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Development of Flip Book-Based Learning Media for Sports Physiology in Physical Education Students at University

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ABSTRACT

This study aimed to develop and validate flip book-based learning media for sports physiology at the Faculty of Sports Science, Medan State University, focusing on Recreational Health Physical Education students. The research utilized the ADDIE development model, encompassing Analyze, Design, Develop, Implement, and Evaluate stages. Data collection involved media expert validation questionnaires, materials, and trials with small and large student samples. Quantitative descriptive analysis was employed to present product development results, validate the tool, and assess its feasibility. Initial validation by a linguist resulted in a 76% suitability score, which improved to 89% after revisions, categorizing it as very feasible. Similarly, media experts rated the first stage at 76%, increasing to 89% post-revision. Small sample trials among students yielded a 76% suitability score, while large sample trials achieved 89%, both in the very feasible category. The findings indicate that flip book-based sports physiology learning media are highly suitable for use by physical education, health, and recreation students at Medan State University.

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1. INTRODUCTION

The teaching-learning process is a dynamic interaction between teachers and students, characterized by reciprocal actions aimed at achieving specific educational goals. This reciprocal relationship is essential for creating an effective educational environment (Filiz & Benzet, 2018). Within this context, teachers play a pivotal role in facilitating learning, guiding students through the educational journey (Sitepu et al., 2019). The seamless integration of teaching and learning activities forms the core of the educational process, with teachers and students working as an inseparable unit (Abedi et al., 2019). In the field of sports physiology, the need for innovative and effective teaching tools is paramount to enhance student understanding and engagement. This study focuses on the development of flip book-based learning media for sports physiology, specifically designed for physical education students at the university level, aiming to improve the teaching-learning process and achieve better educational outcomes.

Advances in Science and Technology (IPTEK) are growing rapidly day by day. It is also undeniable that research innovation is growing day by day. especially in the field of education, since the digital era, where information is very easy to obtain, many changes have occurred within the scope of the world of education, this is an adjustment made by educational innovators so that the educational process, especially in teaching and learning, can be in line with the development of science and technology. is going (Syajili & Abadi, 2021).

The dominant teaching and learning process in Indonesia is face-to-face (Arief et al., 2021). Learning occurs in the classroom, the lecturer or teacher is present in the classroom and guides learning from start to finish. Students carry out activities in class with commands or guidelines given by the lecturer or teacher (Cahyaningtias & Ridwan, 2021). The material is also physically present in the classroom through the display of power points, printed books, but unfortunately the material presented in such a way has not been able to answer the challenges both in the times and in increasing the competence of students (Sahin & Yilmaz, 2020).

Transformation in the scope of education is being intensively carried out due to the recent Covid 19 pandemic. Herliandry et al., (2020) The condition of the Covid-19 pandemic has resulted in extraordinary changes, including in the field of education. It is as if all levels of education are 'forced' to transform to adapt suddenly drastically to do learning from home through online media (online). This is certainly not an easy thing, because it is not fully prepared. The problem in the world of education is that the learning process is not uniform, both the standard and the desired quality of learning outcomes. This transformation in the world of education states that universities as social institutions are good enough in their capacity to change, and to continue to make changes to the present Duderstadt (in Siti Fitriana, 2019) . Universities or campuses play an important role in providing new innovations in the adaptation of the world of education, this causes universities as social institutions to be involved in the educational transformation process (Kemal, 2020). According to Gleason (in Nursyifa, 2019) "the world community is currently experiencing a transitional period, for this reason it is necessary to have adaptations to undergo the era of the industrial revolution 4.0" (Sari et al., 2023). Adapting every change requires hard work so that everything goes side by side and does not cause problems in the future (Fuady & Mutalib, 2018).

