

*PHAGO PHARMACOLOGY ON THE GO. GAMIFICATION APPROACH IN CASE
LEARNING PROCESS*

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ABSTRACT

Learning process among medical students have developed along with technological advances so that it can be useful for users. One of the breakthroughs in the world of medical education is the development of serious games using multimedia technology that are relatively small in size so that they can be accessed using computers or devices named Pharmacology on the Go (PHAGO). The implementation stage was done by testing prototype game on 88 users since October 20, 2021. Evaluation was done by using a feedback questionnaire for PHAGO users, shows 79 (89.8%) users who agree and strongly agree that the PHAGO application helps users understand the use of Pharmacology for clinical application. The results of the Wilcoxon test in evaluating the increase in students' knowledge with Pre Test and Post Test showed that there was a significant difference ($p = 0.000$). The existence of serious game stimulates an active learning process to create a learning environment that encourages the development of interpersonal, communication and problem solving skills. PHAGO is expected to be a forum that supports students to be able to independently study pharmacology in a fun and easy-to-understand way.

Keywords: Medical education ; Pharmacology ; Serious games ; Active learning process

ABSTRAK

pengembangan permainan interaktif farmakologi menggunakan teknologi multimedia yang relatif berukuran kecil sehingga dapat diakses menggunakan komputer maupun gawai dengan judul *Pharmacology on the Go* (PHAGO). Tahap penyelenggaraan berupa uji coba *prototype games* pada 88 responden mahasiswa sejak 20 Oktober 2021. Evaluasi menggunakan kuesioner umpan balik bagi pengguna PHAGO, menunjukkan 79 (89,8%) responden yang menyatakan setuju dan sangat setuju bahwa aplikasi PHAGO membantu responden dalam memahami penggunaan Farmakologi untuk aplikasi klinis. Hasil Uji Wilcoxon dalam mengevaluasi peningkatan pengetahuan mahasiswa dengan PreTest dan PostTest menunjukkan terdapat perbedaan nilai yang signifikan ($p = 0,000$). Adanya permainan interaktif tersebut memacu proses pembelajaran aktif sehingga tercipta lingkungan belajar yang mendorong perkembangan interpersonal, komunikasi dan kemampuan *problem solving*. PHAGO diharapkan dapat menjadi wadah yang mendukung mahasiswa untuk dapat belajar mandiri farmakologi dengan cara yang menyenangkan dan mudah dimengerti.

Kata kunci: Pendidikan kedokteran ; Farmakologi ; *Serious games* ; Proses pembelajaran aktif

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BACKGROUND

Pharmacology is one of the fields of medical science that must be mastered by students during medical and pharmacy education. Pharmacology acts as the basis for selecting patient therapy with the principle of rational use of drugs.(1,2) Based on the 2012 Indonesian Doctor Competency Standards, a general practitioner must have the competence to properly diagnose and manage hypertension.(3) However, based on data on the value of undergraduate students in Medical Education at the Widya Mandala Catholic University Surabaya (WMCUS) Faculty of Medicine, Surabaya in 4.1 Cardiovascular System 2 Academic Years 2017/2018 to 2020/2021, the graduation rate is in the range of 60-70%. This encourages lecturers to be able to create new breakthroughs in teaching and learning process according to technological developments.

