Chapter 5
The Affordances of Virtual Learning Environments in Remote Chemistry Learning

Mafor Penn
University of Johannesburg, South Africa

Umesh Ramnarain
University of Johannesburg, South Africa

ABSTRACT

Today, virtual learning environments (VLEs) are increasingly valuable for mediating teaching and learning in higher education. This chapter reports the affordances of VLEs in remote chemistry learning. The effects of VLEs versus remote lectures on students' achievement scores in chemistry content tests were compared, and the affordances of VLEs for 21st-century chemistry learning were investigated. This research aimed to investigate the impact of VLEs when learning chemistry remotely and answer some questions about their affordances in the fourth industrial revolution (4IR). Fifty pre-service science teachers (also referred to as students) from a South African university participated in the studies. A mixed methods approach with a quasi-experimental design was preferred. Pre-and post-tests were used to evaluate achievement scores for control and experimental groups, while focus group interviews were used for data gathering in reflection. Results showed a positive shift in achievement scores of the experimental group compared to the control group.

DOI: 10.4018/978-1-6684-6932-3.ch005

INTRODUCTION

At the onset of the COVID-19 pandemic, several students globally were compelled to learn in diverse virtual learning environments (VLEs) due to the restrictions imposed by a series of lockdowns. VLEs are learning spaces, usually online or offline, embedded with simulations, demonstrations and illustrations of scientific processes and systems (Limniou & Smith, 2010). What makes VLEs unique is the addition of learning activities that scaffold a learner's use and interactions with the embedded content (Chamberlain et al., 2014). The experiences of the global response to the COVID-19 pandemic enforced the consideration of new ways of teaching and learning in several educational settings (Asim et al., 2020). While the world as we know it will never revert to pre-COVID-19 conditions, VLEs have become more attractive for researchers and educators alike (Alves et al., 2017). As the world increasingly transforms into a digital village, using available technological tools in science teaching and learning is inevitable for teachers and students alike. This is because 21st-century learners tend to rely on technology to attain diverse learning goals (Alves et al., 2017; Reisoğlu, et al., 2017).

In the case of chemistry education, where laboratory-based learning is a must-have and abstract concepts are usually difficult to comprehend from just engaging with text, diagrams and equations, it becomes questionable how VLEs can help students learn the subject in remote settings. Learning difficulties in chemistry typically revolve around students' poor visualisation of concepts like atoms, electrons, reactivity, molecules, and other micro-scientific phenomena (Faour & Ayoubi, 2018). This chapter firstly breaks down a series of sequential findings from first comparing VLE-based chemistry learning experienced by an experimental group of pre-service teachers (PST) against a control group of PSTs that engaged in lectures only. Secondly, the chapter looks at the same group of participant PSTs' perceptions and reflections on the affordances VLEs for 21st-century science learning. Some future directions are also suggested based on this study.

BACKGROUND

The working definition of VLES in the current chapter is as follows: A virtual learning environment (VLE) is an educational Web-based platform for the digital aspects of a course or module, usually situated in an institutional platform. VLEs present resources, activities and interactions within the module structure and provide for the different stages of assessment. VLEs also usually report on participation; and have some level of integration with other institutional systems (Britain & Oleg, 1999).

The Affordances of Virtual Learning Environments in Remote Chemistry Learning

Mafor Pennand Umesh Ramnarain (2023). *Fostering Science Teaching and Learning for the Fourth Industrial Revolution and Beyond (pp. 105-122).*
www.irma-international.org/chapter/the-affordances-of-virtual-learning-environments-in-remote-chemistry-learning/326211