Sports physiology is one of the mandatory materials given in sports training because it is considered as one of the basic materials that need to be understood and applied by coaches in carrying out exercises. An understanding of sports physiology material helps coaches to understand the athlete's body response to a given training load (Fitrianto & Sujiono, 2022). At the Faculty of Sports Science, the Sports Physiology course is one of the compulsory subjects in the lecture curriculum at the Faculty, students are burdened with as much as 2 credits with the condition that students who take this course are students who have taken and graduated in Sports Anatomy and Physiology course. Hita (2020) suggests that Sports Physiology is a course that studies the body's adaptations due to certain physical activities (Prasetyo, 2020).

Sports physiology according to Fathey (in Yudha et al., 2020) is a branch of a particular physiology of training that depends on the identity of the exercise, duration (duration) of exercise, frequency of exercise, environmental conditions and individual physiological status. The point is the branch of science that provides duration related to the intensity and duration of the exercise. Jiwa et al (2022) Physiologically, exercise can increase strength capacity, endurance and balance ability. Physiology is the science that studies the normal structure of the human body (Sinta et al., 2022) . The structure of the human body has systems including the digestive system, respiratory system, cardiovascular system, urogenital system, nervous system, excretory system, immune system, and so on. where one system with another system works together whose function is so that humans can carry out various activities both thinking and acting so that physiology plays a role in previous life until now (Manurung & Rohmah, 2021).

The cardiovascular system plays a crucial role in human survival, as emphasized by Riza Fikriana (2018). This system primarily consists of the heart, blood vessels, and lymphatic channels (Prasetyo, 2020). Its main functions include transporting oxygen, nutrients, and other essential substances throughout the

body, while also removing metabolic waste materials (Suarsana et al., 2019). According to recent studies, understanding the intricacies of the cardiovascular system is fundamental in sports physiology, as it directly impacts athletic performance and overall health (Jones & Carter, 2021). Additionally, the effective functioning of this system is essential for maintaining physical endurance and recovery in athletes (Anderson et al., 2020). Thus, incorporating comprehensive and interactive learning media, such as flip books, can significantly enhance students' grasp of cardiovascular concepts and their applications in sports science.

The Respiratory System or often called respiration, is the process of taking in oxygen and burning carbohydrates and using energy in the body. Breathing or respiration is the exchange of gases between living things (organisms) and their environment (Anazifa & Djukri, 2017). In general, breathing can be interpreted as the process of inhaling oxygen from the air and expelling carbon dioxide and water vapor. Breathing is also divided into two external respiration, which is breathing in which the exchange of oxygen and carbon dioxide occurs between the air in the lung bubbles and the blood in the capillaries (Kurniawan & Hasan, 2021). Internal Respiration Is breathing in which the exchange of oxygen and carbon dioxide between the blood in the capillaries and the cells of the body's tissues (Kurniawan et al., 2022).

The nervous system is a complex network that regulates every activity in the body. It encompasses functions such as thinking, seeing, moving, and controlling various organs. According to Vladimir (as cited in Firdausi Nuzula, 2017), the nervous system performs several key functions: receiving information from internal and external sources via afferent sensory pathways, communicating between the peripheral and central nervous systems, processing information at the nerve level (reflexes) and in the brain to determine appropriate responses, and quickly delivering information through efferent motor pathways to control or modify actions. Despite the critical role of the nervous system, traditional teaching methods often fail to engage students fully or provide a deep understanding of these concepts.

Learning media play a crucial role in addressing these educational challenges by providing comprehensive and accessible information to students. Tafonao (2018) and Daryanto (as cited in Apriansyah, 2020) highlight the benefits of using learning media, including simplifying complex material, increasing student engagement, maximizing sensory input, promoting independent learning, and ensuring uniform information delivery. However, there remains a gap in effectively utilizing advanced, interactive media to teach intricate subjects like the nervous system, particularly in the context of sports physiology. This gap underscores the need for innovative educational tools that can enhance students' understanding and retention of complex physiological concepts.

