Virtual Reality Stereoscopic 180-Degree Video-Based Immersive Environments:
Applications for Training Surgeons and Other Medical Professionals

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EXECUTIVE SUMMARY

The theoretical and practical applications of immersive VR, although relatively new, have accomplished much in the area of pedagogical learner applications. This chapter describes the conceptual framework and Revinax® 180-degree stereoscopic video-based approach in addressing the academic achievement gap through conventional surgical students and nurses shadowing and how immersive VR environments may best address leveraging the learner's capability of increasing their skill acquisition, learning, and knowledge retention in a more efficient time-period, circumventing the inherent issues with conventional shadowing. Further, these VR experiences through

first-person Point of View (POV), although simulated and artificial, evoke mirror neurons, and can recruit neurocircuitry that are imperative for skill acquisition and later skill application. As such, the Revinax® instructional design model may provide a unique insight in how to use immersive VR environments to teach any learner that seeks to acquire surgical/medical professional training more efficiently and practically in a modern world of technology.

INTRODUCTION

New technological programs, tools, and devices often create excitement and curiosity as people seek to learn about new technologies and their potential future applications. This is especially true for individuals that given their specific job/training roles, could find ways in which technology can help them complete their work more effectively and efficiently. Thus, it is not surprising that many educators and future generation learners are currently increasingly exposed to pedagogical approaches targeted at technology-dependent learning instruction over conventional approaches. Such modern pedagogical technology-dependent approaches have already begun, yet as many emerge, a clearer understanding of their utility, generalization, and translational application(s) from the learning environment into real-world contexts, become the greatest sought after outcome measure. Further, some of these technology-dependent applications may be less educationally immersive (*e.g.,* avatar simulations, 2-D video simulations, passive video recording instruction, etc.), while others can be more educationally immersive (*e.g.,* virtual reality [VR], stereoscopic first-person point-of-view [POV] instruction, etc.). Therefore, during such a technologically expansive, exciting, and necessary time-period, educators are seeking novel and effective approaches for elucidating which technological programs, tools, and devices would be best suited for their pedagogy is warranted. In order to shed light on this very issue, the present study offers an unbiased assessment of how VR can be used in novel evidence-based ways for assessing educational training of surgeons and other medical professionals.

As such, VR has evolved significantly from its inception in the 1950s (*For Review See* Mandal, 2013) and is presently emerging as a versatile pedagogical tool that can be used to train surgeons more effectively and efficiently across a number of medical interventions (Alaker, Wynn & Arulampalam, 2016; Vaughn, Dubey, Wainwright & Middleton, 2016; Aim, Lonjon, Hannouche & Nizard, 2015; Ragan et al., 2015; Anderson, Winding & Vesterby, 2011; Gurusamy, Aggarwal, Palanivelu & Davidson, 2008; Aggarwal et al., 2007; Haque and Srinivasan, 2006). Despite the fact that VR encompasses a wide range of user experiences that are appropriate