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ORIGINAL

We've reached the GOAL. Teaching Methodology for Transforming Learning in the METAVERSE. A teaching innovation project

Llegamos a la META. Metodología de Enseñanza para la Transformación del Aprendizaje en el METAVERSO. Un proyecto de innovación docente

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ABSTRACT

Starting from the innovation articulating principles as pillars for updating and educational excellence, it is pertinent to remark on the need to generate new ways to carry out the training processes to respond to students' interests in the digital age. In this line, one of the most pioneering innovations generated by the technological revolution has been the metaverse, a virtual world in which – out of digital devices – a great immersive experience and total interaction with its elements is generated in the user. Due to its short trajectory, the metaverse's potential in education is still waiting to be explored. This project aims to create an educational metaverse helping to develop the didactic contents of different curricular subjects to raise the teaching and learning process to a larger scale of immersion and innovation. For this purpose, a specific didactic methodology will be designed and implemented for training in the metaverse as well as the preparation and implementation of a competence-training program for creating and using virtual classrooms. This way, it will be possible to generate and transfer knowledge in the metaverse out of the improvement of the psychoeducational skills of students as well as to encourage inclusive education and the improvement of diversity care. The methodology this project will follow will be based on cooperative work and the principle of self-sufficiency for the efficient implementation of learning based on projects and problems to teach the didactic contents and achieve the learning objectives. All the above will start from a systematic strategy to follow up and evaluate the project's development and its impact.

Keywords: ICT; Educational Innovation; Educational Technology; Learning Spaces; Immersive Reality; Metaverse.

RESUMEN

Partiendo de los principios vertebradores de la innovación como pilares para la actualización y la excelencia educativa, resulta pertinente destacar la necesidad de generar de nuevas formas de efectuar los procesos formativos con la finalidad de dar respuesta a los intereses del alumnado de la era digital. En esta línea, una de las novedades más pioneras generadas por la revolución tecnológica ha sido el metaverso, un mundo virtual en el que –a partir de dispositivos digitales– se genera en el usuario una gran experiencia inmersiva y una interacción total con sus elementos. Debido a su corto recorrido, las potencialidades del metaverso en la educación se encuentran aún por explorar. El objetivo del presente proyecto se centra la creación de un metaverso educativo con el que desarrollar los contenidos didácticos de diferentes materias curriculares para elevar el proceso de enseñanza y aprendizaje a una escala superior de inmersión e innovación. Para ello, se procederá al diseño e implementación de una metodología didáctica específica para la formación en el metaverso, así como a la elaboración e implementación de un plan de formación de competencias

para la creación y uso de las aulas virtuales. De esta forma, se podrá generar y transferir conocimiento en el metaverso partiendo de la mejora de las habilidades psicoeducativas del alumnado, así como fomentar la educación inclusiva y la mejora de la atención a la diversidad. La metodología que seguirá el proyecto se sustentará en el trabajo colaborativo y el principio de autonomía para el despliegue eficaz de un aprendizaje basado en proyectos y problemas para la impartición de los contenidos didácticos y la consecución de los objetivos de aprendizaje. Todo ello partirá de una estrategia sistemática de seguimiento y evaluación del desarrollo del proyecto y de su impacto.

Palabras clave: TIC; Innovación Educativa; Tecnología Educativa; Espacios de Aprendizaje; Realidad Inmersiva; Metaverso.

INTRODUCTION

The raison of this project is imbricated in need to adjust the teaching and learning process to the requirements of an increasingly technological society. In this sense, the field of education requires new ways to carry out the training processes in order to respond to the interests of students who have grown up in a digital age.[1,2]

At the same time, this project entails an analysis proper to the reality existing in the classrooms that will contribute to improving the different degrees being part of its development. Likewise, due to the nature of this project, the inclusion of information and communication technologies (ICTs) in the learning spaces is encouraged, generating training environments of an immersive nature in which teaching will take place.[3]

In this line, one of the most pioneering innovations generated by the technological revolution has been the metaverse, a virtual world in which – out of digital devices – a great immersive experience and total interaction with all its elements is generated in the user.[4] Due to its short trajectory in the technological race, even more in its integration into social everydayness, the metaverse's potentialities applied to the education field are still waiting to be explored.[5]

