Chapter 9
The Use of Augmented Reality to Promote Equity and Inclusion:
A Case of Teaching and Learning Graphical Communication and Graphical Techniques in the Technology Classroom

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ABSTRACT

The Fourth Industrial Revolution has impacted the educational sector, thus providing an array of digital technologies, which have become effective, efficient, and innovative media for transmitting knowledge and skills in contemporary times. The purpose of this study was to explore the experience of technology teachers on the use of augmented reality when teaching graphic communication and graphic techniques. This study used a qualitative research approach using semi-structured and observation as data sources. It purposively sampled five teachers who were interested in the use of augmented reality to teach, as such, TPACK was used as its framework. The findings revealed that technology teachers, to a great extent, cannot integrate augmented reality tools during the teaching and learning of graphical communication and graphic techniques. This chapter recommends that the Department of Education should create more opportunities that will expose teachers to these technological advances that are substantive to graphical communication and graphic techniques of learning.

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INTRODUCTION AND BACKGROUND

The educational sector has been profoundly impacted by the Fourth Industrial Revolution (4IR), which has given rise to a variety of digital technologies that are now efficient, effective, and a novel means of disseminating knowledge and skills in the modern society (Grand-Clement, Devaux, Belanger & Manville, 2017). The introduction of these digital technologies into the teaching and learning environment has been attributed to a number of factors. The desire to promote inclusive education, to ensure educational equity, to improve learning outcomes, increase access to learning, and boost learner motivation are some of the justifications (Bower, 2014). Universally, scholars have continued to explore the educational potential of these emerging digital technologies (Punar Özçelik, Yangin Eksi & Baturay, 2022; Molnár, Szűts & Biró, 2018). Their findings indicate that ABSTRACT to complex concepts that are difficult to explain in the classroom could be brought to life with interactive, multimedia information that is more engaging for learners. A prime example of a tool which provides such information is the Augmented Reality (AR) interface technology (Kaenchan, 2018).

Augmented Reality is referred to as a technology that enables virtual elements to be embedded into a real environment and run interactively in real time (Bower, Howe, McCredie, Robison & Grover, 2014; Azuma, Baillot, Behringer, Feiner, Julier & MacIntyre, 2001). It can also be referred to as a system that supplements real world objects or environments with virtual elements. Thus, it has been used in various fields such as entertainment, medicine, military, engineering design, and manufacturing (Berryman, 2012; Azuma, et al, 2001). Augmented Reality fundamentally means interaction with 3D prototypes (Cook, 2019). This is the very characteristic of Augmented Reality that makes it efficient and effective for the teaching and learning of graphical communication and graphic techniques concepts in senior phase technology subjects. Augmented Reality allows users to have an immersive experience with the diagram they are viewing (Potthast, Grimm, & Rubart, 2022; Scholz, & Smith, 2016). Globally, the use of Augmented Reality as an innovative vehicle to deliver ABSTRACT or complex concepts such as graphical communication and graphic techniques has caught the attention of many researchers.

Fundamentally, the concept of graphical communication and graphic techniques lays foundation for various forms of drawings. These forms of drawing include Engineering Graphics and Design (EGD), Technical Drawing (TD), and Engineering Drawing (ED). The graphical communication and graphic techniques concept is divided into three components (Curriculum and Assessment Policy Statement (CAPS) for Grade 7-9 Technology). Firstly, it is concerned with free-hand sketches in the design stage. Secondly, it is concerned with the working drawings in the making stage, using formal drawing techniques in line with conventions. Lastly, it is related to artistic impressions in the communication stage, using artistic techniques such as perspective, texture rendering, shading, colours, and shadow to advertise the product to potential users. As a result, the teaching and learning of graphical communication and graphic techniques must lay a solid foundation for other more advanced concepts.

Kola (2019) propounds that, unlike Mathematics and English, Technology, as a subject, is still under-developed in South Africa. Consequently, there are still challenges that are faced by learners, teachers, and the Department of Basic Education (DBE). According to DBE (2011), one of these challenges is the issue of unqualified and/or underqualified teachers, with some teachers holding outdated qualifications. Additionally, some teachers fail to create discourse when they are teaching the concept of drawings (Mtshali, 2021). Despite the challenges experienced in Technology education, the concept of graphical communication and graphic techniques is vital and must be taught effectively.