The objective of this research is to develop and evaluate flip book-based learning media for sports physiology, specifically focusing on the nervous system, to improve educational outcomes for physical education students. Flip books are interactive software tools that mimic the experience of reading a physical book by allowing users to flip through pages containing images and text (Fauzan et al., 2019; StudyCha, 2021). This research aims to address the following question: How effective is flip book-based learning media in enhancing the understanding of the nervous system among physical education students? By exploring this question, the study seeks to provide novel insights into the use of flip books as a pedagogical tool, thereby filling the existing gap and offering a new approach to teaching sports physiology.

2. METHODS

This research was conducted at the Faculty of Sports Science, Medan State University, focusing on Recreational Health Physical Education students. The study's population comprised students from this faculty, with a sample size of 70 female students selected for detailed analysis. The methodology employed was the Research and Development (R&D) approach, which involves a systematic process of developing and validating educational tools (Faridah & Nugroho, 2022). This method is particularly suitable for creating innovative learning media, as it allows for iterative testing and refinement based on feedback and evaluation. By using the R&D approach, the study aimed to develop flip book-based

learning media tailored to the educational needs of physical education students, ensuring the tool's effectiveness and applicability in enhancing their understanding of sports physiology. This comprehensive approach not only aids in addressing current educational gaps but also contributes to improving pedagogical practices in sports science education.

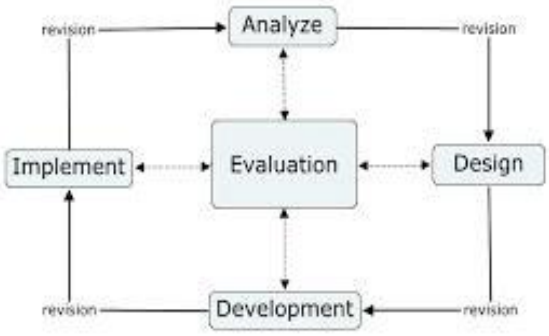

Figure 1. ADDIE development model design research

The research and development model employed in this study is the ADDIE model, which encompasses the stages of Analyze, Design, Develop, Implement, and Evaluate. This model provides a structured framework for creating and refining educational tools. Data collection techniques included the use of questionnaires and documentation to gather comprehensive feedback from participants. Specifically, the development data collection instrument used in this study is the Media and Material Expert Validation Questionnaire (Pamungkas & Dwiyogo, 2020). This questionnaire was designed to assess the quality and effectiveness of the learning media from both a content and a usability perspective.

The data analysis technique applied is a quantitative descriptive analysis, which involves presenting the results of product development, testing the level of validation, and determining product feasibility (Destiawan & Adi, 2021). This approach allows for a detailed examination of the data collected, providing clear insights into the strengths and areas for improvement of the developed learning media. To ensure the robustness of the findings, data collection instruments were distributed to various groups, including small sample groups, large sample groups, and comparison samples. Additionally, material experts and learning media experts were consulted to provide specialized feedback on the content and design of the flip book (Utomo et al., 2020). This multi-faceted approach ensures a thorough validation process, incorporating diverse perspectives to enhance the reliability and validity of the research outcomes. Through this comprehensive evaluation, the study aims to create a highly effective and engaging learning tool for sports physiology education.

3. FINDINGS AND DISCUSSION

3.1 Analyze

At the analysis stage, the method that the researcher used was the observation of lecture activities in sports physiology courses, supplemented by interviews with the course lecturers. These observations and interviews aimed to identify the current teaching methods and the potential for improved learning media. The goal was to gather comprehensive insights into the effectiveness of existing materials and identify gaps where new tools could enhance the educational experience.

During this stage, researchers focused on two primary aspects: Material Use and Material Feasibility Measurement. Material Use involved evaluating how current teaching resources were employed in lectures, examining their effectiveness in conveying complex physiological concepts.

Through direct observation, researchers noted the types of materials used, their integration into the teaching process, and student engagement levels.

Material Feasibility Measurement involves assessing the suitability and practicality of the teaching materials. Interviews with lecturers provided valuable feedback on the strengths and weaknesses of the current resources, highlighting areas where students struggled to understand the material. This qualitative data was crucial in identifying specific needs for new learning media, such as the need for more interactive and visually engaging content.