Consequently, it is necessary to establish the applicability of the educational metaverse to improve the teaching processes and to optimize and update the didactic methodologies. This way, diverse psychoeducational dimensions greatly relevant to students will be fostered, such as motivation to learn, self-sufficiency of students, interaction with contents, with their peers and with the professors themselves, and the repercussion of the above on the performance of students.[6]

METHODS

Need for realization

The COVID-19 caused pandemic has unveiled not only the deficiencies of the educational system but also the potentialities of technology in the education service to carry out the teaching process in other environments different from traditional/in-person learning.[7] Such has been the evolution and integration of ICTs into daily work that have been transferred very much into the educational field, favoring new training methods and resources. Technologies such as augmented and virtual reality have greatly affected education.[8] However, the experts have gone for taking a further step and creating an environment that generates a further immersive experience for the user.

The metaverse is a reality in the technological evolution that – little by little – is going deeper into the field of education.[9] This project seeks – on the one hand – to train professors to implement the teaching and learning process in these digital environments. On the other hand, to generate an educational metaverse to develop the didactic contents of different curricular subjects. This will entail raising the teaching and learning process to a larger scale of innovation,[10] in which all agents of the teaching act will have room and equal opportunities, thanks to its great possibility of adapting to the different individual needs. This way, putting into practice an educational metaverse will also enable the improvement of technology-helped diversity care.[11]

Psycho-pedagogical fundament of the project

Current education passes through diverse pedagogical trends to convey knowledge to students and succeed in making them better assimilate content and their respective learning.[12] In this line, the experts advocate incorporating new learning environments different from the traditional or expository ones to increase students' motivation.[13]

Likewise, these new environments generated by digital resources and tools will foster meaningful learning and favor constructivist learning in which the student is the main protagonist of the instructional process.[14]

These methodological innovations will also foster the cooperation of students, either to develop cooperative projects or to solve problems resulting in further learning, consolidated through teamwork and the use of technology. In like manner, all these paradigms articulating the teaching and learning process facilitate the

adaptation of teaching to students with special educational needs, thanks to the great potential shown in the scientific literature on the adaptive possibilities of ICTs in the educational spectrum.[5]

Goals

Below are the goals that will guide the development of this project:

- Prepare and implement a professor-training program for the acquisition of competencies needed to create and use virtual classrooms in the metaverse;
- Prepare and implement a student-training program for the acquisition of competencies for optimal performance in the metaverse;
- Design and implement a specific didactic methodology for the process of teaching and learning in the metaverse;
- Generate and transfer knowledge in the metaverse;
- Foster inclusive education and improvement of diversity care by developing the training process in the metaverse, adapting the environment to the needs of students;
- Encourage the improvement of psychoeducational skills such as motivation, self-sufficiency, participation and interaction, among others;
- Design and offer a support system to solve problems resulting from carrying out the training activities in the metaverse;
- Foster knowledge transfer and dissemination of results to the scientific and educational community.

Methodology

The methodology to be followed by this project will be based on several pillars, such as cooperative work and the principle of self-sufficiency and diversity care to efficiently implement learning based on projects and problems to teach the didactic contents and achieve the learning objectives. Likewise, these training models will be complemented with diverse ICT resources needed to develop a training activity in the metaverse. The resources are virtual reality glasses, smartphones, computers and specific software to generate learning environments.

This way, to attain our goals, we have designed a work schedule comprising a series of stages that – systematically – articulate the implementation of this project.

RESULTS AND DISCUSSION

Training stage

This first stage will begin when this project is approved and will focus on acquiring the knowledge and tools needed by the professors to manage the different technological resources and devices for the development of teaching in the metaverse. For this purpose, a specific professor-training program for acquiring competencies needed to create and use virtual classrooms in the metaverse will be prepared and implemented. This training program will comprise a series of courses, presentations and knowledge pills related to all the skills needed to make teaching real within the metaverse. In addition to receiving training in technological devices and resources, the professors will be trained in the principles and foundations for the implementation of a teaching methodology in the virtual classrooms, the group of contents to be taught in each of the subjects being determined and the methodological principles that will rule teaching in the metaverse during the implementation stage being established. This way, the characteristics that the structure and the design of the interface of the virtual learning environment should have for students to find it arranged clearly and intuitively will be concretized. Finally, the specific student-training program to acquire competencies for optimal performance in the metaverse will be prepared and implemented. The innovation group professors will give this training through in-person seminars and virtual knowledge pills.

