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Guiding Exploration Through Three-Dimensional Virtual Environments: A Cognitive Load Reduction Approach

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The real-time interactive nature of three-dimensional virtual environments (VEs) makes this technology very appropriate for exploratory learning purposes. However, many studies have shown that the exploration process may cause cognitive overload that affects the learning of domain knowledge. This article reports a quasi-experimental study that investigates the effects of guiding the exploration through three-dimensional VEs on learning. The results of this study show that the inclusion of additional navigational aids (tracer and directional arrows) to guide the exploration through VEs provides significant learning effects when compared with the use of VEs that do not provide such aids. These results are discussed with respect to theories related to cognitive load.

To date, there are various types of Virtual Environment (VE) systems, ranging from the expensive and high fidelity immersive systems to the more affordable but lower fidelity non-immersive systems. This article focuses on the non-immersive system. Such a system can be defined as an interactive three-dimensional computer generated visual and auditory environment that can be manipulated. It is implemented through a conventional personal computer without the need of any additional peripheral. This article also uses the term "VE-based learning environment" to refer to a learning environment that incorporates three-dimensional VE as well as other multimedia elements, such as text and images, onto a web interface.

Figure 1 shows a screenshot of the VE-based learning environment that was used in this study. This learning environment was designed and developed for