# Technological innovations in biomedical training and practice

Juan A. Juanes
VisualMed Systems Group
University of Salamanca, Spain
jajm@usal.es

Pablo Ruisoto
VisualMed Systems Group
University of Salamanca, Spain
ruisoto@usal.es

Piedade Barros
School on Health Technologies.
Polytechnic of Porto, Portugal
fin@affiliation.org

## ABSTRACT

As we become more integrated into a global world, technological advances and teaching innovation that are grounded in Science have become crucial. Rapid advancements in science education and information technology provide promising resources that require many academic disciplines to work together. Developing new tools and defining new methodologies to share educational experiences, including empirical studies that support their efficiency, constitute a promising approach to improve Health Sciences. The aim of this session is to encourage and enable the exchange of information related with the advance and support of Health Science Education. In this paper the authors summarize the recent advances in technological innovations in biomedical training and practice. Most of the main trends in this field are reviewed, including: training in health sciences through a variety of resources such as computer simulations, stereoscopic visualization systems with augmented reality glasses, computer platforms for managing and using resources and documents; the generation of three-dimensional images developed with commercial software for 3D reconstruction; medical and surgical simulation using Virtual Reality (RV) and Augmented Reality (AR); the role of stereoscopic vision systems in the health sciences; and the use of teaching medical material reconstructed with 3D printers.

## CCS CONCEPTS

• **Human-centered computing**

• **Computing education** → information technology education

## KEYWORDS

Active learning, evaluation, computer-based technology, education.

## 1 INTRODUCTION

The transmission of knowledge, independently of space and time, using teaching innovation technologies and computer systems is, nowadays, one of the great scientific-technical and cultural revolutions in our society, where the field of biomedical and health sciences, has been able to obtain excellent developments and applications.

The aim of this track is to collect some of the most innovative computer based technological developments applied to both the contexts of biomedical training and clinical practice, as well as in other fields related to Health Sciences training; providing an excellent opportunity for the promotion and exchange of innovative teaching experiences in the health field, especially those based on the use of state-of-the-art technology.

In this Track, we will review works on the latest trends, methodological and technological, teaching innovation, from radiology medical treatment and handling software for three-dimensional visualization, to clinical simulators, under stereoscopic vision environments, for practical training, with techniques of virtual reality and augmented reality.

Technology, applied to training in health sciences, has undergone great changes over time, always parallel to the technological evolution of society; For this reason, technological advances have modified the teaching and learning methods of university students in the experimental and health sciences. The relationship between the current context of the information society, medicine and health systems is especially important given that information and knowledge are especially relevant in this field of activity. The accelerated increase of different devices that the technological industry develops every year, suppose an incorporation and use, in our society, in a full and daily way.

Therefore, the impact of different information and communication technologies on university education in health sciences, make products that are incorporated into the teaching or

academic field in a very common way. The application of computer technologies in training in experimental sciences and health, expands the possibilities of action and intercommunication between teachers and students, also allowing access to new means of exploration and representation of information, along with new ways of access to knowledge, through very diverse resources, such as computer simulations, stereoscopic visualization systems with augmented reality glasses, computer platforms for managing and using resources and documents, etc.

The use of visual resources, in three-dimensional format, turns out to be an attractive and innovative method for the teaching and learning of the students, being in addition, reusable and useful tools to encourage and motivate the learning of the students of any discipline in the area of health sciences. For this reason, the generation of three-dimensional images developed with the help of commercial software for 3D reconstruction, are part of the new visual pedagogical strategies that allow the activation and revision of teaching contents, for the improvement of the understanding of corporal structures.

On the other hand, the uses of Virtual Reality (RV) and Augmented Reality (AR) in the health sciences have been very different, being one of the most currently used in the field of medical and surgical simulation, using these systems of three-dimensional vision with glasses or helmets of stereoscopic vision.

Stereoscopic vision systems are very useful in the field of medicine because they allow to eliminate some errors and help to perceive and better evaluate some clinical practices. The use of technological systems of clinical training, facilitate the training in different medical techniques, thus acquiring basic skills in different clinical examinations such as cardiopulmonary auscultation, ultrasound exploration... or, even for the acquisition of more complex skills such as endoscopy, laparoscopy...

It is evident that technological environments provide very useful tools in university education, incorporating additional and complementary resources to learning, which allow generating training situations, free from the restrictions of time and space imposed by a purely classroom teaching.

Currently, the progressive optimization of computer components has allowed computers to have a smaller volume each time, which facilitates their portability. More and more students are coming to different sources of information through their mobile devices and tablets. The boom that these technological media are having the computer applications for these portable devices, is constituting a role of great relevance, for the efficiency and the improvement of the quality of the training processes.

Technological advances define the basis of modern education and offer us the possibility to use new resources in the teaching of health sciences that offer a more versatile strategy for the representation of knowledge, without losing classical descriptive training. These technological resources suppose excellent materials to support medical training, promoting undoubtedly the process of learning and of acquisition of practical skills.

One of the latest technological trends is the use for teaching medical material in general and anatomical in particular, reconstructed with 3D printers. This type of technology, used in health sciences, is allowing to develop anatomical pieces, to exact size, of a specific part of the body

It is evident that technological advances in the health sciences are bringing us a clear benefit both in medical training and in clinical practice.

The use of computerized technological environments, of medical training, always employed as additional resources in teaching, facilitates and optimizes the learning and clinical skills of students and residents of different specialties of health sciences.

Providing a meeting space to share teaching experiences of a technological nature such as those presented at the International Conference on Technology Ecosystems for Enhancing Multiculturality, (TEEM), is a good representation of its impact and current dissemination, in training in different areas of health sciences [1-27].

## ACKNOWLEDGMENTS

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