Preparation and development stage

This stage will begin once the professors have received specific training and will be connected to the student-training stage. The specific didactic methodology for the teaching and learning process in the metaverse will be designed during this stage. The group of contents to be taught in each of the subjects and degree courses will be established, and the characteristics that the structure and the design of the interface of the virtual learning environment should have will be concretized. Next, the training metaverses for the different subjects will be effectively created to create spaces as arranged, intuitive and immersive as possible for the students. The virtual environments in the metaverse will be created via the free web server Mozilla Hubs! (figure 1) (https://hubs.mozilla.com/), which has a specific interface to use in the educational field. Likewise, a manual will be created for the efficient development of teaching in the metaverse, as well as the specific Chatbot's design and development to support students and professors in the implementation stage.

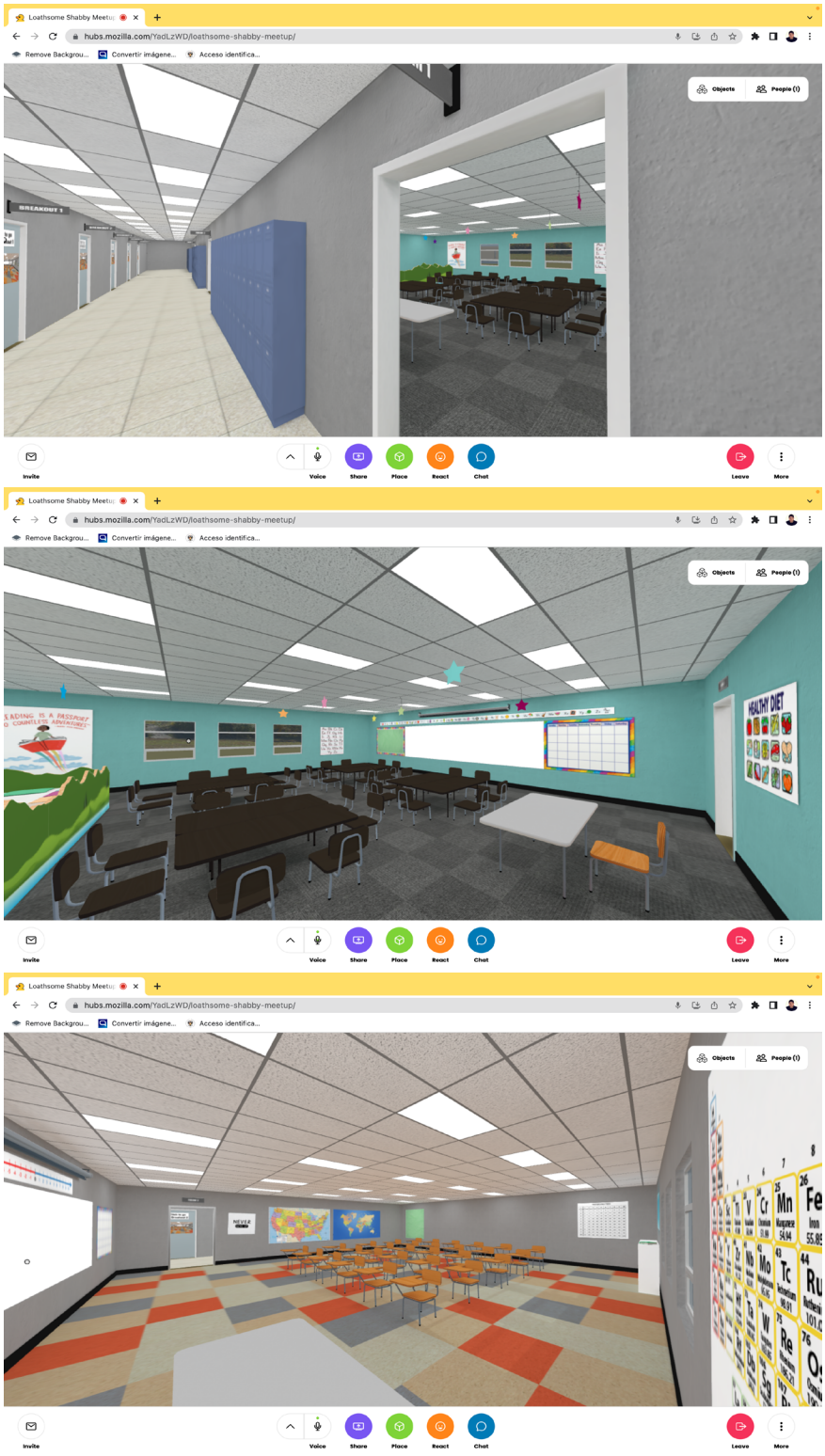

Figure 1. Interface of Mozilla Hubs!

