



Effectiveness of sports biomechanics module based on literacy skills to improve student concept understanding

Umar *, Alnedral, Padli, Pringgo Mardesia

Faculty of Sports Science, Padang State University, Padang, 25132, Indonesia.

* Corresponding Author. E-mail: umarkepel@fik.unp.ac.id

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Abstract: This study aims to determine the results of developing a sports biomechanics module based on literacy skills to improve conceptual understanding and determine how student responses affect student concept understanding. This module was developed using the ADDIE development model (Analysis, Design, Development, Implementation, and Evaluation). Before testing, the module must be validated. The results of the material expert validation obtained a score of 4, which was in the excellent category. The media expert validation obtained a score of 4, which was in the excellent category. Moreover, the results of language validation also obtained a score of 4, which means excellent. The results of trials conducted on 90 students showed a positive response where 60% of students stated that this product was good to use. The results of the product effectiveness test were carried out by looking at the effect of the response with the understanding of students' concepts using regression testing. The results of the simple linear regression test showed results of 54.1% on the coefficient of determination which indicated that there was an effect of student responses on understanding the concept. So that the use of this biomechanics module is effective for use in the learning process.

Keywords: concept understanding, module, responsive, sports biomechanics.

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INTRODUCTION

The rapid progress of the times demands developments in the field of education so that it also has an essential role in the lives and behavior of individuals (Adeniji et al., 2018; Astalini et al., 2021; Zorluoğlu et al., 2019). One of the courses that students must take at the Faculty of Sports Science, Padang State University is Sports Biomechanics. Biomechanics is a basic science in sports that can change the way of thinking, but the lack of teacher competence in the application of technology has resulted in minimal sports achievements in Indonesia (Gani, 2020; Kurniawan, 2015). The science of sports biomechanics is a branch of science that deals with internal and external forces on the human body to determine effective and efficient movements in a series of motions and to know what factors influence its success (Irawan et al., 2021; Kusumawati & Muhamad, 2020). The purpose of learning sports biomechanics is so that students can describe, define, and analyze the motion displayed by athletes in sports activities, such as straight motion, vector, the center of force scalar, power, effort, and momentum. Someone who studies a subject, one of which is sports biochemistry, should be accompanied by literacy skills.

Every student must have skills to face 21st-century learning: creative thinking, critical thinking, digital literacy knowledge and skills, information literacy, media literacy, and mastering information and communication technology (Frydenberg & Andone, 2011; Rahmadani et al., 2018). Literacy can be interpreted as a skill closely related to reading, thinking, writing, and improving one's understanding ability (Mutia et al., 2018; Suyono et al., 2017; Zuhra et al., 2021). Literacy is not only about understanding, but also about how one's ability to apply it in everyday life. Literacy ability is often defined as literacy in reading and writing and becomes a milestone in advancing a nation (Devianty, 2019). Good reading and writing skills pave the way for other language skills such as listening, speaking and writing, honing skills such as critical thinking and creative innovation, and developing students' personalities (Akbar, 2017; Megawanti, 2012). Good literacy skills are expected to improve the quality



of education. The literacy skills can be supported by using interesting and systematically packaged teaching materials.

Teaching materials are an alternative to support the learning and teaching process that provides convenience and a real picture of the subject being studied, making it easier for students (Astalini et al., 2021; Wulandari & Febriana, 2020). The teacher prepares the expected teaching materials because the teacher is an expert in field practice who better understands the field conditions and even the characteristics and level of students in the classroom. Thus, it is necessary to have teaching materials in the form of modules in the learning process (Sirate & Ramadhana, 2017). The learning module is an independent teaching material designed by the author to assist students in understanding concepts in order to achieve learning objectives (Chongo et al., 2021; Fortner et al., 2016; Sirate & Ramadhana, 2017). In practice, a sports biomechanics module is needed so that students can understand the material taught in this course systematically. The advantage of this sports module is that the design and discussion of the material are packaged more attractively, equipped with pictures to support understanding of the material (Kristiono et al., 2019; Rejeki, 2020).

