with varying years of seniority exhibited significant differences in their perceptions regarding Metaverse integration in the classroom.

These findings showcase the evolving nature of attitudes towards technological innovation and integration among educators in educational settings. This also does emphasize the need for continuous support and training to foster adoption and use of not only novel technologies such as the Metaverse, but also other educational technologies and pedagogies as argued by H. Lee & Hwang (2022) in Moroccan educational settings.

All in all, the findings from this study align closely with the theoretical arguments of the TAM model. This research aimed to validate two critical hypotheses, H1 and H2.

H1 postulated that the perceived usefulness of Metaverse technology among Moroccan educators directly correlates with their intentions to use it. Indeed, the empirical evidence reported in this study, particularly the disparities in perceived benefits and readiness across different groups, accentuates the resonance and validity of H1. On the same note, H2, highlights the direct positive influence of perceived ease of use on perceived usefulness and finds correlation within the disparities observed in satisfaction levels among educators with varying teaching experiences and digital material integration.

6. Conclusion

Education faces multiple pressing challenges not only domestically, in terms of local catastrophes such as the 2023 Al Haouz earthquake, but also at the international level, such as global threats, notably exemplified by the rapid spread of contagions like COVID-19 variants which prompted widespread lockdowns and accessibility issues for students and teachers as well.

Schools are urged to devise measures to ensure the continuity of sustainable education; however, this exigency also highlights the potential challenges faced by educators who are insufficiently equipped in terms of technology and know-how skills to navigate such circumstances. Within this context, this study attempted to delve into the dimensions underpinning Moroccan teachers' preparedness to incorporate Metaverse technology into educational environments.

This study not only sheds light on the relevance of the Metaverse within classroom environments, but it also highlights its significance and potential impact. Its findings not only offer a glimpse into potential avenues for enhancing professional development for educational practitioners but also underscore the necessity of nurturing educators' appetites towards embracing emerging technologies for the success of their educational goals and overall careers.

While this study's insights are thought-provoking, they synchronously prompt the emergence of new questions and research ideas. As a case in point, future research endeavors should encompass quantitative and qualitative methodologies to corroborate the theoretical underpinnings and pedagogical efficacy of Metaverse integration within the Moroccan educational milieus.

6.1 Limitations

One of the most limiting factors when it comes to this research lies in its methodology. Since this study is mainly a quantitative one, many of the questions it attempted to answer resulted in further questions that did not find an answer such as the reasons why teachers from rural milieu are more likely and what explains the lower satisfaction levels of female participants in the study, according to the findings of the study, to adopt and use Metaverse technology in Moroccan classes. Such questions raise important avenue for further research as the next section of this conclusion will discuss, however, this also highlight the limitation of the study in terms of methodology and requires mixed methodology that relay on quantitative and qualitative data gathering techniques to answer questions raised by this study.

Another significant limitation is the sample size since the study relied on a relatively small sample size of Moroccan teachers to answer its research questions. This highlights the need to a larger sample size in terms of participants and also in terms of geographical location to further investigate its findings.

6.2 Suggestions for Future Research

Building upon the findings and limitations of the study, numerous avenues for further research can be identified and further investigated by researchers to further investigate not only the integration of the Metaverse technology in Moroccan schools, but also other innovative technologies such as VR or AR.

In this regard, future research should employ in-depth qualitative methods such as semi-structured interviews and focus groups to further explore the varying levels of motivations between male teachers and their female colleagues. This could in turn generate more in depth data into the technological, societal and cultural barriers that may hinder the adoption and satisfaction of levels of Moroccan female teachers of this novel technology.

Another avenue for further research is the disparities among private and public teachers in all three investigated dimensions of the study. It is within such context of apparent institutional disparities that the perceptions, roles and experiences of teachers must be further investigated. Further studies should seek to answer specific research questions on environmental, administrative and resource-based factors that are shaping the responses of private and public Moroccan teachers vis-à-vis the integration of the Metaverse technology in Moroccan educational settings.

Conflicts of Interest: The authors declare no conflict of interest.

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