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Message of the General Chairs of HELMeTO 2022

Dear friends,

the 2022 edition of HELMeTO confirmed a growing interest in the topics of higher education learning methodologies and technologies, as well as the relevance of the interdisciplinary approach that characterizes our community. This increased interest, drive us to translate HELMeTO event from a workshop to a conference, hosting a higher number of contributions from several countries and bringing a more international perspective on the topics.

Exactly, we received 126 extended abstract submissions from more than 400 authors and 24 countries (Italy, Israel, United States, Japan, Turkey, Slovakia, Germany, Ireland, Spain, Portugal, Morocco, Greece, Algeria, Brazil, Czechia, Malta, India, Estonia, Bulgaria, Netherlands, United Kingdom, Slovenia, Sweden, Poland).

The presentations and the talks highlighted the complex relationship between technologies and pedagogical approaches. These discussions also pointed out new emerging topics such as the potential role of learning analytics, artificial intelligence, augmented and virtual Reality, big data analytics, and the key role of tutorship and learning design in online learning. A great discussion is also taken on the impact of the Covid-19 emergency on the online education through a dedicated session already introduced from HELMeTO 2020.

However, the emergency has forced universities to adopt solutions for distance learning very quickly, often without being able to provide adequate planning or build up specific technical and didactic skills to develop e-learning courses. In the last years, online learning topics escalated in the agendas of all the educational institutions around the world: schools, universities, education ministries, and policy makers and education has changed dramatically, with the distinctive rise of e-learning. It is a common idea that even if several education institutions return in the last month to their traditional learning models, the integration of information technology in education will be further accelerated and online education will eventually become an integral component of education. This extraordinary situation is well represented by most of the accepted contributions explicitly dedicated to the reaction of academic institutions to the Covid-19 impact on their courses.

The 2022 edition of HELMeTO also signed the so-desired return to the on-site since HELMeTO 2020 and 2021 were fully online, given the Covid-19 emergency. The event is taken in Palermo at the Department of Mathematics and Computer Science of the University of Palermo and organized in collaboration with the Institute of Educational Technology of the National Research Council of Italy.

September 17, 2022
Palermo

The General Chairs:

Marta Cimitile

Giosuè Lo Bosco

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Special Track 1

Improving education via XR and AI

Organizers:
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Development of experiential learning, modelling and repetition processes in Virtual Reality applications. Theoretical analysis and didactic implications

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1 Modeling, repetition and experience in the learning process

Teaching and learning are extremely complex and interconnected processes that may be influenced by many cognitive factors, such as perception, memory, attention, focalization, language, and emotions. Cognitive neuroscience studies highlighted that it is extremely necessary to be aware of this implication, in order to support the learning process and to improve the teaching efficacy [1].

Due to the evolution of neuroscience, we know much about the structure, development and functioning of the human brain [2] and it is possible for all the actors in the educational field to understand the most important evidence about the brain, memory and learning process.

According to this idea and thanks to the progress in neuroscience and brain research in the last decades, a new interdisciplinary research field, neurodidactics [3; 4], was developed. Considering the different denominations present in the literature ('neuroeducation' proposed by Breuer, 'educational neuroscience' by Geake, 'brain-based education' by Caine, …) this perspective, despite some critical remarks [5], is useful for concentrating on practical suggestions aimed at the didactic process.

Although neurodidactics analyses many areas of the learning context, we believe the following is worth considering. Several studies confirm that the learning process is mainly supported by at least three scenarios, through which our brain works: modeling, repetition and experience [6].

The first scenario deals with the idea that students can learn how to behave by observing a professional working on an artefact or a teacher using a precise didactic method. Mainly this is the case of apprenticeships or modern school internships, and it is based on the identification of the mirror neurons and the comprehension of their functioning [7].

Repetition has a great impact on the memorisation process: when students consistently repeat a notion or a movement, the synaptic relations assigned to this work increase and the information that has to be learned moves from the short term memory to the long term one [8]. This idea is based on neuronal plasticity and supports lifelong learning theory in a neuroscientific perspective.

Finally, we know the essential contribution of the experience for the learning process. Kolb [9] defined experiential learning as the process in which knowledge is created through the transformation of the experience and it helps learners to develop new skills,

attitudes or ways of thinking. Kolb based this idea on several models, including Dewey and Piaget that referred to “learning by doing” or “learning from experience”.

2 Immersive technology

According to the premises, several evidence could be considered to support teachers in improving their didactic efficacy, but it is only a partial point of view. On one hand the scientific studies provide several neurodidactic references suggesting practical advice; on the other hand, the research on new technology and the didactic devices add a further significant contribution. This is the case of the research on the application of Head-Mounted Display (HMD) technology and the Immersive Virtual Reality (I-VR) which is progressively spreading in our contemporary society, becoming more and more used.
The implementation of technology-aided education as a pedagogical method is not a recent phenomenon, and the studies about its efficacy have been carried out for almost half a century. As far back as the 1970s, Ellinger and Frankland [10] found that the use of early computers to teach economic principles produced comparative learning outcomes with traditional didactic methods (such as what is called chalk and talk).
Nowadays, despite the researchers focus on learning outcomes, intervention characteristics, design, and assessment measures associated with I-VR use has been sparse, the adoption of it (I-VR) as a pedagogical method is challenging and seems to be useful and effective. Jensen and Konradsen [11] confirmed that learners who used an immersive HMD were more engaged, spent more time on the learning tasks, and acquired better cognitive, psychomotor, and affective skills. Jang [12] confirmed the hypothesis that an immersive learning experience can promote self-confidence and make the task relevant to the user, driving engagement and motivation to learn. In addition, high fidelity graphics and immersive content using HMD have allowed students to explore complex subjects in a way that traditional teaching methods cannot [13].

3 Rationale and research questions

Neurodidacts and I-VR studies must be designed in a combined way, in order to increase the potential of the teaching and learning process, especially considering the contributions of the latest scientific research.
It is essential to complete an analysis in which to make a synthesis of the didactic concepts of modeling, repetition and experience with the potential of immersive reality in the context of higher education, trying to bring out the meaning of this proposal.
The analysis is proposed with the intent to improve the understanding of how I-VR can be used to facilitate the learning process by imitating a model, as well as the understanding of how virtual reality can be developed to support repetition or how to create an "authentic experience" referred to an immersive environment.
It is also essential to investigate what kind of decision-making [14] occurs in these learning situations
The analysis is still ongoing and will address both the feasibility of this topic and the weaknesses still inherent in VR technologies, in order to support the implementation of these scenarios and the design phase of an educational path.

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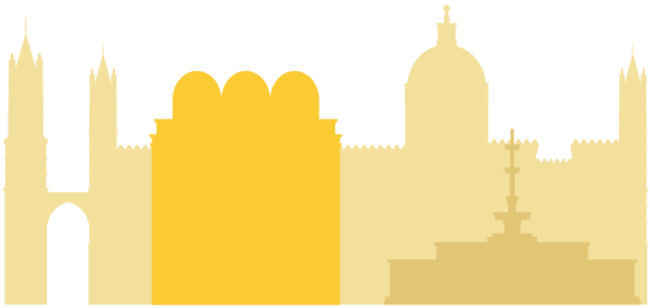

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