Developing 3D Acoustic-based Virtual Environments for the Teaching of English Vocabulary to Visually-Impaired Learners

Kee-Man Chuah *
Faculty of Language and Communication, Universiti Malaysia Sarawak
Email: kmchuah@unimas.my

Radina Mohamad Deli
Faculty of Language and Communication, Universiti Malaysia Sarawak

Chwen-Jen Chen
Faculty of Cognitive Sciences and Human Development, Universiti Malaysia Sarawak

* Corresponding Author*

Abstract
Purpose: Many researchers have revealed how extensive repertoire of vocabulary is capable of expanding learners' language competence or mastery. Various computer-based tools have been proposed to improve vocabulary learning among English language learners but almost none of those tools focused on visually-impaired learners. While they may be the minority in academia, assistive technology in helping them to acquire vocabulary especially for academic purposes is equally crucial. This study proposes the use of 3D acoustic technology in creating virtual environments for the visually-impaired learners to learn vocabulary in context. Since they are unable to depend on visual cues like normal learners, the 3D sounds play a vital role in triggering their cognitive ability in generating mental representations for the accurate use of specific words.
Design/methodology/approach: The study was divided into three phases. In the pre-development phase, a thorough investigation of suitable scenarios to be created was conducted by involving the visually-impaired learners. In the development phase, the identified scenarios were developed using 3D acoustics, which were then assembled to form interactive virtual environments specific to the context of the vocabulary. Subsequently, in the initial evaluation phase, the developed learning environments were tested on 5 visually-impaired learners.
Findings: The preliminary findings revealed the potential use of learning environments based on 3D acoustics in teaching the visually-impaired learners vocabulary. Instead of depending on braille, they noted how it helped to created mental representation of the words.
Research limitations/implications: The prototype was tested by a confined set of respondents. The outcome of this study has highlighted the need to further assist visually-impaired learners in learning vocabulary through novel means.
Practical implications: The study revealed critical steps in improving the design of virtual learning environments using 3D sounds.
Originality/value: The prototype incorporated a novel integration of 3D-sound technology and its method will be patented.

Keywords: 3D Acoustic, Vocabulary Learning, Assistive Technology