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Application Kinovea to Improve Student Learning Outcomes in Biomechanics

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ABSTRACT

The aim of this research is to improve student learning outcomes in biomechanics learning. The research method used was classroom action research using two cycles, namely cycle 1 and cycle 2. The method in this research was carried out by planning, implementing, observing, and reflecting on actions collaboratively to improve learning outcomes in biomechanics courses. The subjects in this study were all seventh semester students who attended court tennis lectures, totaling 35 students. This research was carried out from February 2023 to April 2023. The data obtained was then selected as needed and could be used as a reference in preparing research reports. After getting an overview of the problems and obstacles found in cycle 1, the researcher's next step was to redevelop the activity plan in order to get good results in the second cycle. The results showed that in the first cycle the students' completeness was 71.4%, and in the second cycle the students' completeness was 91.4%. The conclusion in this research is that the application of kinovea application-based learning can improve student learning outcomes in biomechanics learning.

***Keywords**: biomchanics, kinovea, learning outcomes*

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INTRODUCTION

As one of the educational institutions that focuses on producing future teacher candidates, especially in physical education study programs, it is very important for lecturers and to be able to keep abreast of technological and information developments because science moves dynamically with the times, in order to prepare a professional education, a curriculum that can provide the desired competencies, physical education lecturers are lecturers who have been selected and qualified in fields of knowledge related to the science of physical education itself. The physical education study program curriculum includes subjects related to motion science and other supporting science. One of the compulsory subjects in the physical education study program at the teaching science education faculty is biomechanics. Biomechanics is one of the scientific studies that can help sports practitioners, especially trainers, to optimize the performance of a movement and reduce the risk of injury. This perspective means the same as knowing the effectiveness and efficiency of a movement (Chmait & Westerbeek, 2021). The results of observations in biomechanics courses show that some physical education study program students tend to have difficulty understanding the concept of analyzing motion in

biomechanics courses, the most visible obstacle is Physical Education study program students are only able to analyze with theory and study from learning sources verbally while minimal media for students to practice direct motion analysis with video forms that they practice themselves.

Kinovea is a video-based application that is used by sports practitioners in analyzing motion to support sports performance (Chidambaram & Nallavan, 2021; Puig-Diví et al., 2019), one of the advantages of this application is the application's ability to create guidelines and display the angles of motion shifts that occur in a sports movement video, but these applications are rare once used as a learning medium in courses that aim to learn to analyze human motion (Ortiz-Padilla et al., 2022). The era of globalization demands abilities that can compete with civilizations that prioritize mastery of software-based digitalization as well as supporting applications in the learning process. Kinovea is an application that can analyze the motion of the human body in terms of kinematics or joint angles and movements based on video, but technological advances have had a big impact in the world of education, but sometimes rapid technological advances become an obstacle for students in keeping up with technological developments alone. This limitation can be seen from the students' ignorance of the existence of an application to analyze motion related to the output of the biomechanics course itself.

Biomechanics is the science that studies the internal and external forces acting on the human body and the effects produced by these forces on sports activities and is a scientific discipline that studies the forms and types of motion since the principles of mechanics and motion kinematics (Tai et al., 2023) This scientific discipline cannot stand by itself, but is supported by other sciences, including anatomy, physiology, physics and kinesiology, then from these sciences the basics and principles are combined to create a science called biomechanics (Irawan et al., 2019). The basic emphasis on biomechanics is on the concepts of mechanics and kinetics, but the human body is a more complex and perfect system. Therefore, biomechanics concerns the human body and all living things. Biomechanics is a scientific discipline that studies the forms and types of motion based on mechanical principles and analyzes motion. The scope of biomechanics includes developmental biomechanics, biomechanics of exercise, rehabilitation mechanics, equipment design and sport biomechanics (Forte & Teixeira, 2023). Biomechanical analysis carried out using a computer is usually carried out by examining the recorded results of training sessions or matches carried out by athletes. From the results of the biomechanical analysis, the data obtained is in the form of the

athlete's speed and the angles of the athlete's joints when running. The results of this analysis determine whether the athlete has good running technique or not. By using the kinovea application, learning biomechanics will become more meaningful (J. Lubis et al., 2022)

METHODS

The research method used was classroom action research using two cycles, namely cycle 1 and cycle 2. The method in this research was carried out by planning, implementing, observing, and reflecting on actions collaboratively to improve biomechanica learning outcomes. The subjects in this study were all seventh semester students who attended biomechanics courses, totaling 35 students. This research was conducted from February 2023 to April 2023. The research procedures used in this study consisted of planning, action, observation, and reflection.

1. Planning

At this stage the researcher creates a learning design that contains the Semester Learning Plan (RPS) which has been approved by the Study Program Coordinator.

2. Action

The learning process is not only carried out in face-to-face classes, but is also carried out online through thunkable applications, whatsapp groups and zoom meetings as a medium of communication and giving each other information. The kinovea application is used as an aid in analyzing motion learning, and as a learning medium. The kinovea application is accessed during face-to-face learning, meaning that students independently learn material by accessing it anytime and anywhere.

3. Observation

These stages were carried out by the researcher to observe each event during implementation. Observation activities are carried out at each face-to-face meeting using observation sheets to determine the increase in student learning outcomes.

4. Reflection

At this stage the researcher carried out several processes to reach the stage of reflection and discussion with colleagues. The discussion includes successes, failures, and obstacles encountered during the action. The data obtained is then selected what is needed and can be used as a reference in compiling a research report. After getting an overview of the problems and constraints contained in cycle 1, the next step is for researchers to rearrange the activity

plan in order to get good results in the second cycle.

