Augmented Reality and Education: Design, Implementation, and Impact

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Augmented reality (AR) is technology which overlays virtual objects (augmented components) into the real world. These virtual objects then appear to coexist in the same space as objects in the real world. Augmented Reality (AR) affords the ability to overlay images, text, video and audio onto existing structures, space or imagery in real time and in context with learner's environment. The engaging nature of AR make it an especially attractive tool for education. AR normally is used in real time and in context with environmental elements. By incorporating virtual and real world experiences AR has many potential applications in education and product development (Greenwood & Wang, In Press).

There are currently three main types of AR technologies: 1) Head-mounted displays and wearables (see Figure 1), 2) Mobile handheld devices, and 3) Pinch Gloves. "Head-Mounted Displays are complex technological devices that allow a learner to see computer- generated images overlaid onto the real world via a digitally enhanced viewfinder" (Novak, Wang, Callaghan, & Zhao, 2012, p. 96). The second category, mobile devices, are prevalent and can be easily integrated into learning settings. Indeed, most of the AR applications used in education today rely on mobile Apps and devices such as Aris and Aurasma.

AR has been considered a significant tool in education for many years (Gredvig, Larson, Ridolfi, & Romenesko, 2011). The world has also witnessed exemplary uses of AR in education, from K-12 to higher-education, from formal learning to informal learning. Immersive and Social learning theories provide the foundations underlying the use of Augmented Reality and mobile AR in teaching and learning (Greenwood and Wang, In Press).

As Greenwood and Wang (In press) argued in their book chapter, in education, it seems that AR's development has followed a similar trajectory to mobile learning, which was heralded as mainstreaming education but eventually became a supplementary educational tool in most countries. However, from learner perspective, mobile learning is already part of their daily lives. Learners do not draw a clear line between how they learn, either online or mobile. They tap into all devices available and networks available to learn at work, at home, on the go, or in a face-to-face classroom (Greenwood and Wang, In press). Therefore, convenience, flexibility, and mobility associated with AR-infused activities have greatly appealed to the mobile generation.

Figure. 1   SDSU Graduate Student (Nader Elnaka) trying out Oculus Rift, filmed by his teammate--Kevin Storm Jorgensen.

As the usage of mobile devices in formal settings continues to rise, so does the opportunity to harness the power of augmented reality (AR) to enhance teaching and learning. Many educators have experimented with AR, but has it proven to improve what students grasp and retain? Is AR just another fun way to engage students, with little transformation of learning? This invited speaking will introduce augmented reality as an emerging trend in education, provide an overview of its current development, and also explore examples of AR implementation in both higher-education and industry. In particular, this presentation will showcase AR-related projects completed by graduate students at the Learning Design and Technology program of San Diego State University.

References

[1]   Greenwood, A. & Wang, M. J (In Press). Augmented reality and mobile learning. In H, Crompton and Traxler, J (Eds.), Mobile learning in Higher Education: Challenges in Context. Routledge.

[2]   Gredvig, J., Larson H., Ridolfi P., & Romenesko, E. (2011) Augmented reality and learning. Internal report, Learning Design and Technology, San Diego State University.

[3]   Novak, D., Wang, M. J., Callaghan, V., & Zhao, X. L. (2012). Looking in, looking out: A discussion of the educational affordances of current mobile augmented reality technologies. In J.Y. Jia (Ed.), Educational stages and interactive learning: From kindergarten to workplace training (pp. 92-106). Hershey, PA: IGI Publishing.