



History and Evolution of Virtual and Augmented Reality in Medical

Education

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Introduction

The history and use of virtual and augmented reality dates back to the early 19th Century, Charles Wheatstone, an English scientist, and inventor, discovered that the brain interprets stereoscopic photos and paintings differently than 2D images. His research demonstrated that using a stereoscope to view two images side by side allows the viewer's brain to interpret the two 2D images as one cohesive 3D image.¹ The rationale behind the use of virtual and augmented reality is primarily rooted in the principle of interactivity, which creates a world where the individual can interact with the material at hand.²

Evolution of Virtual and Augmented Reality

As the world began to realize the unique power of virtual reality, the uses became more and more diversified. In 1981, The National Aeronautics and Space Agency (NASA) began looking into using virtual reality as an educational tool for astronauts in training.³



In the 1990's, the use of virtual reality was appearing more in media and entertainment such as the movie *The Matrix* and the Nintendo virtual boy.⁴ During this time, the use of virtual reality was also becoming more popular in medicine. One of the first uses of VR in this field was to help visualize anatomic structures to help prepare surgeons for surgical interventions.⁴

Augmented and Virtual Reality in Medical Education

Technological advances, such as augmented and virtual reality (AR/VR), have introduced their way into medical education. Both AR and VR stem from the initial use of illustrations in medicine, a technique that has been shown to have varying influences depending on the discipline of study.⁵ Augmented reality involves the virtual world superimposed on our surroundings and has been useful in certain aspects of anatomical education. The combination of cadaveric dissection and augmented reality can teach students precise anatomical landmarks and build an understanding of radiographic information (top pane of figure).⁶



The similar tool, VR, can also be utilized in medical education. VR allows for a completely computerized simulation. Medical education throughout the past three decades has begun adopting simulation-based education.⁷ VR can be used to simulate any medical intervention without any of the risks associated. This allows for an environment where students can learn techniques and become familiar with them. Surgical education can utilize VR to teach students the tools and steps necessary to perform a given procedure (bottom pane of figure).⁸

Discussion and Conclusion

Ghosh studied the evolution of illustrations in the anatomical field from the classical periods of Europe to modern times. In summary, illustrations began to emerge in the Late Middle Ages. The development of illustrations provided detail in different anatomical components.⁹ As time moved along illustrations began to lose their initial artistic component and began taking a more scientific rendition. The 20th century saw the emergence of photography that could capture anatomical detail at a higher level, and finally with computer technology arriving in the late 20th century anatomical education has utilized various imaging modalities to enhance medical education.⁹

AR and VR are even further developments of the computer technology that arrived in the late 20th century. The utilization of these new tools can be efficacious towards medical school curriculum.¹⁰ However, these advances are not without common pitfalls that are often seen with technology.¹¹

It is valuable to understand, from an anthropological standpoint, how history and evolution can teach us how far we have progressed. That progression gives us a reasonable understanding on what humanity can accomplish as time moves forward. The increase in technology and varying imaging modalities in medical education will continue to evolve and revolutionize the way current and future physicians are taught.

References

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Early History

Morton Heilig, in 1957, decided to use this idea of interactivity to create a 3D interactive stimulation and experience. He invented the "Sensorama Machine", which combined 3D movies with smell, physical vibration of the seat, air blowing mimicking the feeling of wind blowing, and distinct clear sound that varied depending on the individuals input.²



Ivan Sutherland continued elaboration on Heilig's initial idea of head-mounted displays by adding two cathode ray tubes near the user's ears. This addition is still used even in head-mounted displays today.³



First Second