

Metaverse and artificial intelligence: towards a pedagogical revolution in hybrid language teaching in a university context

Nadia Chafiq^{1,*}, Imane EL imadi^{1,*} and Mohammed Talbi^{1,*}

¹University Hassan II, Faculty of sciences Ben M'sick, Casablanca, Morocco

Abstract

By using Metaverse and AI to provide students with a more customized and immersive learning experience, teachers in a hybrid language teaching environment may enhance face-to-face classes. This can facilitate student interaction, communication, and teamwork on projects. However, as a result of Metaverse and the components that it now offers, new issues are being raised, including how AI and Metaverse may improve language education and how instructors' relationships to information and pedagogical techniques. In fact, the use of Metaverse in language instruction is still in its early stages, and this raises numerous issues regarding its potential benefits and drawbacks. Our research has two objectives. To start, let's examine the benefits and drawbacks of AI and metaverse for teaching languages. This study's second goal is to investigate how teachers see the usage of Metaverse and AI and determine whether these tools provide new pedagogical opportunities for language instructors. To that goal, 23 language instructors at Hassan II University in Casablanca each received a questionnaire about Metaverse and AI. We were able to investigate instructors' opinions regarding the usage of metaverse and AI by examining the data gathered.

Keywords

Metaverse, language teaching, AI, ,, AI, hybrid teaching, AI technologies, language teacher

1. Introduction

The development of Metaverse and AI is poised to revolutionize language instruction. This change that we are seeing affects every aspect of language teaching, including the creation of digital resources, the way that content is disseminated, how teachers and students interact with one another, and how they carry out their respective roles in the classroom. The Metaverse, a 3D virtual world where individuals can communicate, work together, and learn, provides an ideal platform for teaching languages. Students may now connect with virtual native speakers, immerse themselves in real-world language contexts, and develop their language abilities. This virtual immersion encourages greater language learning because it develops interesting and realistic experiences that go beyond the capabilities of traditional teaching techniques.

AI gives language learning a personalized component. Indeed, artificial intelligence (AI) has been incorporated into our personal and professional lives recently, changing our routines

AIXEDU: 1st International Workshop on High-performance Artificial Intelligence Systems in Education, November 06–09, 2023, Rome, Italy

*Corresponding author.

✉ nadia_chafiq@yahoo.fr (N. Chafiq); imaneel678@gmail.com (I. E. imadi); khayati.youssef@gmail.com (M. Talbi)



© 2023 Copyright for this paper by its authors. Use permitted under Creative Commons License Attribution 4.0 International (CC BY 4.0).



CEUR Workshop Proceedings (CEUR-WS.org)

and ways of living. In a new era when people must coexist with AI, AI has given rise to the fourth industrial revolution (Industry 4.0), according to Unesco (2019). In many industries today, including education, where we can already witness the beginnings of AI, its influence is growing. This technological revolution raises the possibility that language instruction will change in the future.

Teachers may tailor each student's learning experience based on their skills, limitations, and unique language demands using clever AI technologies. AI tutors may provide immediate feedback on vocabulary, grammar, and pronunciation, allowing students to advance at their own rate. Additionally, AI-powered language chatbots are accessible 24/7 for practice and review sessions. Additionally, metaverse and AI break through cultural and geographical borders. Without leaving their school, students may engage in cross-cultural communication, learn many languages, and improve their intercultural competency. This broadens their language horizons and fosters global understanding, two abilities that are essential in a world that is becoming more linked.

As a result, although the use of Metaverse and AI in language education in a university setting is still in its early stages, many issues remain regarding their potential benefits and drawbacks. We shall investigate how language teachers see the application of AI and metaverse in this article: Does Metavers give language teachers new educational perspectives? What stage of development is it at right now? From the perspective of a language instructor, what are the greatest restrictions for the implementation of Metaverse and AI in language teaching? What competencies must language instructors acquire to properly integrate educational Metaversals and AI? What specific applications of AI are there for hybrid learning or in the classroom?

