Interactive multimedia development for swimming learning and training

W Widiastuti1,*, I Sulaiman1, S Susilo1, H Hernawan1, M Mashud2, S Solahuddin3 and K Pradityana4

1 Faculty of Sport, Universitas Negeri Jakarta, Jl. Pemuda No.10, RT.8/RW.5, Rawamangun, Kec. Pulo Gadung, Kota Jakarta Timur, Daerah Khusus Ibukota Jakarta 13220, Indonesia
2 Physical education and Health department of faculty of teachers training and education, Universitas Lambung Mangkurat, Jl. Brigjen H. Hasan Basri, Pangeran, Kec. Banjarmasin Utara, Kota Banjarmasin, Kalimantan Selatan 70123, Indonesia
3 Department of Physical Education, Universitas Sriwijaya, Jl. Palembang Prabumulih KM.32, Palembang, South Sumatera Province, 30128, Indonesia
4 Physical education and Health department, Universitas Islam 45 Bekasi, Jalan Cut Meutia No. 83 Bekasi Timur 17113, Indonesia

* widiastuti@unj.ac.id

Abstract. The purpose of this research is to create interactive multimedia. This research and development uses Borg and Gall Research and Development (R&D) method which consists of 10 (ten) steps. The subject of this research was students of PJKR from three universities in three different areas in Indonesia. The subject of this research was students of PJKR from three universities in three different areas in Indonesia. The numbers of samples used to test the effectiveness of interactive multimedia are 45 people of experimental class and 45 people of control class. The research design used is the one group control pretest-posttest design experiment, the results of interactive multimedia development research show the value of Zcount (89 > -5,7622), which means that there are significant differences between before and after the utilization of interactive multimedia. From these results it can be concluded that the development of interactive multimedia can be applied by the community to facilitate swimming training.

1. Introduction

It cannot be denied that people who lived in 21st century are having a close connection with computer, hand phone and another digital device either on-line or off-line. The conventional way seems to be forgotten in this modern era. A digital device also has big role in the education field. Especially, computer, it is used to make the learning process, administration, and educational bureaucracy become easier to do. In addition, the computer is able to make an interaction with high accuracy, work with quick and efficient, and save a data in a large amount. One of the benefits of computers is to display videos more efficient and high quality. The utilization of computer based video has became a necessity to facilitate human activities, one of which is to support learning and training. The use of multimedia instructions in the learning environment is becoming common over the last two decades [1]. Multimedia
has proven to be beneficial to learning as exemplified by some empirical studies on the case for using videos in teaching and learning. It has resulted in valuable collaborations, communication and reflections among learners as well as instructors [2–4]. However, the utilization of multimedia in the swimming training and learning process has not been optimally developed, whereas in fact the use of multimedia in swimming will help improve one's comprehension of swimming techniques. The knowledge of swimming techniques must be possessed before doing the exercises in the pool as a safety measure to reduce the risk of injury. The multimedia utilization has been widely developed in this decade, it is used as an alternative to change the conventional methods. Helping society move toward a vision of lifelong and on-demand learning [5]. It has become one of the fastest-moving trends [6] and aims to provide a configurable infrastructure that integrates learning material, tools, and services into a single solution to create and deliver training or educational content quickly, effectively, and economically [7]. Thousands of online courses are now being offered. Not only can instructional material be made available on the Internet but online collaborative learning and discussions can also occur [4].

Multimedia is a varied and durable media that used in e-learning. Multimedia can provide information interestingly and consistently. Previous studies have examined the effects of instructional multimedia on learning outcomes [8]. However, the multimedia that used in the initial studies is still in the form of learning videos which mostly broadcasted throughout TV programs or stored on CD-ROMs. The linear nature of the instruction videos produces inconsistent results [9].

The latest developments of multimedia and communication technology have resulted good learning systems using instructional video components. This has been being the background of the existance of non-linear interactive digital video. Technology allows one to interact with video which can increase one's involvement to increase the effectiveness of learning [10]. There have been many studies that utilize technology such as the one that has been done by Jones and Jo which utilizes the advancement of streaming technology that enables rich media content to be delivered to students as a whole program or a specific segment anywhere and anytime while connected to the Web [11]. Another study was conducted by Hartsell and Yuen who developed instructional videos that sent to the server where it was connected to the LAN for playback [4]. In this research, interactive multimedia that can be accessed via a smartphone will be developed so that it will be easier for users to learn and practice swimming wherever and whenever.

2. Methods
This research is used Research and Development (R&D) method from Borg and Gall, it consist of 10 steps development; 1) the analysis of necessary and observation field, 2) the arranging of the research draft, 3) the development of initial product, 4) the trial of the initial step, 5) the revision of the initial product, 6) the first trial, 7) the product revision, 8) the main test to see the effectiveness of the product, 9) the final revision, 10) the dissemination and implementation.