IMPLEMENTATION STAGE

This stage entails implementing the teaching within the virtual learning spaces generated in the metaverse. The teaching methodology will be based on the principles of cooperative work, self-sufficiency and diversity care to implement learning based on projects and problems efficiently and with the leading role played by the potentialities provided by digital pedagogy. Consequently, to start implementing the educational metaverse with the students, the following actions will be carried out:

- Make virtual reality glasses available to students and display brief knowledge pills about their functioning

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as a summary of the information received in the first stage of this project;

- Have the professor make a presentation of the virtual environment generated to carry out the training process;
- Have students create the avatars;
- Pilot test of the virtual environment by teaching certain contents previously digitized by the professors;
- Solve problems resulting from the pilot test.

The previous actions having been attained, it will be possible to develop an instructional process in which both students and professors are familiar with the new learning model, achieving more efficiency in the whole process and avoiding as many contingencies as possible.

Concretely, this training innovation will be carried out in four-degree courses and different subjects to reach a more extensive and diverse student population. Below are the topics and the degree course of which they are part:

- Systematic observation and analysis of contexts for innovation and improvement (Degree in Early Childhood Education);
- Didactic and technological resources applied to Primary Education (Degree in Primary Education);
- ICTs, education and social changes (Degree in Social Education);
- Teaching innovation and introduction to educational research (Master´s Degree in Compulsory Junior High School Teaching and High School Teaching, Professional Training and Language Teaching).

However, to facilitate the immersion of students in this new learning space, there will be progressive transference from the traditional space to a metaverse-directed training program. For this purpose, the following methodological learning chain going from the most in-person/hybrid teaching[15] to virtuality (figure 2) will be followed:

Figure 2. Methodological progression

Because of the above, it is pertinent to remark that this stage is the most important, and the process should be constantly evaluated. To this end, the team of professors of this project will have periodic meetings to analyze, put forward and propose the corrective or facilitating measures making it possible to channel and continue implementing any possible modifications and improvements that can arise from the practices developed by the students to include them in the revised methodological design.

Evaluation stage

This last stage will be carried out partially upon completing the whole process but will be constant throughout the three previous stages. The strategies to follow up and evaluate the development of this project will be applied, and results, materials, byproducts and possible impacts of their realization will be evaluated, both questions being developed in the fifth section herein. Likewise, the reports and conclusions of this project will be prepared, emphasizing the evaluation of every stage separately and every element designed and put into practice. This analysis will make it possible to draw conclusions and proposals for future improvements, and the preparation of scientific articles where the transcendence of this project is made known with concrete data and teaching innovation is promoted.

Cross-sectionality of this project

Self-sufficiency and transparency

Technology provides an extra component of self-sufficiency to carry out the training processes and to enable every student to prepare their tasks self-sufficiently and ubiquitously, regardless of time and space. In this line, the metaverse will allow students to carry out their teaching and learning process with full self-sufficiency, adjusted to the requirements of the subject. Likewise, transparency of the whole instructional process will be advocated, adapting the generated metaverses according to the peculiarities contained in the teaching guidelines of the diverse subjects. This way, quality training adequate to the requirements of an increasingly virtualized society can be implemented.

Inclusion and diversity

The literature shows how technology adapts to the individual characteristics of people. In this sense, the metaverse enables customized teaching with differentiated resources and with predefined levels of learning. This allows every student to keep their own learning pace and the professor can take care of those who may have more difficulties. Besides, the development of group tasks in immersive environments helps other students to develop social, professional and academic competences.

Gender equality

This project implies learning allowing involvement, a personal and cooperative initiative based on the development of positive habits of coexistence where – via experiential activities of diverse kinds – reflection, analysis and critical awareness towards the current social-educational challenges are experienced, fostering coeducational values based on gender equality, social integration and inclusion, respect for diversity in all its dimensions, as well as developing communicative competence (avoid sexist language). Furthermore, the interaction with technological resources and tools can break the gap existing in the access and the initiative of women to the use and implementation of technology, favoring better training so that future female students feel motivated to take the denominated STEM subjects, this acronym meaning Science, Technology, Engineering and Mathematics.