The use of modules in the lecture process is expected to be well received and responded to by students. With this prepared module, students are expected to be enthusiastic and not passive in participating in lecture activities (Laili et al., 2019; Yodha et al., 2019). Students are also expected to have motivation after using this module as one of the considerations for their teaching materials (Agustina & Adesti, 2019; Yanti et al., 2016). In addition, students are expected to feel happy with the ease of using this sports biomechanics module (Asrial et al., 2020; Setiawan et al., 2016). With the positive response from students to the use of this module, students can optimize their thinking and understanding abilities.

The formation and development of one's thinking ability to understand or understand something are born from the maturity of intellectual abilities and those obtained from studying for a certain time (Adnyana, 2012; Evi, 2011). Students' intellectual abilities can be achieved with a good understanding of concepts (Hanif et al., 2016; Luthfya, 2020). However, efforts to generate an understanding of the concept as a whole have not been maximally implemented in classroom learning (Adnyana, 2012; Fauziah & Ruqoyyah, 2022). It affects on students' understanding of concepts that are still low, and students' process skills based on critical thinking skills cannot be empowered. As a result, the knowledge gained very quickly disappears from students' memory. In addition, the use of learning resources has not varied, so it does not provide many new phenomena and problems.

Various studies have been carried out as an effort to improve the quality of learning by providing innovations in the teaching materials used. Such as the research conducted by Kuswanto & Pratiwi (2020), who developed thematic-based physical education teaching materials for early childhood. In addition, Widowati & Rasyono (2013) researched and developed floor exercise teaching materials for sports students at Jambi University. Another study was conducted by Astantry (2014) who developed teaching materials in the form of worksheets in the teaching with health protocol and learning process. Based on previous studies, the development of teaching materials has become common research to do, however, it is still rare for researchers to develop modules for the lecture process, especially in sports biomechanics courses.

This research focused on developing learning modules to support literacy skills-based sports biomechanics courses to improve conceptual understanding. The aims of this research are: 1) To find out the results of the validation of the biochemical module based on literacy skills to improve understanding of concepts, 2) to see the effect of student responses on students' understanding of concepts.

METHODS

This research was designed using research and development (R&D) research. The research and development model used is the ADDIE model. The ADDIE model used as a reference is the ADDIE model developed by Branch Robert Maribe (Maribe, 2009). According to Cahyadi (2019), the ADDIE model is one model for designing a media or teaching material to create a learning environment. The ADDIE model developed by (Maribe, 2009) consists of 5 stages, namely Analysis, Design, Development, Implementation, and Evaluation which are easy to carry out in development research.

This research was conducted on students of the Faculty of Sports Science, Padang State University. The sample in this study were students who used this sports biomechanics module, namely

90 students from the 2019 Faculty of Sports Science, Padang State University batch. The sampling technique used at the time of data collection was a total sampling technique, namely by making all the population a sample for data collection (Edwan et al., 2017).

The instrument of data collection was done by using a questionnaire. Questionnaires are a way to collect data by providing a list of questions or statements to research subjects (Lestari, 2020). The questionnaires used were validation questionnaires by experts, student response questionnaires, and concept understanding questionnaires. The validation questionnaire consists of the validation of material experts, graphic design experts, linguists, and evaluation experts, which aims to determine the results of the validation of the products made. The student response questionnaire was used to assess student responses to the developed product. The questionnaire was also used to determine how students understand concepts using this biomechanics module.

The types of data obtained in this study were in the form of quantitative data and qualitative data. Quantitative data were obtained from product validation results assessed by experts, student response questionnaires to the developed module, and concept understanding questionnaires. Meanwhile, qualitative data were obtained from suggestions and comments from experts on the developed module. The steps taken in this study were to validate the product developed, then the researcher to conduct the product trials by providing student response questionnaires, then examine the students conceptual understanding to test the effectiveness of the products made.

Data analysis techniques consisted of an analysis of product validation results and product effectiveness. Product validation was carried out using a validation questionnaire of material experts, media experts, and linguists. This expert validation questionnaire was adopted from Setyawan (2012). This questionnaire uses a Likert scale consisting of 4 score choices. The material expert validation questionnaire consists of 21 statement items (Table 1).

Table 1. Grid of Module Validation Sheets by Material Experts

Aspect	Indicator	Item Number
Quality of Learning Materials	1. Appropriateness of basic competencies and learning objectives	1,2,3
	2. Study guide	4
	3. Material selection	5,6
	4. Exercise	7,8
	5. Summary lesson	9
	6. Preparation of the test	10,11,12,13,14,15
Contents	1. Coverage of material	16,17,18
	2. Clarity of material	19,20
	3. Presentation of material	21

Furthermore, the expert validation questionnaire by the media consists of 15 statement items (See Table 2).