The subject of this research is taken from the students who are majoring in Educational of body health and recreation (PJKR). These students are PJOK teacher’s candidate. The subject experiment of small group is taken from 15 students of PJKR from University A, whereas the experiment subject of large group is taken from 120 students (40 students from PJKR University A, 40 student from PJKR University B and 40 students from PJKR University C). In addition, the research samples for the sample product test were 90 students (45 students as the subject of experiment group and 45 students as the control group). Additionally, the technique for data collection taken place by probability sampling technique random. It is the process where the trial subject is randomly taken through sortation, this is because all the subjects (population) are homogeneity [12].

The data of this research is classified into a quantitative data and a qualitative data. Quantitative data is taken from an experiment research in the form of the one group control pre-test - post-test design. Research design is shown in table 1.
Table 1. Research design in effectiveness model test.

| Subject | Pre-Test | Treatment | Post-Test |
|---------|----------|-----------|-----------|
| E       | O₁       | P         | O₂        |
| K       | O₃       |           | O₄        |

The hypotheses of effectiveness model is questioned, whether it makes a significance influences or not in a crawling skill before and after treatment with interactive multimedia learning based on android?

The steps in this trial research are; (1) determines the subject of the research group; (2) implements the post-test; (3) attempts on the development program; (4) execute the post-test; (5) find an average scores from pre-test and post-test, then comparing both of pre-test and post-test; (6) finds out the differences average scores through the statistic method (test-t) to find out the significant influences from the model.

The students’ magnitude development on swimming ability could be disclosed through pre-test and post-test score use gain index, such below:

\[
\text{Normality gain}(<g>) = \frac{\text{posttest score} - \text{pretest score}}{\text{maximum score} - \text{pretest score}}
\]  

(1)

Criteria that has been used to interpreted N-gain (Hake, 2017). Gain criteria shown in table 2.

Table 2. N-gain criteria interpretation.

| Averages score | Criteria |
|----------------|----------|
| (<g>) < 0,3    | Low      |
| 0,3 ≤ (<g>) < 0,7 | Middle  |
| 0,7 ≤ (<g>)    | High     |

3. Results
This research uses a methodology from Borg and Gall. There are ten stages of the development program [13], there are:

Firstly, the analysis shows that majority students’ state that a swimming course based on interactive multimedia is needed.

Secondly, arrange the research draft and make a development program draft. The development program draft is arranged based on the subject of a swimming course that focuses on the crawl learning process which is consist of; 1) a researcher profile, 2) A crawl learning process contains of several movements (leg, arm, respiration, and coordination), 3) E-book, 4) Interactive quiz.

Thirdly, examine the development product draft that is given to the swimming course expert, the movement expert, the swimming expert coach, and the media expert.

Fourthly, the result that is received from the experts above will be revised by the researcher. This is the first step of revision.

Fifthly, examine the development product into the small group; this group consist of 15 students. After that, it can be concluded that all development crawl model can be applied with several notes, especially in its application that needs equipment, a pool area, and a private pool that needs to be communicated with another swimmer.

Sixthly, revise the product based on suggestions and notes from the application in a small scale of the product. This is the second step of revision.

Seventhly, examine of a large group, which is the function of this test will be used and implemented in the learning process. There are 120 students that will be involved in this test, that are 40 students majoring PJKR in University A; 40 students majoring PJKR in University B; 40 students majoring PJKR in University C. The result of the test is all the models are reasonable and can be used in the swimming...
subject. However, a pool condition, equipment, and swimming facilities, and not all of the students have hand phones with an internet data and large internal storage become a note that must be concerned.

Eighthly, revise the product based on a suggestion and note from an application product in a large scale. This is the third step of revision.

Ninthly, examine the product effectiveness, the purpose of this test is to discover the effect of the development product in the learning process of the students, this test is involved 45 students as the sample of the research. This step used a quantitative approach with a research design experiment called as the one group control pre-test post-test design.

| Table 3. One group control pre-test post-test design. |
|---|---|---|---|
| Subject | Pre-Test | Treatment | Post-Test |
| E | O₁ | P | O₂ |
| K | O₃ | O₄ |

The result of the effectiveness experiment model is taken from the 45 students’ test. Those tests, before and after the treatment, are given to the students.

The result of effectiveness experiment model to the experiment group between pre-test and post-test is $Z_{table} > Z_{quantification} (89 > -5.7622)$, there is a significant differences before and after the treatment is given to the students.

On the other side, the result of effectiveness experiment model in a control group between pre-test and post-test is $Z_{table} > Z_{quantification} (89 > -5.7171)$, it show a significant differences before and after the treatment is given to the students.

The last, counts the differences from each group. A group with the last test or pre-test is a group that will be counted. The purpose of this experiment is to discover whether there is a differences result of crawl learning process from the students who are majoring PJKR within the treatment and the students who are majoring PJKR without the treatment.