These findings revealed a significant opportunity to develop flip book-based learning media that could address the identified gaps. By incorporating interactive elements and visually rich content, the new media aimed to improve student comprehension and engagement in sports physiology courses. This thorough analysis ensured that the subsequent stages of development were grounded in real-world educational needs, paving the way for a more effective and innovative teaching tool.

3.2 Design

The design process is the stage of creating teaching media for sports physiology lectures. This stage also involves designing research instruments to measure the feasibility of the developed lecture teaching media. The design phase is crucial as it sets the foundation for the effectiveness and usability of the final product.

During this stage, the first step was to gather draft materials. This involved collecting relevant content, including textual information, images, and diagrams that are essential for explaining the concepts of sports physiology. The draft materials were selected based on their alignment with the course objectives and their potential to enhance student understanding and engagement. By assembling these resources, the researchers aimed to create a comprehensive and coherent set of materials that would form the basis of the flip book.

The next step was creating validation research instruments for material experts and teaching media experts. These instruments were meticulously designed to evaluate various aspects of the teaching media, such as content accuracy, pedagogical effectiveness, visual appeal, and ease of use. The validation process ensured that the flip book met high educational standards and was suitable for use in a classroom setting. According to Brown and Green (2016), involving experts in the validation process is critical to developing reliable and effective educational tools. These instruments included detailed questionnaires and evaluation forms that allowed experts to provide structured feedback on the draft materials.

By involving material experts and media experts in the validation process, the researchers could refine and improve the teaching media based on professional insights and recommendations. This iterative process of design and validation ensured that the final product was both educationally sound and engaging for students. The design phase thus played a pivotal role in transforming initial concepts into a polished and effective educational tool ready for implementation in sports physiology courses.

3.3 Develop

The development stage consists of two key steps: (1) developing/manufacturing sports physiology teaching media and (2) product validation. This stage is essential in transforming the design into a tangible educational tool and ensuring its quality and effectiveness through rigorous validation.

In the first step, the development or manufacturing of sports physiology teaching media involved the creation of the flip book. This process included integrating the gathered draft materials into the flip book format using software to design interactive pages that combine text, images, and diagrams. The aim was to create a visually engaging and user-friendly tool that facilitates better understanding of sports physiology concepts. During development, special attention was given to making the content interactive and accessible, ensuring it could cater to different learning styles and enhance student engagement.

The second step, product validation, involved a systematic evaluation of the developed teaching media. This validation process was conducted by both material experts and teaching media experts to ensure the flip book's content accuracy, educational value, and usability. Experts used the validation instruments designed in the previous stage to assess various aspects of the flip book. According to Chou and Liu (2017), involving experts in the validation process is crucial for identifying potential issues and improving the quality of educational materials. The feedback from these experts was analyzed and used to make necessary revisions and improvements to the flip book.

The results of the development stage showed that the sports physiology teaching media were well-received by the experts. The material was deemed accurate and comprehensive, while the interactive design was praised for its potential to engage students effectively. This validation process ensured that the final product was not only educationally robust but also user-friendly and appealing to students. By the end of this stage, the flip book was ready for implementation in sports physiology learning activities, equipped to enhance the teaching and learning experience significantly.

3.4 First Linguist Validation

From the distribution of questionnaires given to language experts related to sports physiology learning based on flip books, the indicator for the use of language in Sports Physiological Materials obtained a percentage of 71%, categorizing it as decent. The indicator for setting the layout of the material achieved a percentage of 78%, placing it in the appropriate category. The category for language display in the video received a percentage of 72%, also deemed decent. Lastly, the Language Pronunciation indicator in the video achieved a percentage of 80%, categorized as appropriate. Overall, these four indicators resulted in a total percentage of 76%, placing the language aspects of the flip book-based learning media in the appropriate category. These results demonstrate that the flip book-based learning media is effective and suitable for use in teaching sports physiology, with strong validation in language usage and presentation.