In the initial part of this paper, we'll define Metaverse and AI, go over its elements and operation, and talk about how it may be used to teach languages. The fieldwork and methodology of analysis for our exploratory study on the usage of Metaverse and AI with 23 language professors at Hassan II University in Casablanca are presented in the second section of this paper. We requested the language instructors to respond to a survey on AI and metaverse. We were able to learn how teachers felt about this virtual environment by examining the data that was gathered. We'll wrap off with some suggestions for the current state of language instruction, which is experiencing an extraordinary transition from face-to-face instruction to a hybrid training mode that may be enriched by the use of Metaverse and AI.

2. Metaverse and AI to optimize language teaching

2.1. AI to enrich student experience in the metaverse

Science-fiction writer Neal Stephenson first used the phrase "metaverse" in 1992, which is thirty years ago. In his book *Snow Crash*, he describes the metaverse as a 3D virtual environment where avatars of individuals may move around, communicate with one another, and engage with characters created by artificial intelligence. The metaverse is, according to its inception, a virtual environment. A "successor to the mobile Internet, with the vision of a single platform for leisure, work, and human existence in general," is how Matthew Ball [1] really refers to the metaverse. Digital worlds known as metaverse have three features: they are immersive, persistent, and collaborative [2]. Because the learner acts as the main character in the encounter,

they are immersive. They are persistent because events still take place even when you are not around. Finally, metaverse work together. Furthermore, AI is the newest revolution and has a variety of applications that might improve students' experiences in the metaverse. Artificial intelligence (AI) may be utilized to design more dynamic and personalized virtual learning environments that are suited to the needs of each student. By offering real-time translations and sophisticated language learning capabilities, it can also make communication and cooperation inside the metaverse easier. Additionally, AI can assist in the analysis of the data produced by students' metaverse activities, allowing language teachers to better understand their students' development and modify their teaching strategies accordingly. The capacity of Metaverse and Artificial Intelligence (AI) to work together to create more lifelike, immersive, and engaging virtual experiences is consequently a sign of their convergence. Some of the closely related parts are represented by the items below: Immersive Interaction: The Metaverse, a 3D virtual setting where people may engage with a virtual world, allows for immersive interaction. By enhancing the intelligence and responsiveness of virtual characters, AI can improve this engagement. For instance, a virtual native speaker in the Metaverse can employ AI to better comprehend and respond to students' inquiries. Personalized Experience: The Metaverse can include AI to provide users a more tailored experience. For instance, an AI system may monitor a learner's language development in a virtual setting and adapt the content to meet their unique needs. This results in a more personalized learning environment. Virtual support is available in the Metaverse in the form of chatbots and virtual agents powered by AI. An AI-powered language chatbot may provide learners immediate feedback as they practice and work to improve their language abilities. Analysis of data and ongoing improvement: AI may be used to study user interactions in the Metaverse, collect information on their performance and behavior, and then utilize this information to enhance the learning environment and instructional techniques. This makes it possible to continuously improve the experience for increased efficacy. AI may be used to dynamically create content in the Metaverse that is tailored to users' wants. For instance, on-the-fly cultural simulations or language exercises can be developed in accordance with the learning goals of the students. In this way, Metaverse and AI complement each other to create advanced virtual learning environments. AI enriches the Metaverse experience by making interactions more intelligent, personalized and responsive, which is particularly relevant in the field of language teaching.

2.2. Metaverse platform types

Metaverse equipment takes significant expenditure. They can only be put into practice by multinational businesses. Major network firms like Facebook, Microsoft, with its HoloLens headgear and Mesh for Microsoft Teams metaverse for meetings, as well as the Gafams, are among them. Amazon, Apple, and Google are also rumored to be working on related initiatives. Education in a metaverse has the potential to open up new vistas for assimilation, transmission, and eternalization of information, enabling better, deeper, and more rapid learning than ever before. Early educational metaverse come in many forms. Notably, one of the first metaverse to be utilized for teaching was Second Life, a virtual environment introduced in 2003. To educate ideas like interaction, cooperation, and communication, virtual worlds like Minecraft and the Horizon Worlds metaverse have also been utilized as educational metaverses [3] (see table 1):