Data collection used in this classroom action research uses observation guidelines to see learning outcomes in biomechanics learning. Calculate the average student learning outcomes with the following formula:

$$\bar{x} = \frac{\sum x}{\sum N}$$

Calculating student completeness with the following formula:

$$\frac{Students\ who\ completed}{Total\ of\ students} x\ 100\%$$

RESULTS AND DISCUSSION

Results

The research was carried out in two cycles, each cycle consisting of five meetings. Cycle 1 was held on 13 February - 10 March 2023, while cycle 2 was held on 20 March - 14 April 2023. In this study, what was observed was the process of giving actions carried out by lecturers or teachers. Student learning outcomes in the learning process using the kinovea application can be observed through indicators in the kinetics concept material, human kinematic linear motion, human kinematic angular motion, human kinetic linear motion. The results of each indicator in each cycle can be seen in table 1 below.

Table 1. The Results of Research

Indicators	*Cycle 1*	*Cycle 2*
Kinetics concept material	72	78
Human kinematic linear motion	75	85
Human kinematic angular motion	76	80
Human kinetic linear motion	74	85
Completed	25	32
Not Finished	10	3
Student completeness	71,4%	91,4%

Based on table 1, it can be seen that in cycle 1 the learning outcomes for the kinetics concept material indicator had a score of 72, human kinematic angular motion a score of 76, human

kinetic linear motion 74, and it is known that students' completion in cycle 1 was 71.4%.

Based on table 1 it can be seen that in cycle 2 there was an increase in each indicator. In terms of learning outcomes, the kinetics concept material indicator has a score of 78, human kinematic angular motion score is 80, human kinetic linear motion is 85, and it is known that student completeness in cycle 1 of students completes as much as 91.4%.

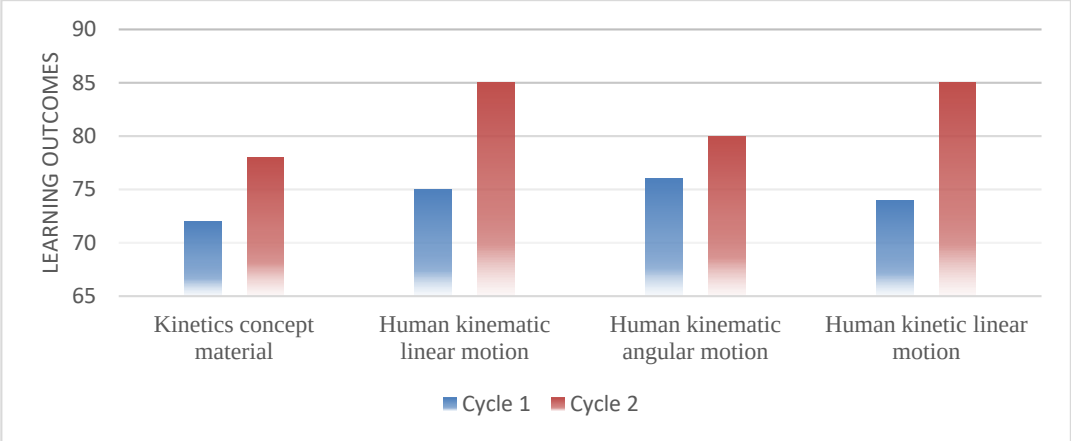

Figure 1. Graphic student completeness

Discussion

The Biomechanics course has lecture outcomes to teach how to analyze a human movement seen from the aspect of motion construction, angles and displacement distances between joints in parts of the human body, which is useful for educating physical education study program students in this scientific field. Biomechanics is also a science that can help teachers and trainers optimize the performance of a movement and reduce the risk and impact of injury in sports activities, this perspective means the same as knowing how effective and efficient a movement is.

The use of learning media through applications and technology in the teaching process will be able to generate new desires and interests as well as provide psychological stimulation to students (Puspitarini & Hanif, 2019). The use of learning media can support a fun and interesting learning process for students, so that boredom (L. H. Lubis et al., 2023). This situation is very clearly visible from the students' good attitude in taking biomechanics courses. This situation proves that the use of learning media using applications can increase interest and motivation to learn (Basri et al., 2021) which will ultimately affect learning outcomes. that the use of applications in learning is more effective than conventional learning because mobile learning is a learning medium that has a constructivist learning theory approach (Garzón et al., 2023; Yakar et al., 2020).

In line with the results of the study interpreting that the average student completeness experienced an increase in cycle 1 of 71,4%, an increase of 250% in cycle 2 of 91,4%. The application of the results of this study is that an educator must be able to know the type of learning style of each student, so that he can choose the right learning model to increase the participation and thinking skills of students so that it can affect learning outcomes (Hidayat & Sujarwo, 2022; Rogowsky et al., 2020).

The inclusion of application-based teaching materials in the learning process is one way to improve relationships between teachers, educational resources, and students. The same thing was also expressed (Berie et al., 2022) to meet the curriculum objectives set by the availability of teaching resources that serve as the most convenient source of information for students to practice what they have learned. That the more choices of learning resources available, the better the learning process will be (Solikhin et al., 2022). Apart from functioning as a learning medium, technology-integrated teaching materials are also used as learning resources to encourage the transition of abstract learning to concrete learning that can be seen in action. Students will learn concrete concepts more easily than abstract concepts (Yulianci et al., 2021)

CONCLUSION

The conclusion in this research is that the application of kinovea application-based learning can improve student learning outcomes in biomechanics learning. The software used in this study is the kinovea application which can be downloaded and accessed without using an internet network. It is hoped that future research can use similar applications in every basic movement lesson

This section contains the conclusion of research results related to research questions. This section also contains answers to research questions. Conclusion must answer specific objectives. This section is written in essay form and does not contain numbers. In the conclusion, suggestions can be written in the form of input for further researchs, as well as implicative recommendations from the research findings.

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