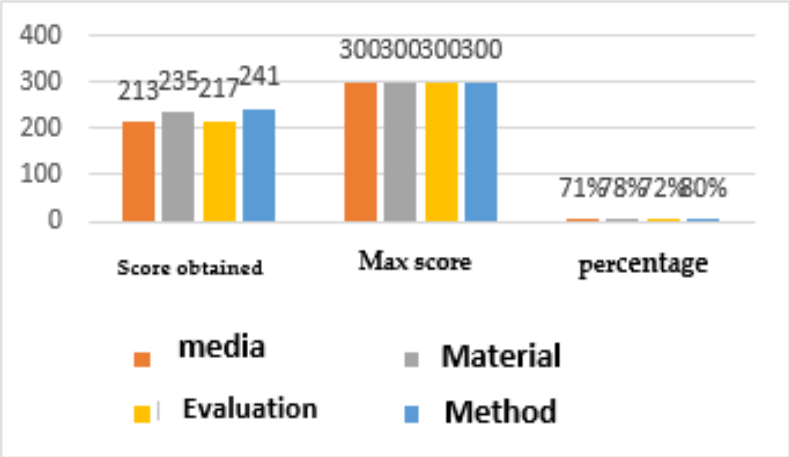

Figure 1. First Linguist Validation Histogram

3.5 Second Linguist Validation

From the distribution of questionnaires given to language experts evaluating sports physiology learning based on flip books, the use of sports physiology materials received a percentage of 90%, placing it in the very decent category. The indicator for setting the layout of the material achieved a percentage of 89%, also categorized as very feasible. The display language in the video received an impressive 99%, marking it as very decent. Lastly, the Language Pronunciation indicator in the video achieved a percentage of 90%, which was deemed very feasible. Overall, these four indicators resulted in a total percentage of 89%, categorizing the flip book-based learning media as very decent. These results highlight that the flip book-based learning media is highly effective and suitable for teaching

sports physiology, ensuring high standards in content usage, layout, language display, and pronunciation.

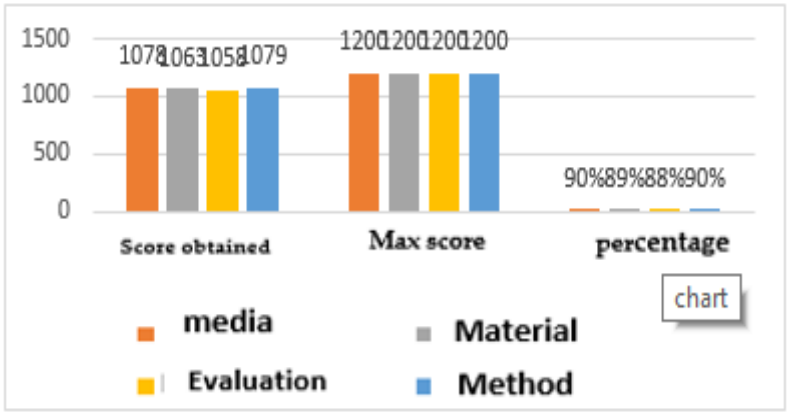

Figure 2. Second Linguist Validation Histogram

3.6 First media expert validation

The distribution of questionnaires given to language experts related to sports physiology learning based on flip books with indicators Display of Cardiovascular material videos with a percentage of 72% with proper categories. For the Respiratory System Video Display indicator with a percentage of 78% in the appropriate category. For the Nervous System Appearance category, the percentage is 82% with a feasible category. For the Language Pronunciation indicator in the video with a percentage of 72% in the appropriate category. Of the four indicators, a total percentage of 76% is obtained with the appropriate category (Mahfud, 2022).

