



## Design Application GM3-Bacterial© Application Based on Android Smartphone for Bacterial Identification

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### Abstract

Digital technology continues to develop along with the times, such as Android smartphones. Android smartphones are a new innovation in the identification of bacteria carried out in the Microbiology and Biotechnology Laboratory. Identification of bacteria in the Microbiology and Biotechnology laboratory is usually done manually using various substances, is expensive, has to do a lot of tests, and has to grow bacteria in vitro in a growth medium. In addition, the inaccuracy of the results of bacterial identification if the bacteria tested show unique and different biochemical characteristics and do not match the characteristics of the genus of the species being tested. Human error also occurs during the identification of bacteria and it takes a long time to find out the results of bacterial identification. The specific objective of the research is to produce an innovative GM3-Bacterial© application based on Android smartphones for bacterial identification. The research method is the GM3-bacterial© application initial display design and design prototype GM3-bacterial© application. The results showed that the design of the GM3-bacterial© application prototype design application had been successfully carried out. The GM3-Bacterial© application based on Android smartphones has been successfully designed using the Software suite for building GM3-bacterial© applications. The GM3-Bacterial© application is based on an Android smartphone for the identification of bacteria such as the recognition of morphology, biochemical properties, and types of bacteria.

Keywords: bacterial identification, prototype, GM3-bacterial© application

### Acknowledgments:

Thank you to all those who have helped carry out this research.

### For citation:

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Megahati, R. R. P & Azhar. (2022). Design Application GM3-Bacterial© Application Based on Android Smartphone for Bacterial Identification. *Journal of Digital Learning and Distance Education*, 1(1): 42-46.

## Introduction

In the era of the industrial revolution 4.0, the use of digital technology-based visualization is used as a means of research to be more effective, efficient, interactive, attractive, and low-cost (Zhong et al., 2017); (Witkowski, 2017). Digital technology is a technological innovation used to meet human needs that aim to simplify, streamline and streamline various human activities or work (Chien, 2014); (Christensen et al., 2018). Digital technology continues to develop along with the times, such as interactive multimedia, digital video, animation, podcasts, augmented reality, virtual reality, game-based learning, gamification, and Android mobile smartphones. Android mobile smartphone is a smartphone working system that uses the Linux 2.6 Kernel which includes an operating system, middleware, and applications (Kirthika, 2018). Android growth in Indonesia reached 89%, this is because the Android operating system allows users to get various benefits and use applications.

Applications based on Android mobile smartphones are becoming a new paradigm in problem-solving and work and academic activities. In addition, the Android mobile smartphone-based application is a new innovation in the identification of bacteria carried out in the Microbiology and Biotechnology Laboratory. Identification of bacteria is the introduction of morphological forms, biochemical properties, and types of bacteria (Indriati et al., 2018). Identification of bacteria in the Microbiology and Biotechnology laboratory is usually done manually using various substances, is expensive, has to do a lot of tests, and has to grow bacteria in vitro in a growth medium. In addition, the inaccuracy of the results of bacterial identification if the bacteria tested show unique and different biochemical characteristics and do not match the characteristics of the genus of the species being tested. Human error also occurs during the identification of bacteria and it takes a long time to find out the results of bacterial identification. This happens because the area of the bacterial domain is between 10,000 and 1 billion which have almost the same characteristics (Alias et al., 2018).

We need an application to identify bacteria quickly, effectively, efficiently, and at a low cost. The specific objective of the research is to produce an innovative GM3-Bacterial© application based on Android mobile smartphones for bacterial identification. The utilization of ICT in the field of research is very important in order to improve the quality of research, especially in the field of Microbiology. In addition, the use of ICT in the field of research can align Indonesian researchers with researchers in foreign countries. The Microbiology Laboratory is a place used for various microbiological research activities, such as growing microbes, bacterial culture, fragmentation, and identification of bacteria. Identification of bacteria can be carried out easily when using the application that will be designed in this study. The GM3-Bacterial© application based on Android mobile smartphone is an interactive application that can be used to identify and test bacteria quickly, efficiently, and at a low cost.

## Methodology

GM3-bacterial© Application Initial Appearance Design. Some of the software used in this research are:

1. Android studio
2. Xampp for Windows
3. MySQL

4. JavasPhp
5. Microsoft Word 2019
6. Google Chrome
7. Notepad++
8. Android - JSON Parser (JSON)

The design of the software circuit can be seen in Figure 1 below:

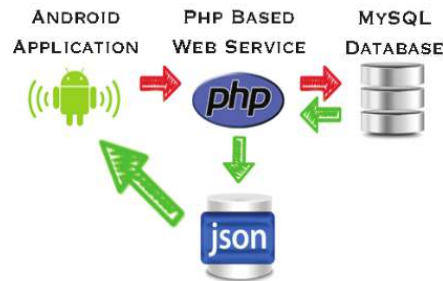


Figure 1. Software suite for building GM3-bacterial© applications

GM3-bacterial© Application Prototype Design.

Making the GM3-bacterial© application prototype consists of several stages, namely:

1. The layout of the planning plan
2. Navigation buttons
3. The design includes a database of 25 morphological and biochemical tests
3. Design and enter Help text
4. Insert background
5. Beautify the look with animations and add notifications when the app is closed
6. Test and evaluate in running the product.

## Results and Discussion

The prototype design of the GM3-bacterial© Application has been successfully carried out (Figure 2). The prototype design of the GM3-bacterial© Application consists of navigation buttons, identity text, description text, and the main menu.



Figure 2. The prototype design of the GM3-bacterial© application

Prototyping is an important part of the initial design of product development and is developed into a usable product (Elverum et al., 2016; Luff et al., 2018). Several researchers have developed mobile applications based on an Android prototype to improve the learning process (Dollah et al., 2017; El-Sofany et al., 2014; Eppard et al., 2019). Furthermore, the prototype was refined into instructional media based on Android smartphones.

Prototyping is an activity carried out in developing a new product and cannot be explored formally before the product is finished. Research on product development begins with the early stages of design, such as concept generation and design sketches. When making prototypes within the framework of making prototypes starting from topics about the technical elements of the design intended for allocation and management of resources. Although there are many taxonomies, models and frameworks still lack knowledge about the nature of the prototype because it is complex and dynamic nature (Lauff et al., 2018).

The GM3-Bacterial© application based on Android mobile smartphone is an interactive application that can be used to identify and test bacteria quickly, efficiently, and at a low cost. The GM3-Bacterial© application based on the Android mobile smartphone which will be designed has 25 morphological and biochemical test databases of bacteria. The database is based on Bergey's Manual of Determinative Bacteriology. The GM3-Bacterial© application based on Android mobile smartphones can help researchers identify bacteria. Thus, this application product is feasible to be produced to answer the challenges of the 4.0 industrial revolution era, as a positive impact and breakthrough from the advancement of Information and Communication Technology (ICT).

## Conclusion

The GM3-Bacterial© application based on Android smartphone has been successfully designed using the Software suite for building GM3-bacterial© applications. The GM3-Bacterial© application based on Android smartphone for the identification of bacteria such as the recognition of morphology, biochemical properties, and types of bacteria.

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