Table 2. Grid of Module Validation Sheets by Media Expert

Aspect	Indicator	Item Number
Module Display	1. Cover suit	1,2,3
	2. image suitability	4,5,6,7,8,9
	3. Matching fonts	10,11,12,13
	4. Text placement suitability	14
	5. Module size	15

In addition to the material and media expert validation questionnaire, there is also a validation questionnaire by linguists consisting of 10 statement items (See Table 3).

Table 3. Grid of Module Validation Sheets by Linguists

Aspect	Indicator	Item Number
Legibility	1. Rules for using language	1
	2. Use of the term	2
	3. Language compatibility	3,4,5,6,7
	4. EYD Accuracy	8,9,10

After the product is declared valid, it is tested on students. After the trial, a student response questionnaire was given to the e-module. The student response questionnaire was adopted from Setyawan (2012). consisted of 28 statement items. The student response questionnaires are described in Table 4.

Table 4. Grid of Student Response Questionnaire

Aspect	Indicator	Item Number
Display Aspect	1. Cover suit	1,2
	2. Image suitability	3,4,5,6
	3. Letter compatibility	7
	4. Module size	8
Content/Material Aspect	1. Material suitability	9,10,11
	2. Systematic presentation of material	12,13
Learning Aspect	1. Instructions for use	14,15,16
	2. Ease of understanding the material	17,18,19,20,21
	3. Giving motivation	22,23
Aspect of Readability	1. Readability of writing	24
	2. Language selection	25,26
	3. Language use	27,28

After filling out the student response questionnaire, a student concept understanding questionnaire was given in the form of questions to find out how students understand concepts using this module. The questionnaire about understanding this concept was adapted from Nurhabibah (2014). This questionnaire is feasible to use because it has been declared valid and reliable with a Cronbach Alpha value of 0.83, which states that the reliability of the questionnaire is very high. The questionnaire consists of 35 multiple choice questions (See Table 5).

Table 5. Grid of Student Concept Understanding

No	Indicator	No. Item
1	Mention the types of styles	1
2	Counting style	3,4
3	State the advantages and disadvantages of forces caused by friction	5
4	Explain the effect of force based on Newton's Laws	2,21,22,23,24,27,34
5	Determine the pair of action-reaction forces	35
6	Identify the quantities of motion	6,7,8,9,29,31
7	Distinguishing Motion	25,26
8	Determine the classification of motion in sports	10,19,20,30,32
9	Analyze the motion of the body	28
10	Making motion graph analysis	14,15,16,17,18,33
11	Applying the use of motion and Newton's laws in sports	11,12,13

The results of the data obtained from product validation were analyzed using a Likert scale from 1 to 4. The classification for the Likert scale score can be seen in Table 6:

Table 6. Score Classification

Interval	Category
1.00 – 1.75	Very Bad
1.76 – 2.50	Bad
2.51 – 3.25	Good
3.26 – 4.00	Very Good

Then the questionnaire responses and students' conceptual understanding were analyzed by using descriptive statistics. Descriptive statistics present data that include maximum, minimum, and average values (Sugiyanto & Candra, 2019). As for the effectiveness stage, the data were analyzed using inferential statistics. Meanwhile, inferential statistics are divided into two, namely assumption test and hypothesis test. The hypothesis test used in this research is linear regression test. Test the assumptions or prerequisites before testing the hypothesis using the normality, homogeneity, and linearity tests (Chen et al., 2018; Ong et al., 2021; Ozdemir et al., 2018). This assumption test itself is fulfilled if the Sig

value > 0.05 is obtained in each test. Then for Regression test was conducted to see the effect of student responses on the results of understanding the concept.

RESULTS AND DISCUSSION

The result of this research and development is a product of a sports biomechanics module based on literacy skills to improve students' conceptual understanding. The development of this sports biomechanics module refers to the ADDIE development model. The stages include the analysis stage, the design stage, the development stage, the implementation stage, and the evaluation stage.

