

# THE DEVELOPMENT OF VIRTUAL REALITY-BASED E-LABORATORIUM FOR TECHNOLOGY EDUCATION TO SUPPORT GREEN CAMPUS AND LOW-COST EDUCATION

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## ABSTRACT

### ABSTRAK

Technology Education is recognized as high-cost education since it requires technology laboratories equipped with a variety of sophisticated and costly equipment and materials. In addition, the implementation of higher education, especially in the field of technology needs to achieve the status of a green campus. Learning in laboratories and workshops is identical with noises, waste, and discomfort. These two things are always labeled to the technology education program. There needs to be a special breakthrough to break the stigma that technology education programs are expensive and does not consistent with the green campus program.

This study aims to develop a technological laboratory that is notoriously expensive and produces laboratory waste. The breakthrough is utilizing electronic-laboratory system (e-laboratory). The long-term goal of this study is to achieve technology education which supports green campus and low-cost education through e-laboratory. Using this e-laboratory the students will experience being in a traditional laboratory and can do an exploration of the required competencies without being limited by space and time.

This e-laboratory development uses virtual reality with the Android operating system thus it is compatible with the smartphones used by technology education operators. This study is conducted in three stages in the Computer Application Laboratory of Faculty of Engineering UNY. **The first stage** is the development of educational technology learning content which in this study will be sampled by the digital control system laboratory, and it can be further developed for various types of other technology education laboratories. **The second stage** is the development of the e-laboratory software through virtual reality with the Android-based operating system. The second stage ensures that the operating system supports all brands of smartphones and types of hardware of electronics glimmers that the users use in operating the e-laboratory. **The third stage** is to conduct the feasibility testing and measurement by experts, teachers, technicians, and students in the subject of digital control system. These objectives of this study are to: (1) develop the learning content of technological education with a sample of digital control system laboratory, then it can diversify in other subjects. (2) develop e-laboratory software with virtual reality using the Android-based operating system. E-laboratory is certainly able to reduce the cost of education, especially for the procurement of equipment and materials and improve the practices of the green campus program since there is not laboratory waste. (3) the feasibility resting and measurement of the e-laboratory is conducted by experts, teachers, technicians, and students in the digital control system laboratory. (4) improve the independence of the students to explore competence without limited space and time. The results of the study are: (1) obtaining a package of learning content that is supported with e-laboratories, (2) obtaining new user-friendly and reachable software based on virtual reality and Android operating system for students, educators, and technicians. (3) building a virtual reality-based e-laboratory thus the students are able to access the e-laboratory without the limitations of space and time, (4) obtaining the competence of the students because it can explore the content of practice learning in the e-laboratory without the limitations of space and time. In addition, patent filings, international journals article publications are also achievements targeted in this study.

Kata Kunci: *e-laboratory*; *technology education*; *virtual reality*