Table 1
Metaverse platform types

Types of Platform	Description
Second Life	Second Life's Metaverse City bills itself as "a welcoming role-playing community" with immersive experiences that allow players to enter and exit as they wish
Room	Room specializes in virtual corporate showrooms, 3D product presentations and virtual events that can be used by marketing and sales groups in verticals such as education, retail, life sciences and manufacturing
Altspace VR	Acquired in 2017 by Microsoft, the virtual platform enables the creation of virtual events and is part of the tech giant's Mixed Reality division. Users can host a meeting, show or class
Meta Horizon	Meta (formerly Facebook) touts its Horizon metaverse platform as an "ever-expanding social universe" for hanging out with friends and creating your own worlds. Workrooms is the company's mixed reality app for employee collaboration

2.3. Technologies and equipment used to access metaverse

The goal, according to Mark Zuckerberg, the founder of the metaverse, is to use a virtual reality headset or pair of goggles to engage more naturally while connected and to feel more physically present in place. The ability to create one's own avatar, or any number of virtual bodies whose look may be changed at will, will be available to internet users. The tools required to enter the metaverse are listed below: Immersive technologies have enabled the Metaverse revolution. These technologies provide immersion through sight, hearing, touch, machine connection, and more. Avatars and scenery may now be found throughout the Metaverse thanks to virtual reality, giving learners access to a customized learning environment [4]. Headsets: Without a doubt, the visual component of metaverse is one of the most crucial components. Image processing is frequently used in the metaverse, which will encourage the growth of visual science. Oculus devices, for instance, can immerse the learner in virtual reality during planning meetings or online classes. One of the best examples is the Oculus Quest 2. It's vital to remember that the Oculus Quest 2 employs a Snapdragon 865 CPU and is a standalone VR device. The metaverse is multimodal and may be accessed with linked glasses (Ray-Ban has a deal with Meta), screen cabins that eliminate the need for a headset, a computer, tablet, phone, or television, as well as other devices. However, given how much more immersive they are, headphones are likely to overtake them [5]:

- Exteroceptive immersion by projection into an avatar, also known as "embodiment", typical of video games and classic virtual worlds
- Proprioceptive immersion, obtained with virtual reality headsets, which allows the surfer to turn in all directions (360 video, VR 3DOF, kinematics) and move around the simulation space

Avatars: Metaverse avatar options are one of the best parts of the metaverse experience. A metaverse avatar gives the learner the ability to look as they do in any environment. Métaverse

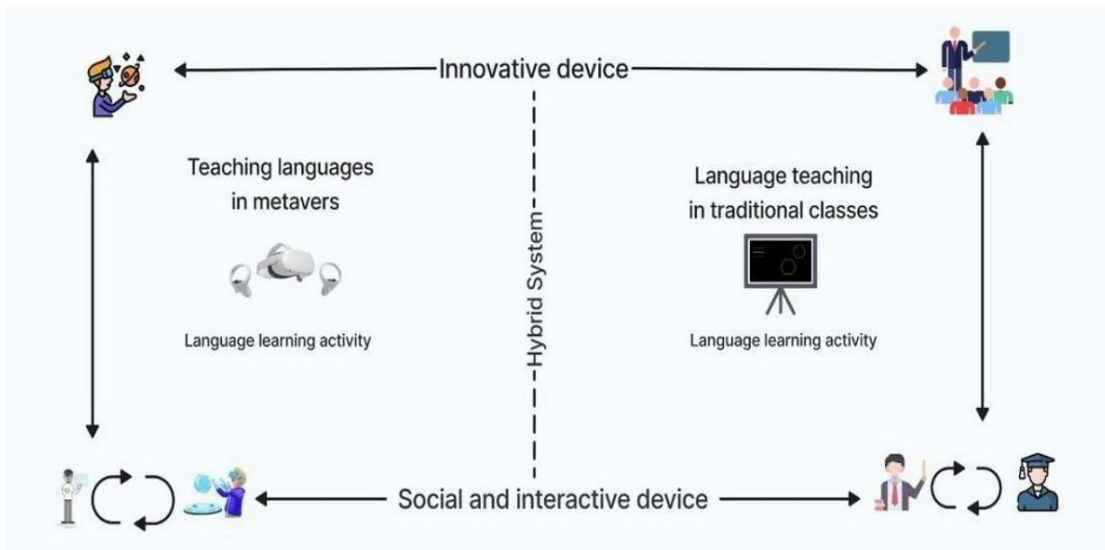


Figure 1: innovative, interactive and social hybrid language teaching model

also uses servers distributed around the world. These servers need to be powerful enough to store the maps, environments and 3D objects of the virtual world. Being persistent, this virtual space must be able to be logged, recording everything that has been done when an object is added, moved or deleted. The renewing power of the "Metaverse" therefore stems from the variety of digital tools it offers, which language teachers need to exploit. The use of these tools in language teaching makes it possible to innovate in terms of learning activities, which begs the question: what kind of language learning activity can be envisaged in Metaverse?