Healthy life and sustainability

The use of technological resources and immersive environments where the working documents and the contents of the subjects are included entails a considerable saving in the paper, cross-sectionally promoting care for the environment and watching over the sustainability of our planet from the potentiality of virtualization. The prepared manuals will be digital to minimize the polluting mark. This entails making future professors or professionals working in education aware of the importance of these aspects and taking them into consideration when they are active.

Internationalization

The intrinsic characteristics of this project favor the internationalization of the actions taken. That is, there is a possibility of generating educational metaverses in other contexts and fields of knowledge to export this new training model that is in the development stage concerning education. Likewise, the creation of links with other universities advocating the incorporation of recent technological trends in the world of education will be fostered. In this sense, pertinent internationalization of the actions taken in this project is considered optimal and necessary for exporting and advocating the metaverse in the field of education as a teaching and learning model adapted to the requirements of contemporary society.

Digitization and virtualization

Despite the goodness of the virtual learning environment offered by Granada University with the platform PRADO, together with the range of resources provided by the platform go.ugr.es, it is necessary to go one level up at the technological level. That is, we seek to introduce professors and students to a parallel world where it is possible to carry out the teaching and learning process. This will make it possible not only to have contents available as in the platforms above but also to experience in person a virtual, ubiquitous environment enabling work with the different didactic contents adapted to the needs and particularities of every person.

Employment and entrepreneurship

In general, a metaverse is an object of study in the development and expansion process at the world level. Notably, the experiences undertaken in this immersive environment are scarce in education. In this line, this project will enable the implementation of the metaverse and its respective development at the educational level. This will encourage the technological sector to advocate producing new hardware and software products to make the immersive experience increasingly accurate and inclusive. All this will imply the generation of new jobs qualified for that purpose.

Expected results

The following are the expected results once this innovation project has been implemented:

- Make professors obtain a high level of competencies for the creation and use of virtual classrooms in the metaverse;
- Make students receive a high level of competencies for optimal performance in the metaverse;
- Make teaching effective, optimal and efficient, which will contribute to attaining meaningful learning in the several degree courses and subjects involved in this project;
- Encourage the improvement of psychoeducational skills in students, such as motivation, self-sufficiency, active participation, attention and interest, student-professor and student-student interaction, and easy access to content;
- Foster inclusive education and improvement of diversity care by developing the training process in the metaverse, adapting the environment to the needs of students;
- Achieve a significant impact on the educational community, which will enable the use of the metaverse as an innovative pedagogical proposal in the several compulsory and post-compulsory educational stages and in the different branches of knowledge.

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CONCLUSION AND FORESIGHT

Implementing the work schedule proposed in this project entails creating a specific metaverse for the educational area. This virtual learning space will make it possible to develop teaching innovatively in the several subjects and degree courses taught by the participants in this project. However, the development of the first steps of teaching in the metaverse materialized with the implementation of the project goals will make it possible to have an accurate and spreadable sample of the educational metaverse in its exploratory stage. These results will be made known to the community in general and the teaching staff in particular, so the teaching community is expected to take an incipient interest in replicating our experience with the metaverse in their fields of knowledge, regardless of the nature of the contents to be applied and the educational stage in which we are. This implementation will entail going beyond the limits of this project and extrapolating our immersive and innovative experience to the rest of the teaching community. This way, the new implications and applications of teaching in the metaverse can continue to be evaluated beyond the limits of this project, and, therefore, its functioning and adaptability to new learning contexts can continue to be improved.

We have decided to begin this teaching innovation via a basic project due to the initial and exploratory nature of the metaverse in the field of education. However, once this project has been developed, we intend to continue the set path by designing and carrying out an advanced project enabling the acquisition of a larger volume of resources and, consequently, undertaking training experiences in the metaverse in a larger university population.

As a result of the realization of this project, a manual accessible to all members of the educational and researching community containing the premises needed to generate educational metaverses will be prepared. This work will serve as support so that any professional working in education and interested in state-of-the-art can implement, step by step, this immersive environment in their teaching praxis.

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CONFLICTS OF INTEREST

None.

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