

Designing of Stem-Based Teaching Materials for Pencak Silat in Junior High School

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Abstract

Education is a person's effort to develop their personality in accordance with the values of society and culture. In learning pencak silat, students will be taught basic movements, self-defense techniques, and the art of pencak silat. To help develop themselves better, students must keep up with the times so that they have more freedom to develop themselves. In the STEM (Science, Technology, Engineering and Mathematics) learning model with an educational approach that combines science, technology, engineering and mathematics in an integrated learning environment. STEM learning is very good if it is integrated to PJOK learning, especially in pencak silat materials. This research was conducted to apply teaching materials designed on a STEM basis for PJOK subject with pencak silat materials at Junior High School 19 Palembang. This research is an experimental study of The Equivalent Time Series Sample during 4 weeks of meetings which was measured using LKPD (Learner Worksheets) and FCE (Formative Class Evaluation) questionnaires. The samples used were students in class 7.11 at Junior High School 19 Palembang with the total number 30 students. The results of the research carried out were: 1) LKPD showed results in the poor category. 2) The FCE questionnaire shows results in the medium category. So, it can be concluded that there is a difference between learning pencak silat using STEM and learning pencak silat without STEM.

Keywords: PJOK; STEM; Pencak Silat; LKPD

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INTRODUCTION

Education is a systematic process that aims to develop individual potential and abilities so that they can contribute optimally to the social life. More than just conveying information, education includes the process of building characters, values and skills needed to face life's challenges. Education is all learning experiences that last throughout life in all situations that have a positive influence on each individual growth (Desi, 2022). Education is an effort to help students both physically and mentally, from their innate nature towards a human and better civilization (Sujana, 2019). Physical education is the process of educating a person as an individual or a group carried out consciously and systematically through various physical activities to obtain physical growth, health, physical fitness, abilities and skills, intelligence and harmonious development of character and personality in the context of forming the quality of Indonesian based on Pancasila (Arifin, 2017).

Learning is a process of creating an environment that encourages students to develop well in gaining knowledge (Pane & Dasopang, 2017). Physical education learning tends to involve physical activity to maintain a balance of health and physical fitness. Physical

education, sports, and health is an education carried out through activities aimed at achieving individual characteristics in mental, emotional, and physical aspects. Physical education is used to achieve individual development. PJOK learning tends to involve physical activity to maintain a balancing of health and physical fitness (Junaedi & Wisnu, 2015). Physical education, sports, and health is education that uses physical activity to produce significant improvements in terms of the physical, mental, and emotional aspects of students (Roji & Eva: 2014). Learning PJOK at school invite students to move so that their bodies are fit and do not get excessively tired so that in teaching and learning process they are able to receive the material well (Sports et al., 2023). Physical education and sport at school are an important means for the development and the function as a place for distributing emotions, strengthening identity, social controlling, socialization, changing, distributing feeling, and achieving success (Soedjadmiko, 2015). Physical education can be said to be an educational tool or educational medium that can achieve educational and the process of civilizational goals (Sofiarini, 2016). Currently, teachers are required to be able to provide innovation and variation in teaching and learning process so that they can improve student performances at school. Basically, each student has a different understanding when receiving materials by the teacher in learning PEHS (Wiraguna et al, 2020).

Pencak Silat is a sport, pencak silat and Indonesian culture has developed nowadays. Pencak Silat means that the art of movement to defend oneself or fight. Pencak Silat is a series of physical exercises called martial arts originating from Indonesian culture to increase faith and devotion to God Almighty (Wilda & Irwandi, 2018). Pencak silat as a martial art has the characteristic of using all parts of the bodies and limbs from head to toe. Hair can also be used for self-defenses, it can be done with bare hands or with a weapon, but it is not related to the use of a particular weapon, any object can be used as a weapon (Muhtar T, 2020). Pencak silat as an educational sport, emphasizes coaching physical skills, especially the formation of attitudes and movements as well as mental/spiritual development by embedding self-confidence with the noble qualities. Pencak silat is a place for spiritual education with regular and continuous training to develop skills (Sudiana & Sepyanawati, 2023).

Pencak silat plays an important role in developing the attitudes, mentality, and qualities of the younger generation. This is related to the goal of the sustainable development of the younger generation, so that pencak silat becomes an opportunity for the educational institutions to raise the level of students through mental, attitude and discipline. So, it can build a disciplined and has a warrior spirit young generation (Kholis, 2016). Reviewing from its

identity and rules, pencak silat is the essential substance and means of spiritual mental education and physical education to form someone who can appreciate and practice the teachings of the philosophy of noble character (Kriswanto, 2015).