2.4. Hybrid language training integrating Metaverse and AI

The notion of a hybrid device that incorporates several pedagogical modes, alternating distance and face- to- face teaching, is something we draw from [6]. Through the integration of physical and virtual space, the use of Metaverse in the educational sector offers the chance to investigate new applications for these hybrid technologies. The hybrid gadget built on metaverse that can assist students in interacting, communicating, and working on group projects with other students is summarized in the model below. The central notion of this concept is learning [7]. These dimensions are presented on three levels (see picture 1):

- Level 1: Innovative device
- Level 2: Social and interactive device
- Level 3: Language learning activities in metaverse and in the classroom

Inventive: The approach takes the inventive component into account as a metaverse-based process. Using pedagogical techniques that are not available in traditional face-to-face teaching, teachers may enhance face- to-face courses by providing students with a more immersive and individualized learning experience on a hybrid device. Due to the metaverse, consumers now

have access to a huge variety of new apps and services in the virtual world. Tools for building learning networks are being introduced by more and more metaverse platforms. Generation Z, who have grown up in a society that is already predominately digital, are significantly responsible for the societal acceptance of Metaverse as social and interactive platforms. For learning or for interacting with friends, many young people use machines and digital technology as a regular part of their everyday life. Their interactions with digital technologies and metaverses have also developed; they now take part in forums and chat rooms, spend real money on their virtual worlds, etc. For certain students, metaverse socializing provides benefits, not the least of which is removing them from isolation: Each student's development on the learning route can be influenced by peer "socialization" in many ways [RFFER]. The metaverse platform's socializing elements foster engagement, which enables students to share their knowledge with others and allows them to have a more customized learning experience. The selection of an avatar and its unique qualities enable this customisation. Each "metanaut" follows a different route, which is customizable and chosen by the learner. They will be in charge of picking their own schedules and courses. Activities for learning languages in the classroom and in the metaverse: For instance, language professors at the Ben M'sik Faculty of sciences regularly witness and share the worry of scientific students regarding the languages they must know (French and English), the absence of which is a significant disadvantage for the majority of them. Language instructors, however, believe that they lack the resources and the time in a one-and-a-half-hour language class to deal with both spoken and written language, which is why they are interested in using the metaverse. In fact, a one-hour, thirty- minute session is not long enough to cover all the areas of language and communication skills: this observation prompted us to think about which activities should be prioritized in the classroom and which might be carried out in the metaverse, as well as how they should be taught. As a result, we used an innovative and social hybrid teaching model that integrates the metaverse to meet the needs of Generation Z students who are looking for new, more immersive, and personalized learning experiences.

Online gaming, social gatherings, language learning, and many other activities may also be found in the metaverse [8]. Students will be able to complete tasks including creating presentations, writing summaries, syntheses, reports, scientific reports, and more in the metaverse. In fact, students may utilize this online environment to complete group projects, etc., and give oral presentations. Language instructors may be able to engage students in enjoyable activities and role-playing outside of the classroom, such as while working on writing, by using the metaverse.

3. Teachers' perceptions of metaverse usage and AI in language teaching

This section presents the results of our survey. This questionnaire will enable us to explore teachers' perceptions of the use of metaverse and AI in language teaching. We begin by presenting the material and the method used, and then go on to present the results obtained.

3.1. Methodology

This paper offers an overview of the application of AI and metavers in language instruction. There was established an approach to accomplish this goal. The questionnaire given to instructors uncovered a number of recurrent ideas on the application of metaverse and AI in language instruction. Teachers were given access to a questionnaire as part of the study. Given the significance of this extensive study, a test was conducted before the main survey. The questionnaire's format and content were tested on 5 instructors in order to make any required revisions. A survey of the metaverse and AI literature served as the foundation for the questionnaire.