The differences between two groups experiment is a $Z$ table score (88.593) it is bigger than $Z$ counted (-1.82294), it shows a significant differences between a control group experiment.

In conclusion, a swimming skill of students who are majoring PJKR with experiment group or a group of students who are given a model of crawl learning process with multimedia interactive is better than a skill from students who are majoring PJKR in a control or comparison group.

4. Discussion
This research conducted regard with the problems in higher education, especially for swimming course at physical education study program. As matter of fact, the program pretended to in learning result of the study, even ignored the learning process. As the result, the case impacted the alumnus profile of the major. The alumni are seen not capable enough applying their swimming ability. Some alumni with Cum Laude predicate with good swimming skill not well understand the process of right swimming and how to teach another people. Dealing with the case, this research is set forth to reveal the swimming course process is completely understood (the ability, manner, knowledge of swimming, as well as the alumnus will be able to teach swimming lesson to their student when they become the PJOK (Physical, Sport and Health) teacher.

The result of this development research is a product about a crawl learning process based on interactive multimedia. The product of this development research is an Interactive of Multimedia Application. This research is expected to increase the result of student’s PJKR capability in crawl learning process.

The development product has been verified that it increase a capability result of the student in crawl learning process, included 45 students as a subject in experiment group and 45 students as a control group. The verification process of this development product is taken for about one semester (6 months). In six months, the researchers observe the effectiveness of the product and maximize the function of
interactive multimedia as a media and a source of learning process for the student. The application in
the learning process is used as a media and source in a motoric task for the student outside the college.
Darmawan states that a learning source like multimedia interactive has several advantages as a learning
source, that are, 1) it can be used whenever and wherever, 2) it has a wide scope, 3) it is integrated with
another system [14]. Those advantages, will create a learning philosophy from Moston and Ashwort
[15] and Williams [16]. They state that “... learning is a process or exertion from each individual to get
an alteration in behaviour, such as knowledge, creativity, attitude, and positive value as an experience.

Interactive multimedia in crawl learning process is created in offline version. It is only need once
installation and no need to use internet when used the device. So, an interactive multimedia is not giving
a bad impact to the students. The process of interactive multimedia is economics, practice, and
conditional. It means, there is no reason as the student for not learning and exercising. Interactive
multimedia has an important role in order to give the student of PJKR a maximum result in crawl
learning process, through the media, the students’ potential will be increased. state that one of a superior
product to increase a learning process is multimedia, that is, a combination of computer and video,
sound, picture, music, animation, text, graphics, that can be presented as dynamic and interactive
[17,18]. The combination between several elements’ media such as text, picture, and video will
accommodate the student to learn more.

The result of media development is a printed book and electronic book that is designed in literature
book called as PDF. Media development is intended as a subject, a source, a media, in order to provide
a lot of characteristic of the students in the learning process. The students who are interested in
interactive multimedia use an electronic book or pdf, and the students who are interested in manual are
able to use a manual version like a printed book. All of a form and a version of this development product
are intended to give an effect to increase the result and ability on crawl learning process. Besides, the
students of PJOK teacher’s candidate are expected to have a learning variation and constructive
dynamic, conducive and effective learning process.

There are several advantages of the product as an alternative media as follows; 1) the crawl learning
process is arranged based on a movement stages from the simplest into the most complicated, the
simplest into the hardest, individual into pair, and group, 2) the application appearance of interactive
multimedia, researcher design in several components, such as, picture, video, and text, 3) the crawl
learning process based on interactive multimedia can be used as a self-learning process, 4) the crawl
learning process based on interactive multimedia can be used wherever and whenever, 5) the crawl
learning process product based on interactive multimedia has role as a complement, reinforcement, and
alarmed about crawl learning process.

There are several disadvantages of this development product as follows, 1) the arrangement of crawl
learning process has not specific knowledge about a complete crawl learning process technique, 2) the
crawl learning process only provides a learning process that increase a learning process condition, 3)
the interactive multimedia application needs to be corrected and repaired.

Furthermore, based on the advantages and disadvantages in previous paragraph makes the researcher
to develop a specific, a better, and an interesting development of a crawl learning process or another

5. Conclusion
Based on, the result of the research which is taken from several stages; a product’s planning, an analysing
test from the swimming expert, a learning process expert, and a media testing expert, all of the experts
state that this product is reasonable to be applied in the crawl learning process for the students. This test
is divided into two parts, which are a test in small scale and a large scale. The result shows whether this
product is reasonable and can be used in the swimming learning subject.

The result of effectiveness development product is increasing the crawl stroke capability of PJKR’s
students. It shows in Z table score, z table (88.593) is higher than Z quantification (-1.82294). The result
show there is a significant difference between a control and experiment group.
In conclusion, crawl’s capability of PJKR students in experiment or treatment group with several model of crawl stroke learning process based on interactive multimedia is better than the students who are majoring PJKR in a control or comparison group.

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