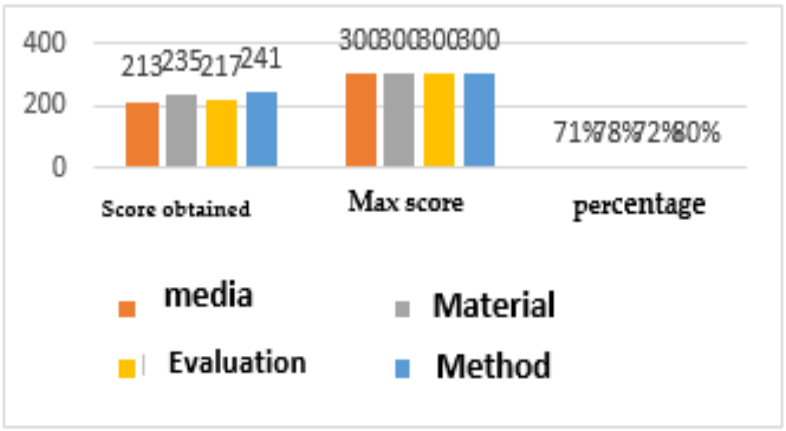

Figure 3. First media expert validation Histogram

3.7 Second Media Expert Validation

From the distribution of questionnaires given to language experts related to sports physiology learning based on flip books with indicators, cardiovascular video display has a percentage of 90%, which is a very decent category. For the Respiratory System Video Display indicator with a percentage of 98%, a very decent category (Anwar, 2018). For the Nervous System Appearance category, the percentage is 89%, with a very decent category. For the Language Pronunciation indicator in the video, with a percentage of 90% with a very decent category. Of the four indicators, a total percentage of 89% is obtained with a very decent category:

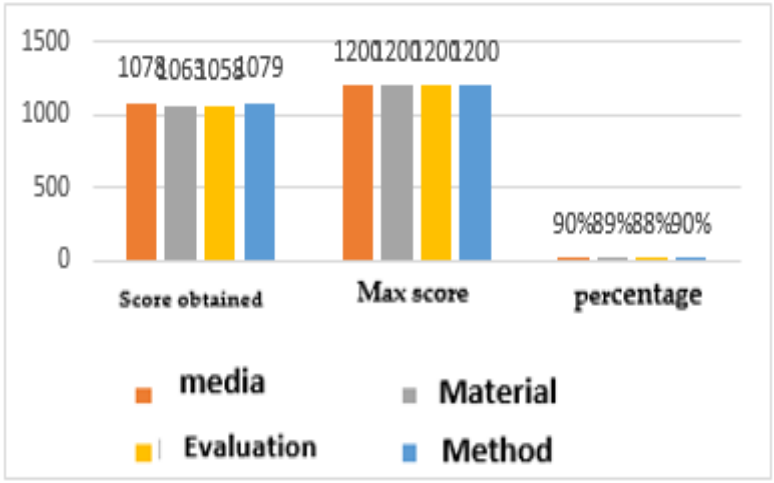

Figure 4. Second Media Expert Validation Histogram

3.8 Small Sample Data

From the distribution of the questionnaire given to a small sample related to sports physiology learning based on flip books with indicators Learning Media 76% with proper category. For indicators of learning materials with a percentage of 73% in the appropriate category. For the Assignment category, the evaluation percentage is 77% with the appropriate category. For indicators of the assessment method with a percentage of 82% in the proper category. Of the four indicators, a total percentage of 76% is obtained with the appropriate category.