Analysis

Stage The analysis stage is the initial stage in the ADDIE model. Activities at this stage are carried out for reference in developing sports biomechanics learning modules based on literacy skills to improve understanding of the concept. The preliminary study was conducted by the researcher with steps such as Semester Learning Plan analysis, analysis of textbooks, literature analysis, analysis of student characteristics, and interviews with colleagues. Semester Learning Plan (RPS) analysis was conducted to see whether the material being taught was in accordance with the *Learning Outcomes* and expected learning outcomes. Based on the results of the Semester Learning Plan analysis, the *Learning Outcomes* are reflected in the learning process. From this course, students can analyze various sports for more effective movement development. Based on the results of the syllabus analysis, the module in the Sports Biomechanics lecture was developed with introductory material on biomechanics, external biomechanics, internal biomechanics, and the application of biomechanics principles.

The textbook analysis was carried out to see whether the book's contents were under the competencies in the Learning Lesson Plan. The textbooks analyzed have been used in lectures, namely the Sports Biomechanics of Umar and Jaka Putra Utama and several additional books on general biomechanics, such as the Bafirman book. Systematic, so it is rather difficult to formulate in the RPS (Semester Learning Plan). So students have difficulty understanding the textbook given by the lecturer.

Analyzing literature is an activity carried out to collect materials related to module design. The characteristic structure of a module is an essential thing in the design.

Student characteristics are analyzed to determine the characteristics of students' abilities and experiences so that the modules developed do not deviate. Based on the results of observations and data collection that has been carried out, it is known that students of the Sports Coaching Education Study Program, Faculty of Sports Science, Padang State University have different high school backgrounds. This background can affect the initial ability, learning method and student motivation in Sport Biomechanics lectures. The textbooks used so far have not been able to become a learning resource that facilitates students with different high school backgrounds, so these results may underlie the need to develop a module.

After analyzing the Sports Biomechanics reference book, the next activity was interviews with colleagues. This aims to find out what problems/obstacles are encountered in the field in connection with the Sports Biomechanics lecture. Interviews were conducted with fellow lecturers of the Coaching Department on June 14, 2021. Students were not ready to take the Sports Biomechanics lecture, students did not know the material to be understood, so it was very time-consuming, and students were unable to answer questions promptly, independently without being given a cue by the lecturer.

Design

The results at the defining stage are used as the basis for the design stage. At this stage, the researcher designed a sports biomechanics learning module based on literacy skills. At the design stage, revisions were made to the module cover and table of contents. Improvements made to the module cover are color adjustments to the module design. As for the table of contents, it is described and rearranged the learning activities carried out on each learning topic systematically.

Development

After the design stage of the sports biomechanics module has been carried out, the next step is the development stage. The development stage is the stage to realize the developed module. At this stage, validation is carried out by validators/experts, and then improvements are made based on the suggestions and comments given. This product needs to be validated in order to know if this product is suitable or

not. This product validation involves three experts; material, design, and language. Those experts are all from UNP. This validation questionnaire uses a Likert scale with four categories: very bad (1), not good (2), good (3), and very good (4).

The results of material expert validation in the first stage obtained an average score of 3.04 from the maximum Likert scale score, which is 4. This score is in the good category, but several items are in the very bad category, so revision is needed. After the revision, the average score was 4. This score was in the very good category, so the material in this module was valid and feasible to be used in the module.

Furthermore, the validation stage is carried out by media experts. The validation results by media experts also consist of 2 stages. The results of media expert validation in the first stage obtained an average score of 2,9 from the maximum Likert scale score, which is 4. This score is in the good category, but there are several aspect items that are in the very bad and not good category so revision is needed. After the revision, the average score was 4. It indicates that the media used in this module is valid.

The last product validation is language validation carried out by linguists. The validation results by linguists also consist of 2 stages. The results of the validation of the linguistic experts in the first stage obtained an average score of 3 out of 4 as the maximum Likert scale score. This score is in the good category, but several aspect items are in the not good category, so it needs to be revised. After being revised the average score is 4, which indicates that the language used in this module is valid.

Implementation

It is the stage that is carried out after the product declared feasible to be used in the development of literacy-based Sports Biomechanics using the ADDIE model. This stage aims to concretely practice the literacy-based Sports Biomechanics module that has been developed and used by students. This implementation phase is carried out by distributing the product as a trial to students. The subjects were the students of the Faculty of Sports Science, Padang State University class of 2019, totaling 90 people.