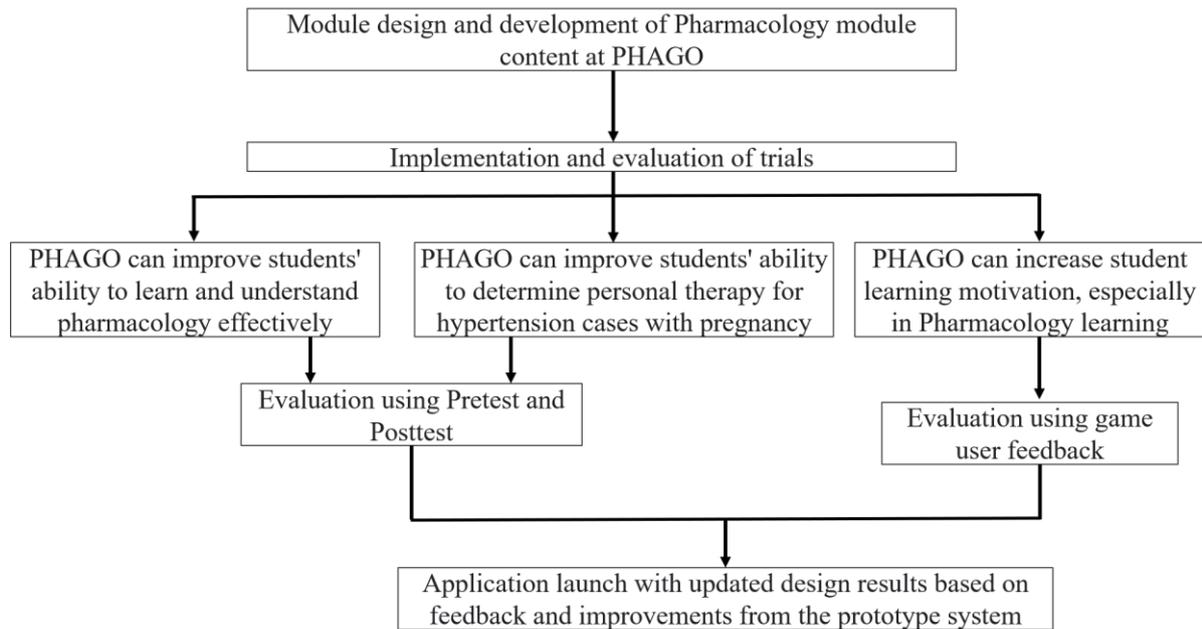
The development of technology is currently growing rapidly, especially in the area of information and computer technology (ICT), in all aspects of life, including the medical learning process.

Learning technology with an Augmented Reality (AR) system, namely the addition of virtual content that visualizes real life so as to create a perception of reality to users, has the potential to develop realistic learning experiences in the medical field. (4) Traditional learning systems have low retention rates, so the use of serious games is an effective method to increase retention and encourage the learning process by creating a dynamic learning environment.(5) Therefore, through the Digital Module Innovation activity, the author developed a serious interactive pharmacology game titled Pharmacology on the Go (PHAGO) which supports students to be able to independently study pharmacology in a fun and easy-to-understand way.

MATERIAL AND METHODS

PHAGO is expected to be an interactive medium in pharmacology learning process for students at the WMCUS Faculty of Medicine and Pharmacy. Some of the development steps and evaluation methods to be carried out are as follows:

Picture 1. The development and evaluation process of PHAGO



The development process of this serious game is carried out for approximately 3 months and involves a third party game developer. The implementation stage of the Digital Module Innovation Program is in the form of testing prototype games for students from the WMCUS Faculty of Medicine and. There are 88 respondents who are actively willing to participate in the trial since PHAGO was first tested on October 20, 2021.

Trials are carried out directly to students by:

1. Respondents were asked to download and play PHAGO directly
2. Respondents were asked to fill out PHAGO questionnaires related to respondents' motivation to study Pharmacology after playing

PHAGO and suggestions to make PHAGO better.

3. For evaluation, pretest & posttest are conducted before and after respondents use PHAGO.

RESULTS

Evaluation using a feedback questionnaire for PHAGO users was carried out by 88 respondents from the WMCUS Faculty of Medicine and Faculty of Pharmacy. The data shows 79 (89.8%) respondents agree and strongly agree that the PHAGO application helps respondents in understanding the use of Pharmacology for clinical applications with 75 (85.3%) stating that it is helpful in terms of how to choose personal therapy. As many as 81 (92.1%) respondents stated that PHAGO helps respondents in retaining Pharmacology lessons so that it has

implications for the desire to study Pharmacology in greater depth after playing PHAGO. Regarding the benefits of PHAGO as an effective learning method regarding Pharmacology independent learning, 84 (84.1%) respondents agreed and strongly agreed so that respondents felt that the PHAGO application was very useful in helping to understand Clinical Pharmacology therapy, especially the selection of disease therapy.