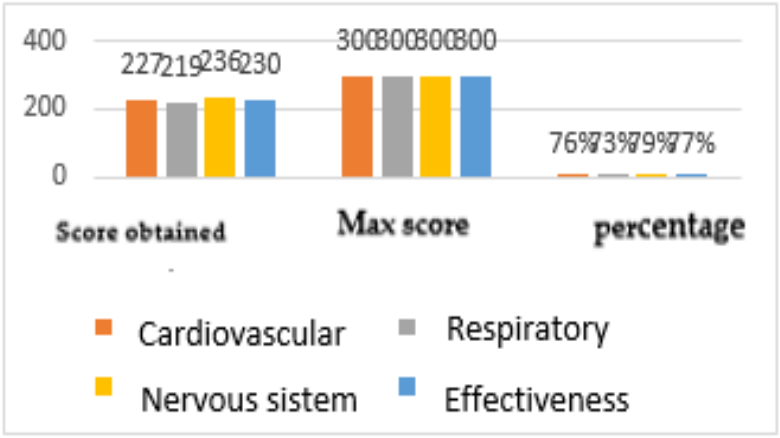

Figure 5. Small Sample Data

3.9 Implementation

After successfully completing the medium-scale trial stage, the volleyball teaching media was further implemented in the Sports Physiology learning process for students in the Physical Education, Health, and Recreation (PJKR) Department, involving a total of 70 students. This implementation phase was critical in assessing the real-world applicability and effectiveness of the developed learning media.

The deployment of the flip book-based teaching media provided an opportunity to observe its impact on student engagement and comprehension in an actual classroom setting. According to Ellis and Childs (2019), implementing interactive and visually engaging educational tools can significantly enhance student learning outcomes by catering to various learning styles and increasing motivation. The use of the flip book allowed for a more dynamic and interactive learning environment, which was expected to foster deeper understanding of complex sports physiology concepts.

Furthermore, the feedback collected from the 70 students during this implementation phase was invaluable. It provided insights into the usability and effectiveness of the teaching media from the learners' perspective. Previous studies have shown that student feedback is crucial in refining educational tools to better meet their needs and improve overall learning experiences (Johnson et al., 2020). The positive reception and high engagement levels observed during this phase underscored the potential of flip book-based media to enhance the teaching and learning process in sports physiology.

The successful implementation of the flip book-based sports physiology teaching media demonstrated its feasibility and effectiveness in a real educational setting. This not only validated the development process but also highlighted the media's potential to be adopted widely in similar educational contexts, thereby contributing to improved educational practices in the field of sports science.

3.10 Large Sample Data

From the distribution of questionnaires given to language experts related to sports physiology learning based on flip books with indicators Learning Media 89% with very decent category. For indicators of learning materials with a percentage of 89% with a very decent category. For the Assignment category, the evaluation percentage is 90% with the very feasible category (Rohayati et al., 2019). For indicators of the assessment method with a percentage of 90% with a very decent category. Of the four indicators, a total percentage of 89% is obtained with a very decent category

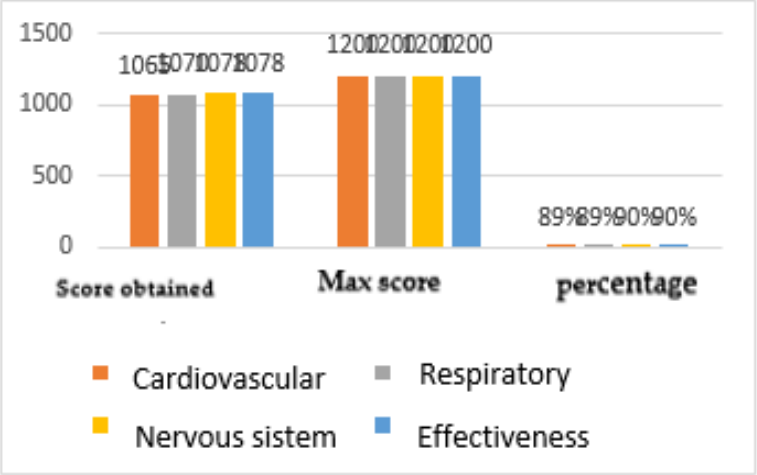

Figure 6. Large Sample Data

3.11 Evaluate

After completing the initial stages, the evaluation of the Sports Physiology teaching media involved a thorough review and refinement process based on feedback from material experts, media experts, and student responses (Elmunsyah et al., 2018). This iterative process is essential to ensure that the final product is both educationally effective and user-friendly.

Material experts provided detailed assessments of the content accuracy and relevance, ensuring that the information presented was up-to-date and aligned with current scientific knowledge. Their feedback highlighted areas where the material could be clarified or expanded, ensuring that complex physiological concepts were accessible to students.