Evaluation

This phase is an important part of the overall module implementation. In developing the module, a normative evaluation has been carried out on the data obtained from experimental and product dissemination trials. In this evaluation, product improvements have been carried out continuously. From the results of the product refinement, a formal evaluation is carried out.

After the product was valid and feasible to use, the researchers then distributed the product to the students and gave them the response questionnaire on the use of this sports biomechanics module. Based on the results of the questionnaire, statistical results for students' responses are represented in Table 7.

Table 7. Descriptive Statistical Results of Students' Response Questionnaire

Interval	Category	Frequency	Percentage	Mean	Max	Min
28.0 – 50.4	Very Bad	0	0 %			
50.5 – 72.8	Not Good	2	2.22 %			
72.9 – 95.2	Fairly Good	10	11.11 %	53.64	60	32
95.3 – 117.6	Good	54	60 %			
117.7 – 140.0	Very Good	24	26.67%			

Based on Table 7, it can be concluded that 60% or 54 students gave a good perception of the sports biomechanics module based on literacy skills developed with an average response score of 53.64. Hence, it can be concluded that this module is suitable for use as additional teaching material in sports biomechanics lectures. Next, a test is conducted on students to determine their comprehension on the concepts obtained by students based on the use of this module. The results of students' understanding of concepts can be seen in Table 8.

Table 8. Descriptive Statistical Results of Students' Concept Understanding

Interval	Category	Frequency	Percentage	Mean	Max	Min
0% - 20%	Very Bad	0	0 %			
21% - 40 %	Not Good	5	5.55 %			
41% - 60%	Good Enough	9	10 %	73.6	92.0	52.0
61% - 80%	Good	50	55.55 %			
81% - 100%	Very Good	26	28.89 %			

Based on Table 8, it can be concluded that 55% or 50 students have a good comprehension on the concept. It can be seen that the students' ability to understand concepts is in the percentage of 61% to 80%. The average score of students' conceptual understanding is at 73.6. It can be concluded that this module is suitable as additional teaching material in sports biomechanics lectures.

The effectiveness of the sports biomechanics module based on literacy skills was tested with a hypothesis test in the form of simple linear regression. This test was conducted to see how the effect of user/student responses on understanding the concepts. However, before testing the hypothesis on these two variables, the data must be declared normal and linear. The researcher conducted an assumption test to determine whether the data is normal and linear or not. The assumption test is an initial requirement to test the hypothesis (Nuvrianti, 2018). The assumption test used is the normality test and linearity test. The results of the normality test can be seen in Table 9.

Table 9. Normality Test Results for

Variable	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistics	Df	Sig.
Students' response	0.148	90	0.200*	0.951	90	0.442
Concept Understanding	0.186	90	0.102	0.939	90	0.284

The condition for a data to be said normal is if its significance value (Sig.) > 0.05. Based on the Table 11, the value of sig. in the Shapiro-Wilk table for user response is 0.442 and for understanding the concept is 0.284. Hence, the results of the normality test show that the significant value of the *Shapiro-Wilk test* > 0.05 is normally distributed, then the data can be continued for the linearity test. The results of the linearity test is described in Table 10.

Table 10. Linearity Test Result

	Sig	Conclusion
Conceptual Understanding Questionnaire	0.462	Linear

The condition for data to be linear is if the significance value is more significant than 0.05. Based on Table 10, it can be seen that the data is linear with a comparison of the significance value of $0.462 > 0.05$. Hence, the data can be continued for analysis of research studies by testing hypotheses.

Hypothesis testing is to see whether the proposed research hypothesis is accepted or not. The hypothesis test is a simple linear regression test. Simple linear regression test aims to see whether there is an effect of one variable on another variable or not. The results of the simple linear regression test are described in the Table 11.

Table 11. The results of the variance test on the simple linear regression

Model	Sum Of Squares	Mean Square	F	Sig
Regression	6091.404	6081.404	408.286	0.000 ^b
Residual	3260.505	14.856		
Total	9351.909			

Table 11 shows that the variance of the results is 0.000 which means $0.000 < 0.05$, so that there is an effect of student responses on students' understanding of concepts.