We conducted an empirical study on a random sample of 23 language teachers at Hassan II University in Casablanca. The questionnaire was distributed to language teachers using Google forms.

- General information about the sponsor
- General data on the metaverse and AI
- Evaluate the contribution of metaverse and AI to language teaching

3.2. Findings

In figure 2 general information about the sample are shown. The sample of language teachers was drawn randomly from 23 teachers from different teaching cycles.

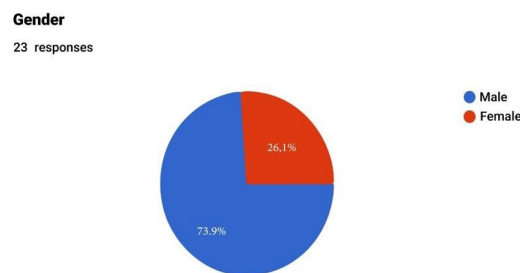


Figure 2: Sample (language teachers)

Figure 3 shows Teachers' perceptions of the use of metaverse and AI. They Perceived uses of metaverse and AI by teachers: Have you ever heard of metaverse? Have you ever used a virtual reality headset? Do you have any fears about the emergence of digital virtual worlds and AI? Figure 3 shows they are highly interested in metaverse, the figure 3 shows that 73,9% of language teachers have already heard of metaverse

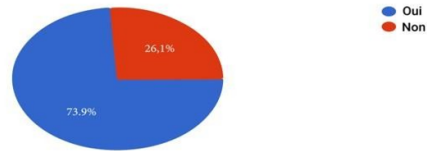
According to the survey, 91,3% of language teachers have already used a virtual reality headset as part of a virtual reality training course. The course was organized by Hassan II University in Casablanca.

In the figure below, the majority of teachers have no fears about the emergence of digital virtual worlds and AI. However, 8,7% of language teachers consider that the use of metaverse will diminish the quality of real life and negatively influence real communication between teacher and student.

Metavers are entirely digital virtual worlds that are connected to the real world and allow for social interaction. The same things that can be done in the physical world can be done online.

Do you know what metaverse are?

23 responses



Do you believe that the teaching of languages may be enhanced by using a digital virtual world?

23 responses

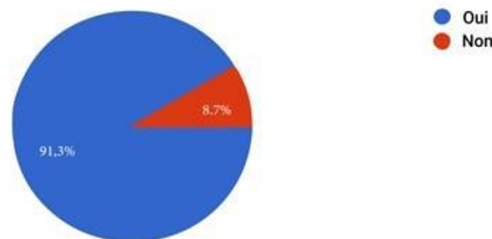


Figure 3: The language teacher has already heard of metaverse

Do you apprehensive about the rise of virtual online worlds?

23 responses

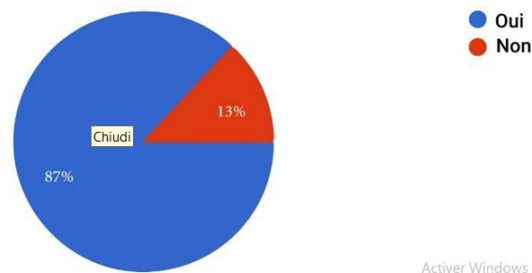


Figure 4: Concerns about the emergence of digital virtual worlds

B-Metaverse and language teaching: Would you be interested in using metaverse and AI to teach languages? Do you think a digital virtual world could play a role in improving the quality of language teaching? What technical skills do language teachers need to acquire to use

Would you be interested in learning a language through the metaverse?

23 responses

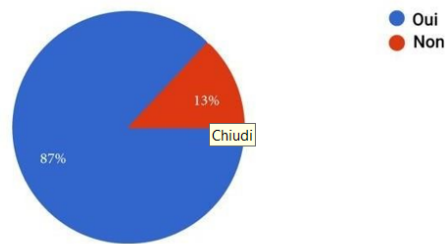


Figure 5: Interested in using metaverse to teach languages

metaverse effectively in the classroom?

Strongly interested in the use of metaverse, the figure below shows that 87% of language teachers are interested in using metaverse and AI to teach languages.