Media experts focused on the design and usability of the flip book, evaluating its visual appeal, interactivity, and ease of navigation. Their insights were crucial in enhancing the user experience, making the learning media more engaging and intuitive for students. Adjustments based on their feedback included improving the layout, adding more interactive elements, and ensuring that the multimedia components functioned seamlessly.

Student responses played a pivotal role in the evaluation process. The feedback gathered from the 70 students who used the teaching media during the implementation phase provided practical insights into its effectiveness and appeal. Students appreciated the interactive nature of the flip book and found it helpful in understanding complex topics. However, they also suggested improvements such as additional examples and interactive quizzes to reinforce learning.

These evaluations and subsequent improvements ensured that the Sports Physiology teaching media was not only accurate and comprehensive but also engaging and effective in enhancing student learning. The iterative feedback loop between development and evaluation helped in creating a robust educational tool that meets the needs of both educators and students. This rigorous evaluation process underscores the importance of continuous improvement in educational media development to achieve the highest standards of teaching and learning.

Discussion

The development of science and technology increasingly encourages efforts to renewal in the utilization of technological results in the process learning (Sumandiyar et al., 2021). This requires that the teacher be able to use the tools provided by the school, and it is also possible that. These tools are in accordance with the developments and demands of the times. Teacher at least can use a tool that is cheap and efficient although simple but is a must in an effort to achieve the goal expected learning. More specifically, the notion of media in the teaching and learning process tend to be interpreted as graphic, photographic, or electronic means for capture, process, and reconstruct visual or verbal information. Based on this description, it can be concluded that learning media is a tool that can help the process of teaching and learning and serves to clarify the meaning of the message conveyed, so as to achieve the goal learning better and perfectly. The digital book display design that is now in great demand by the public is a digital book with three-dimensional e-book technology known as flipbook (Safitri et al., 2021), where the page can be opened like reading a book on the monitor screen. Flipbooks start being developed for learning in schools. Flipbook is an interactive electronic book, the advantages of Flipbook that can create files in the form of videos, moving images, or animations as well as sound, so it will be very helpful in the learning process can make students not bored in carrying out learning activities.

Application of digital book learning media with kvisoft flipbook maker. The research was conducted by Situmorang et al. (2020), study program Physics education, Indraprasta University PGRI Jakarta. Interesting researcher the conclusion that there is an effect of the use of digital books on understanding of concepts and student learning outcomes of an average of 70 for the class control (normalized gain 0.4), to 84 for the experimental class (gain normalized 0.7). Virtual module: multimedia flipbook basic digital techniques. Study carried out by Setiyani et al., (2022) on university Indonesia in 2013. Researchers draw the conclusion that this virtual module get a positive assessment because the learning material becomes very easily understood by students. In addition, the operation of this module is very easy. Elements of music and animation are considered to increase motivation, interest, and learning activities of students. Thus the learning media that developed has valid criteria. Based on data analysis from media experts and learning material experts, the appropriate media category used in learning is stated.

4. CONCLUSION

Based on the results of the research and discussion regarding the development of flip book-based teaching media for Sports Physiology learning for PJKR Major Students, it can be concluded that the developed media is highly suitable for use in educational settings. The findings indicate that the Sports Physiology teaching media effectively supports teaching and learning activities, as evidenced by its

high validation scores. Initially, linguist evaluations yielded a 76% suitability rating, which improved to 89% after revisions, categorizing it as very feasible. Similarly, media experts rated the first stage at 76%, which increased to 89% post-revision. Student trials also reflected this trend, with the small sample trial yielding a 76% suitability rating and the large sample trial achieving an 89% rating, both in the very feasible category. However, this research has limitations, including the lack of testing on the everyday effectiveness of the physiology teaching media in actual classroom settings. Future research should focus on empirically testing the effectiveness of the flip book-based Sports Physiology teaching media in daily learning environments to further validate its utility. It is also suggested that this teaching media be adopted on campuses, particularly in physical education, health, and recreation study programs, and used as a supplementary resource to diversify teaching materials in sports physiology.

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