

## An effective virtual laboratory approach for chemistry

### ABSTRACT

Virtual laboratories, currently used as an approach to virtual learning, have long been adopted in the teaching and learning process in many schools. The objectives of this paper are to develop a multimedia virtual reality laboratory for Chemistry (VLab-Chem) and to conduct an effectiveness testing on the virtual laboratory approach. The VLab-Chem was developed based on the Cognitivist-Constructivist-Contextual Life Cycle Development model (KHK3-VLab-Chem). The effectiveness testing of the virtual laboratory VLab-Chem was conducted based on the quasi-experimental approach, adopting the ethnographic observational technique, through a case study of a Smart School in Melaka. The study involved two groups, Control (K) and Experimental (E) groups, and the t-test measurement was adopted. Results indicated that the Experimental group (E), who underwent the teaching and learning process using VLab-Chem had a higher achievement level in comparison with the control group (K), who experienced the conventional approach to teaching and learning. This paper implies the effectiveness of the VLab-Chem in a chemistry classroom. For future work, it is recommended that the instructional design (ID) model of VLab-Chem includes the three-dimensional (3D) setting through immersive technology during an experiment by using Data Glove or Head-Mount Display (HMD). This would allow users to experience touching the equipment and materials with their own hands.

**Keyword:** Virtual learning; Virtual laboratory; Chemistry education; Cognitivist-constructivist-contextual approach