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The Use of AR in Secondary Education: Educational Augmented Reality Material to Enhance Students' Digital and Social Skills

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Abstract

The aim of this study was the design, the development and the evaluation of an innovative educational augmented reality (AR) material, in order to investigate the contribution of AR in increasing motivation and cooperation among secondary school students. At the same time, it was studied the possibility of enhancing the social and digital skills of the students in the context of an educational mobile learning scenario based on situated learning. The methodology that was used is Design-Based Research (DBR). Among other things, the usefulness and the ease of use of the material, its advantages, as well as the factors that could prevent its implementation in teaching practice were studied. Postgraduate students with excellent knowledge of ICT in education, teachers and secondary school students participated in its evaluation through interviews and questionnaires based on the Technology Acceptance Model (TAM). The major findings showed that the material achieves its purpose, develops skills, is easy to use and has been generally accepted by teachers and students; however, it requires improvements regarding its design and solutions for the technical access problems that arose during its practical implementation.

Keywords:
Motivation, Cooperation, Design-Based Research, Mobile Learning

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Background to the Study

In 21st century societies, the rapid spread of knowledge, the influence of the global market, the interdependence between people and the urgent use of technology have led to the need for acquisition of social and digital skills which are basic for the future of education and crucial for the development of the self and social life Furthermore, the competitive job market demands workers with high qualifications regarding ICT, while security in cyberspace and privacy are some critical issues. The European Centre for the Development of Vocational Training stated that technology can influence the configuration of the competencies needed, but also a combination between "a healthy mix of cognitive (problem-solving, creativity, learning to learn) and socio-emotional (communication, collaboration) skills" are the key for future professional abilities. Nevertheless, there are only limited programs that achieve the correlation of knowledge with the development of social and digital skills Among other, factors that contribute to this situation are: 1) the teacher-centered methods; 2) the endorsement of competition and the lack of cooperation 3) the statical perception of knowledge 4) the lack of digital skills training for teachers and 5) the limited access to technological tools at schools

In order to overcome the above problems teachers, need to design practices that connect goals to activities in formal and informal education in a way that will lead to meta-cognitive scaffolding Between different techniques of education that could lead to this is the use of Information and Communication Technologies (ICT) in education, which offers significant advantages in user engagement, in social interaction and in increasing achievements via social motivated activities Specifically, applications that are based in Augmented Reality (AR) can promote knowledge by using different senses of the user during activities in the context of a pedagogical scenario Especially, Mobile Augmented Reality, i.e. AR which is accessible via mobile devices it is a widespread technology with significant advantages, providing added educational value in different educational environments

AR Applications in Education

Augmented reality (AR) has been used in the past in different levels of education for humanity or science subjects with significant learning advantages and some limitations too Indicatively, a digital game called "Clavis Aurea", which is about the history of Naxos, uses mobile devices in order to augment the historical monuments The researchers found that the game increased students' motivation, because they made them feel positive feelings like joy, satisfaction and enthusiasm, while the interaction between them was better too Moreover, in the subject of Literature the use of AR is effective, because research showed that its use in teaching English increased the understanding of terms, made learning a pleasant experience, declined stress levels, reinforced imagination and creative thinking and improved unity and connection between students On the other hand, another app of AR could make a 3D visualization of the human body and was used for applying properly medical therapies AR was used in Geography so that solar system and planets could be studied in details within the most updated software and also in Mathematics too helping students to acquire higher problem-solving abilities Lastly, AR use in Chemistry lead to perspicuous representation of the atoms in order to expand pupils' knowledge in this domain and finally in Computer

Network Informatics in order to support future professionals to perceive adequately the topology of computer networks in a simpler and faster way

Conclusion

The present research enhances current knowledge on the educational use of AR in classrooms and presents new data regarding its utilization for enhancing social and digital skills, as it is one of the first efforts to develop such material. Moreover, the results of the quantitative and qualitative analysis showed that the most variables were confirmed and the findings were encouraging regarding the satisfaction of the objectives and the material's acceptance. Alongside, the educational value of AR was demonstrated in practice, when properly utilized. Overall, this innovative educational AR material could become a bulwark for future research regarding the AR and the enhancement of skills in secondary education, and also could be expanded by adding more variables according to the needs of the future society.

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