The majority of respondents 87% stressed that metaverse and AI could play a role in improving the quality of language teaching. The analysis of the open-ended question "What technical skills do language teachers need to acquire to use metaverse and AI effectively in the classroom?" has brought to light a number of topics relevant to the practicality of employing metaverse and AI in language instruction. Language instructors are still unsure about what metaverse is, how AI will affect their classes, and what technological abilities they will need to acquire in order to incorporate metaverse and AI into their lessons. The ideas of metaverse and AI are new to the majority of instructors. Many people lack the technological aptitude to employ AI and metaverse. Therefore, educational institutions must design a training program to help language instructors comprehend the elements of the metaverse.

3.3. Discussion

Synchronous language learning is reportedly far more successful in the metaverse than it is on Meet or Zoom. For instance, a university in Florida developed metaverse classrooms that produced a far better percentage of interaction during confinement than Zoom or Teams. For instance, this institution gave students' avatars a tour to Mars, which is a really effective way to pique their interest and engage them. Rethinking the roles that the different participants in this breakthrough performed is necessary to integrate the metaverse. It is evident that learners and teachers will each have a new role to perform in the case of metaverse.

On the teacher's side, by enhancing the manner of accompaniment, the hybrid device modifies the teacher's role. Indeed, the teacher-Avatar-Tutor does not handle the accompaniment solely. The use of the hybrid device that incorporates the metaverse affects the teacher's function by enhancing his style of accompaniment since it progressively shifts the teacher's attention from the contents to the individual students' learning. The teacher-avatar in the metaverse assumes control of the accompaniment. It's crucial to keep in mind that the meta-verse is still evolving,

and as technology advances, so could the educational opportunities. To make the most of the use of metaverse in language instruction, it is crucial for language educators to stay current with fashions and adjust to changes. The benefit of a hybrid device that incorporates metaverse is not on the side of instructional time. More diversified work rhythms, simpler socializing, collaboration [9], and above important, more individualized language exercises for pupils are all part of the increased educational efficiency. Thus, the metaverse offers opportunities for language teaching in that it:

- stimulates the development of language competence through a variety of activities (in the metaverse and the classroom)
- modifies the role of the student by developing his/her autonomy
- modifies the role of the teacher (avatar) by developing his method of accompanying students
- develops interaction and socialization
- exploits the flexibility potential of the metaverse to better respond to specific student needs

Conventional language learning methods can often struggle to effectively integrate the skills and strategies essential for language acquisition [10]. This is where the joint use of metaverse and artificial intelligence (AI) takes on significant importance. These technologies offer a crucial response to a recurring problem: insufficient learner engagement.

The integration of AI within the metaverse enables the creation of interactive and personalized learning experiences, captivating student interest and motivation. These AI tools offer the possibility of designing tailor-made learning environments, adapted to the individual needs of learners, while promoting social interaction and engagement within the metaverse. As a result, teachers are able to develop immersive and stimulating learning activities, encouraging the active participation of learners and promoting a more natural and intuitive approach to language learning. To illustrate this transformation, here are some concrete examples of how metaverse and AI can be harnessed to improve language learning:

Intelligent virtual tutors: learners can interact with AI-powered virtual tutors, who monitor pronunciation, grammar and vocabulary, providing instant feedback and personalized advice to improve their language skills:

1. Simulation of real-life situations: learners can be immersed in virtual environments reproducing real-life situations, where they interact with virtual characters in the target language, promoting contextual learning and the acquisition of everyday expressions
2. Educational games: AI-powered games in the metaverse can reinforce language skills through playful activities, such as role-playing games where learners solve puzzles using the target language
3. Personalized follow-up: AI analyzes each learner's performance and adapts content to their needs, offering specific exercises for grammar, listening comprehension or other skills
4. Collaborative virtual classrooms: virtual classroom environments in the metaverse enable students from all over the world to learn together, while AI facilitates intercultural communication and offers language activities tailored to each group

5. Translation and instant assistance: AI tools integrated into the metaverse facilitate translation in real time, encouraging communication between learners who speak different languages