Table 1. Distribution of Pretest and Posttest Score

	Pre Test	Post Test
Mean	32,98	48,09
Median	32,00	48,00
Minimum	12,00	16,00
Maximum	60,00	88,00
Std. Deviation	9,47	17,22

To evaluate the increase in knowledge, an analysis was carried out using the Pretest and Posttest systems on 81 of the WMCUS Faculty of Medicine students. The Pretest and Posttest were held online, using the Socrative application containing 25 questions which took place on January 24, 2022 and February 3, 2022. Based on the results of statistical analysis, it showed that the results of the Pretest and Posttest scores showed an abnormal distribution of data so

that the overall data Wilcoxon's test was performed. Wilcoxon test results showed that there were 65 students of the Faculty of Medicine who showed an increase in Posttest scores compared to Pretest scores with an average of 39.35. The test results showed that there was a significant difference between Pretest and Posttest among 81 students ($p = 0.000$). Evaluation in PHAGO had also done. Most of respondents gave positive feedback and asked for more variative clinical cases and pharmacology approach.

DISCUSSION

The current focus of education has shifted from basic sciences towards clinical and using an integrative approach. One strategy that can be used is an active learning process to create a learning environment that encourages the development of interpersonal, communication and problem-solving skills. One of the active learning processes that is quite developed in the era of technological development is the use of serious games. Serious games encourage an active learning process because of their interactive nature, where the user cannot complete the game without intervention, in contrast to the passive learning process where the teaching process will continue regardless of the listener's level of attention. (6,7) An interactive

serious game that provide case-based learning have the potential to support students learning and motivation in a playful and meaningful way. (8) In line with the results of the PHAGO evaluation, more than 85% of PHAGO users stated that this application was very helpful for students in understanding pharmacology concepts with comprehensive clinical approach.

Randomized Trial Research to compare the effect of knowledge level of 40 respondents after using virtual reality based serious game Basic Life Support with pretest and posttest methods showed a statistically significant increase posttest results. (9) Effective serious games encourage players to play leading a positive mood as well as better academic performances (10) According to our study, there was an increase in posttest score compared to the pretest score after using PHAGO. A meta-analysis study conducted in 2017 showed that students who were studying Science, Technology, Engineering, and Mathematics (STEM)-based education who carried out active learning showed an average increase in test scores of 6% compared to traditional lecturing.(11) A serious game encourages an active learning process through an interactive process so that users are invited to intervene something to complete the given task.(7)

Use of the Husenynov Antihypertensive drug Game (HAG) developed by the teaching team from the Faculty of Medicine, University of Padjadjaran showed that the number of students who showed an increase in knowledge was 1.8 times higher in the group who studied pharmacology using educational games than in the traditional learning group.(12) However, in this research data, there was still no data analysis comparing serious games group and traditional learning group as our study limitation.

CONCLUSIONS

Trial version of PHAGO application on 86 students from Faculty of Medicine and the Faculty of Pharmacy, Widya Mandala Catholic University, Surabaya, demonstrated a good results in terms of increasing motivation and knowledge, but in this research data there was no comparison of the differences in pretest and posttest scores between groups who studied Pharmacology using traditional learning compared to groups using serious games. Some suggestions related to the development of PHAGO include adding topics, questions and clinical cases in both clinic and emergency settings.

ACKNOWLEDGEMENTS

We thank Directorate of Learning and Student Affairs, Directorate General of

Higher Education, Ministry of Education, Culture, Research, and Technology for funding the development of PHAGO; Rector of Widya Mandala Catholic University Surabaya, Dean of the Widya

Mandala Catholic University Surabaya, Faculty of Pharmacy and Faculty of Medicine.

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