

Chapter 4

A Design of Interactive Learning Applications for Phytochemical Screening in Vocational College: Augmented Reality and Gamification

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ABSTRACT

The challenges of practicum learning for the vocational institute are increasingly prominent. Innovation is needed to utilize technology and learning media to support distance learning and adaptive learning. Phytochemistry Practicum, a course given in the third semester of the Pharmaceutical and Food Analysis Department of Poltekkes Kemenkes Jakarta II, provides knowledge and skills to analyze chemical compounds in plants. This study aimed to develop interactive learning media for remote practicum of phytochemical screening materials at the Pharmaceutical and Food Analysis Department of Poltekkes Kemenkes Jakarta II. The methods used in this study were descriptive exploratory for laboratory experiment, multi-media development life cycle (MDLC) for AR development, and game development life cycle (GDLC) for building the gamification system. The augmented reality application and education game have been published in Playstore under the name AR Fitokimia and Virtual Lab Fitokimia. Both of these products were able to be accessed easily through mobile devices.

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INTRODUCTION

The phytochemical subject is a compulsory course for second-year diploma students (third semester) in the Pharmaceutical and Food Analysis Department of Poltekkes Kemenkes Jakarta II. One of the learning materials is the phytochemical screening of *Simplicia*, such as alkaloid screening, glycoside screening, flavonoid screening, saponin screening, steroids-triterpenoids, and tannin screening.

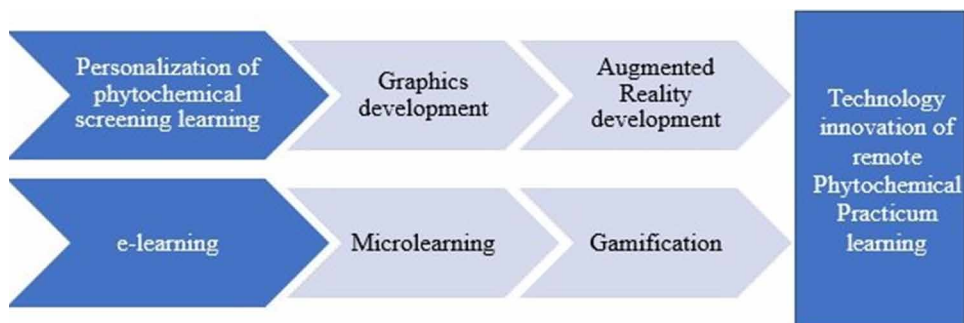
Mobile learning application in the phytochemical area is limited. Research on AR technology in the learning of phytochemicals had not been conducted. It is essential to develop intelligent learning objects to assist students in practical laboratories from the experimental results of phytochemical screening by designing a mobile AR application (Srivastava, 2016).

This research aimed to enrich teaching materials for Phytochemical Practicum courses in Pharmaceutical and Food Analysis Department of Poltekkes Kemenkes Jakarta II by applying Augmented Reality (AR) technology and optimizing smartphone usage. In particular, this study aimed to obtain interactive learning media in the form of marker-based mobile applications and to obtain the results of testing trials for learning Phytochemical Practicum in Poltekkes Kemenkes Jakarta II. The AR technology-based learning media were expected to introduce experimental results interactively and efficiently so that students could observe in detail and make remote practicum easier and fun.

The authors tried to study the format of microlearning media that teachers can use as a form of innovation in the learning process. Based on the results of the preliminary data survey held in 2020 and 2022 as explained in this chapter, the authors needed to develop learning applications with various features to meet the needs of remote practicum learning. These studies are in line with the research topic required in the research roadmap of the team for the period 2020-2024, which is the development of learning technology (Figure 1). Completing the research roadmap for the innovation of phytochemical practicum learning is the background of the research team to develop two Android-based applications that are proposed to students in the same course.

The utilization of gamification in learning phytochemical practicums can hopefully facilitate students in understanding the phytochemical screening procedures for alkaloid compounds, glycosides, flavonoids, saponins, and tannins in mobile technology and virtual laboratory environments and can improve student learning outcomes. Marker information for the augmented reality application is added to the game's material features to enrich the understanding of phytochemical screening results. The research program aimed to design virtual laboratory applications based on gamification for the phytochemical screening materials.

Figure 1. State of the art chart and research roadmap



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