Table 12. Coefficient of Determination

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.717 ^a	0.541	0.640	1.400

Table 12 shows that the value of the coefficient of determination or R_{Square} is 0.541. The magnitude of the coefficient of determination (R_{Square}) is $0.541 \times 100\% = 54.1\%$. It means the student response variable on the understanding of student concepts simultaneously has an effect at 54.1%.

Table 13. Results of Simple Linear Regression Coefficient

Model	B	Std. Error	Beta	T	Sig
(Constant)	59.377	49.787	1.193	0.807	0.000
ability thinking	1.847	0.092		20.181	0.000

Based on Table 13, it was obtained that t_{count} is 20.181, while p-value is $0.000 < 0.05$, which means that student responses affect understanding the concept

This research aims to produce a product in the form of a sports biomechanics module based on literacy skills to improve students' conceptual understanding. Teachers need to develop module teaching materials to enhance the quality and efficiency of learning (Saputro et al., 2018). Learning modules must be arranged systematically and in detail. Before being tested, the product developed must be validated and tested first to find out whether the developed module is feasible to use or not. Expert validation is product validation carried out by experts and consists of several types of validation (Suyatmin & Widiyanto, 2017). The product validation carried out in this study consisted of material validation, media validation, and language validation by three experts from Padang State University. Material expert validation consists of the suitability of the material to the syllabus, lesson plans, and the contents of the sports biomechanics module book. The validation results of this module material were carried out twice: where the last validation result obtained a score of 4, which means the material is in the very good category. Then on the validation of design experts, the validated aspect is the module book related to the cover design and content design aspects. This validation was carried out twice, where in the last validation a score of 4 was obtained which means the design is very good. Furthermore, the aspects assessed for the validation of linguists are word choice, ease of understanding language, and writing grammar. This validation was also carried out twice: where the results of the last validation obtained a score of 4, which means the language used is very good. Based on the overall validation results, it can be concluded that the product is valid and feasible to use.

After the product development was carried out and the product was declared feasible, the researchers then conducted a trial to see how students responded to using this literacy skill-based sports biomechanics module. This trial was conducted on 90 students as the research sample. Based on the results of the statistical test in table 3, it can be seen that 26.67% (24 students) said this module was very good, 60% (54 students) said this module was good, 11.11% (10 students) said this module quite good, 2.22% (2 students) stated that this module was not good, and there were no students who stated that this module was not very good. The average score of student responses is 53.64 with a maximum score of 60 and a minimum score of 32. Based on these results, it can be concluded that students respond well to the use of this literacy skill-based sports biomechanics module. These results are supported by research conducted by Suyatmin & Widiyanto (2017) where the test results (in this case are student responses) categorized as good or very good make the module selectable to optimize the learning process.

In addition, researchers also examined the students' conceptual understanding using this sports biomechanics module. As for the results of statistical tests for understanding student concepts, it was found that 28.89% (26 students) were in the very good category, 55.55% (50 students) were in the good category, 10% (9 students) were in the good category. quite good, 5.55% (5 students) are in the bad category, and there are no students who are in the very bad category. The average score of student concept understanding is 73.6 with a maximum score of 92 and a minimum score of 52. Based on these results, it can be concluded that students' conceptual understanding is in the good category with this literacy skill-based sports biomechanics module. Under the research by Luthfya(2020), the use of learning media can facilitate students' understanding of concepts. Moreover, the study states that biomechanics can correct errors, reduce the risk of injury and understand the importance of designing sports equipment. This statement is supported by Rubiana et al (2017) who state that with a good understanding of the theory and concepts studied, coaches and athletes can provide an exercise process that under the rules of exercise physiology based on appropriate body physiology.

To determine the effectiveness of the developed sports biomechanics module, the researcher conducted a simple linear regression test to determine how much influence the student response had on understanding the concepts they received. Before the regression test, assumption tests and hypothesis tests were carried out. The assumption test is carried out with the data's normality test and the data's linearity test. The normality test results can be seen in table 4, which shows that the significance value of the student response questionnaire is 0.442 and the student's concept understanding questionnaire is 0.284. This shows that $\text{sig} < 0.05$ so it can be concluded that the data is normally distributed. Meanwhile, the results of the linearity test can be seen in table 5, where the significance value shown is 0.462, which means that the data is linear. After testing the assumptions, then tested the hypothesis using a simple linear regression test. Based on the results of a simple linear regression test, it was found that the student's response influenced the students' understanding of the concept with a percentage of 54.1%.

