APPLICATIONS OF VIRTUAL REALITY MODULES FOR MINING ENGINEERING EDUCATION

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BSTRACT

Professional engineers need to be able apply university learning to practice. In rticular, they have to take responsibility for teractions between technical systems and e complex social environments in which they perate. The most effective way of building is competency is through active experiential arning. The School of Mining Engineering at e University of New South Wales (UNSW) has eveloped and deployed immersive, interactive mulations for both the Australian mining gineering education and the mining industry. his paper will discuss the contribution that s been done by the School of Mining gineering in the education sector through e immersive and interactive simulations. The hool has developed an advanced educational tegrated simulation system to provide mining gineering students with an interactive and mmersive learning experience that is not herwise possible.

NTRODUCTION

The relevance of using simulations in the assroom has already been indicated in earlier udies [1, 2, 3, 4, and 5]. Brookfield [6] noted at the effects of simulation and role-playing students "involves the whole person-tellect, feeling and bodily senses - it tends to e experienced more deeply and remembered nger". Meyers and Jones [7] reported that udents who use simulations are "forced to ink on their feet, question their own values d responses to situations, and consider new ays of thinking".

The computer-generated three-dimensional D) artificial worlds are commonly referred to virtual environments [8]. Squelch [9] defines rtual Reality (VR) as "3D computer generated presentations of real or imaginary worlds with hich a user can have real-time interaction and perience some feeling of being present in ose worlds". The key to all simulations is the teractive experience gained by the trainees 0]. VR training has a number of advantages er existing traditional methods including larger amount of data collection during aining, comprehensive review of a participant's performance, and systematic development of a trainee's skills. Mallet and Unger [11] summarised in their paper the organisations involved in VR in mining industry in the USA. Mallet and Orr [12] have developed the Underground Coal Mine Map Reading Training while Lucas et al. [13] conducted research to prevent injuries and fatalities related to conveyor system through the use of virtual environments. Similarly, McMahan et al.

[14] researched on training workers in pre-shift inspections of haul trucks to avoid preventable defects from causing worker injuries and expensive equipment damage. Stothard et al. [15] developed a taxonomy providing insight into where technology can and may be implemented in the future, as virtual environments are a dynamic and evolving technology. Bednarz et al.

[16] demonstrated possible VR applications to deliver an interactive environment for users in the mining industry using collaborative scenarios.

1. EDUCATIONAL MOTIVATION USING SIMULATIONS IN ENGINEERING

Bell and Fogler [17] state that students learn best when a variety of teaching methods are used, and that different students respond best to different methods. Figure 1 shows the average retention rates of various teaching and learning methods. VR based techniques have the potential to revolutionise education in the mining industry when used in conjunction with contemporary teaching techniques such as class discussions, group projects and problem-based learning. These education techniques are more attractive to students as they are flexible, attractive and easier to understand - especially in mining where it can be difficult to demonstrate complex mining methods through the use of two-dimensional diagrams [18].

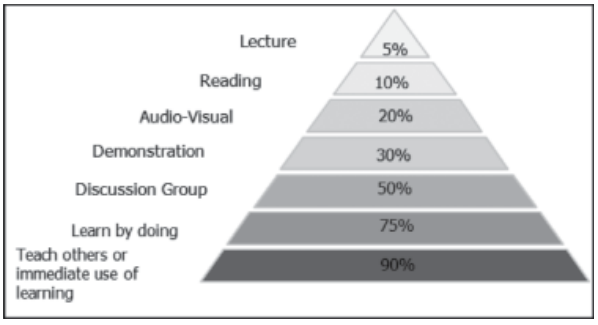

Fig.1. Average retention rates [19]