These examples illustrate how AI and the metaverse are opening up new avenues for language learning, placing learners at the heart of their language acquisition process through more interactive, personalized and immersive experiences. There are a lot of technical difficulties as well (you need a strong internet connection and hardware with a graphics card or enough power). Given the tools and abilities required to use these new services, electronic illiteracy will likewise pose a significant problem. Therefore, it would be wise to consider this feature when creating metaverse. From a technological standpoint, the expansion of the metaverse depends on the scalability of space computing, Internet bandwidth, and energy efficiency, as well as navigating interoperability protocols if we are to truly see networked virtual worlds. Diverse training options: To face the difficulties of the metaverse, colleges and training institutions should provide technical training tracks that excel in immersive technology. Accessing and exiting metaverse: it will be important to foresee the effects of metaverse for both users and those who will not be able to utilize them. In fact, the issue of access disparities can take on a variety of shapes, including sensory and cognitive, as well as economic and social ones (such as illiteracy, the ability to pay for equipment and a reliable connection). Some people might have more intense and satisfying experiences in the metaverse than in the real world, albeit there is a chance that they will find it difficult to leave.

4. Conclusion

Metaverse and AI are in perpetual transformation, and the multiplication of educational metaverse platforms is dizzying. Malcolm Frank assimilated Metaverse as a business model that would have a major impact on the educational world. For this reason, the university should be ready to adopt or develop new devices to keep pace with these changes, to create innovative digital services, enjoyable experiences for learners, more emotional, more immersive interactions and more engaging relationships if they place the learner at the center. The university needs to be heavily involved in training future managers in immersive technologies to meet a real need and position itself as a major regional player in relation to the metaverse. In this paper, after exploring teachers' perceptions of the use of metaverse and AI, we define the contributions and challenges of metaverse in language teaching based on a survey of 23 teachers. In conclusion, we found that the language teacher focuses on the search for "innovative" teaching methods (how to teach in a more innovative, interactive, motivating and meaningful way using metaverse?), whereas the teacher must also be interested in the pedagogical scenario to be proposed in the metaverse, i.e. what to teach and what to assess in the metaverse? It is this question that is essentially at stake when we refer to the development of language competence in metaverse. Indeed, through the use of metaverse and AI, we will be offering learners personalized language teaching in terms of the content to be studied, the multimedia resources to be consulted and the language learning activities to be carried out. This new pedagogical practice will lead us to ask further questions: Is the hybrid device integrating the metaverse likely to foster the development of students' language competence? Obviously, this question goes far beyond

the results of the present study. As a practical extension, the answers to this question will be presented as part of a future research project based on the experimentation of metaverse and AI in hybrid language teaching.

References

- [1] M. Ball, *The Metaverse: How It Will Revolutionize Everything*, De Boeck, 2022.
- [2] P. Cassoulat, F. Illouz, *Metavers, nft: Deciphering the new world* (2022).
- [3] A. Basdevant, C. François, R. Ronfard, *Mission exploratoire sur les métavers*, Ph.D. thesis, Ministère de la Culture (France); Ministère de l'Économie, des Finances et ..., 2022.
- [4] U. Chakraborty, *Metaverse and web3: A beginner's guide: A digital space powered by decentralized technology*, BPB Publications (2022).
- [5] P. Fuchs, G. Moreau, J. Burkhardt, *The treatise on virtual reality - interfacing: immersion and interaction in virtual environments*. (2006).
- [6] B. Charlier, N. Deschryver, D. Peraya, *Apprendre en présence et à distance-a la recherche des effets des dispositifs hybrides*, Réseau Education Formation (REF) (2005) 15–16.
- [7] N. Chafiq, M. Housni, *Towards the design of an innovative and social hybrid learning based on the smac technologies*, in: *Information Systems and Technologies to Support Learning: Proceedings of EMENA-ISTL 2018 2*, Springer, 2019, pp. 126–133.
- [8] L. Olivier, B. Eloïse, M. Laurent, *Social commerce : Social networks, Gaming and Metaverse: On your marks, go for it!*, Eyrolles, 2022.
- [9] C. J. Plume, Y. K. Dwivedi, E. L. Slade, *Social media in the marketing context: A state of the art analysis and future directions* (2016).
- [10] H. Stewart, K. Chris, *Shifting from pedagogy to heutagogy in education*, "<https://www.teachthought.com/education/shifting-from-pedagogy-to-heutagogy-in-education/>", 2006.