The results are supported with the research by Harmono (2017), who states that the learning process is designed as to influence and support student understanding. Hence, with the use of interesting modules and good responses from students, the modules can be used as learning resources to hone students' understanding of concepts.

Research on module development has been carried out by Agape et al (2021) who developed a comic-based basketball module for basketball extracurriculars in elementary schools. Based on this research, students are more interested in reading teaching materials. Students' interest in reading can undoubtedly improve students' understanding of concepts. This is supported by a research statement conducted by Hanif et al (2016) that with the development of learning tools, it can help to improve students' understanding of concepts. Similar results were found in the development research conducted by Dixon (2005) on the biomechanics module. Based on this research, after comparing student test results for two meetings, it turns out that this module can improve students' understanding. Students' understanding of concepts can be better and more active because the teaching materials have more variations.

The results are supported by Astalini et al (2021), who states that the use of innovative teaching materials can be accepted by students where students give a good perception of the teaching materials developed. Based on research conducted by Titting et al (2016), the development of android-based learning media on floor exercise material is more effectively used as teaching material by teachers in schools. In addition research by Sirate & Ramadhana (2017), shows that the use of literacy skills-based modules receives a positive response from both teachers and students. In addition, the effectiveness of the learning module based on the results of the literacy posttest showed the percentage of completeness reached 76.19%, in the good category. Based on the previous description the use of the literacy skill-based sports biomechanics module that was developed meets the effective criteria and it is feasible to be used as teaching material in the lecture process.

With the use of modules in the learning process, it is expected to increase students' understanding. Concept understanding is one of the abilities or skills achieved in the learning process (Arifah & Saefudin, 2017). By understanding the concepts of sports biomechanics, which can be programmed with this machine, our bodies, we can move more precisely and accurately. Moreover, the study states that biomechanics can correct errors, reduce the risk of injury and understand the importance of designing sports equipment (Wahyuda et al., 2016). This statement is supported by Rubiana et al (2017), who state that with a good understanding of the theory and concepts studied, coaches and athletes can provide an exercise process under the rules of exercise physiology based on appropriate body physiology. With this, it can improve the ability of athletes and support athletes to achieve achievements in the field of sports and avoid injury to athletes.

The novelty in this research is the development of teaching materials in the form of modules based on literacy skills at the Faculty of Sports Science. In addition, the findings of this study indicate that the student response variable can influence the variable understanding of the student's concept of the sports biomechanics module based on literacy skills to improve students' conceptual understanding. The effect found is also very simultaneous between these variables. Based on the results of relevant analysis, this research complement the previous studies. The implications of this research include implications for teaching staff (lecturers) that can be used as a guide in designing teaching materials for sports biomechanics lectures. The use of modules in the lecture process is expected to make the learning process more systematic and practical. It is in accordance with the research conducted by Dewi et al (2017), who state that the use of modules in the learning process makes learning more effective and the achievement of learning objectives. The use of teaching materials of this module does not only apply to sports biomechanics lectures, but can be used in other lectures such as mathematics, physics, engineering, English, up to the secondary education level as well. This research needs to be done so that learning can be more innovative and well organized. Furthermore, this research can also be used as a reference for further researchers and it can be a source of literature study as additional material in conducting research. However, this research is limited to developing a sports biomechanics module based on literacy skills to improve concept understanding. It is hoped that further research will be held with other materials to improve students' understanding of concepts, so that the module books developed can be broad. So, every lecture process can take place, both online and offline or in other fields according to their needs.

CONCLUSIONS

Based on the results, the sports biomechanics module based on literacy skills to improve understanding of this concept is declared valid and feasible to use. The validation carried out includes the validation of material experts, validation of design experts, validation of linguists, and validation of evaluation experts. Based on the results of trials using student response questionnaires, it was found that the dominant students gave a good perception of this literacy-based sports biomechanics module. After validation and testing, the researchers examined the effect of student response variables on students' conceptual understanding variables. Based on the results of a simple linear regression test to see the impact of this variable, it was found that there was a significant influence between the student response variables on the student's concept understanding variable.

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