STEM is an effective teaching method for implementing the integrated thematic learning because it combines four main areas of education, namely science, technology, engineering, and mathematics (Sukmana, 2018). This STEM approach prioritizes an educational approach based on science, technology, engineering, and mathematics with a focus on solving problems in everyday life (National STEM Education Center, 2014). STEM refers to the individual and practical application of STEM education while continuing to develop educational approaches that integrate science, technology, engineering, and mathematics by orienting the educational process towards solving real problems in everyday and professional life (Septiani, 2016). The approaching to these four aspects is a harmonious pair between problems that occur in the real world and problem-based learning (Torlakson, 2014). The aim of STEM education is to produce students who can develop their own skills so that they can adapt a various situations and problems in everyday life (Mayasari, 2016). The LKPD includes the LKPD title, basic competencies, completion time, materials/equipment used, brief description, work steps, tasks that must be carried out and what must be reported (Lathifah et al., 2021).

There have been several studies conducted, including research on the development of STEM-integrated LKPD on the temperature and heat material for the students of the Tenth Graders by Agustin Setiani that achieved the result score of the questionnaire of integrating LKPD with STEM with the score is 3,32 means that the score is very good. The average answer of each student and teacher reaches the criteria of being very supportive so it can be concluded that the STEM integrated LKPD with temperature and heat material developed could be used as a learning resource. Then in research on Student Worksheets (LKPD) Elements, Compounds and Mixtures Using a STEM Approach by Lina Arifah Fitriyah and Humaidillah Kurniadi Wardana which was based on the STEM approach through LKPD, they obtained learning results with an average score of 85%. The last one is research on the development of LKPD based on the Science, Technology, Engineering, and Mathematics (STEM) approach to develop students' critical thinking skills, which was carried out by Halim Simatupang, Andika Sianturi and Nanda Alwardah, which obtained results from using LKPD based on the STEM approach which developed critical thinking. The average of 82.57% with 25 students graduating. From research that has been carried out, the STEM approach through LKPD can help students improve their learning performance in the teaching and learning process.

METHOD

This type of this research is a type of experimental research The Equivalent Time Series Sample with a quantitative descriptive approach. The experimental method is defined as a systematic formal method that aims to determine the effect of one variable on another variable through special treatment and special management. The research did not receive data that met the criteria for reasonable data (Endang W, 2018). In this design, students receive treatment (X) and observation (O) using LKPD and FCE questionnaires at the end of learning. Success is determined by comparing the results of treatment using STEM-based LKPD with those that do not use STEM. LKPD in PJOK is designed to support effective learning, active involvement of students and achieve the learning goals. Student worksheets (LKPD) is a learning mean that teachers can use to increase student participation or activity in the teaching and learning process (Noprinda & Soleh, 2019). In this case, LKPD becomes a mean to assist and facilitate learning activities in such an effective way to develop the interaction between students and teachers and it can increase student's activity in improving learning outcomes (Arief, 2015).

The place of the research was at SMP Negeri 19 Palembang. The total sample of this research was 30 students in class 7.11. The data collection technique is a strategic step in the research because the main aim of the research is to obtain data without knowing the data collection techniques. The research did not receive data that met the criteria for reasonable data (Endang W, 2018). The Instruments that used in this design are a form of a Formative Class Evaluation questionnaire sheet (FCE) and LKPD in pencak silat materials. The Formative Class Evaluation (FCE) questionnaire contains 9 questions asked to students, in which there are 4 main components containing results, willingness, methods and cooperation. It used to find out how effective learning in class from the perspective of students' opinions (Mahendrayana T, 2017). The FCE questionnaire sheet is given to students after the learning process takes place. After students have participated in the lesson, they are given an FCE questionnaire at the end of the lesson and asked to provide answer choices according to the questions in the questionnaire.

Table 1. Degree of validity of the Formative Class Evaluation (FCE) questionnaire

Question Number	Validity Score	Degree
1	0,83	Special
2	0,71	High
3	0,78	High
4	0,70	High
5	0,72	High

Question Number	Validity Score	Degree
6	0,60	Enough
7	0,72	High
8	0,65	Enough
9	0,70	High

(Mahendrayana, 2017)

Based on table 1 above, there are 9 questions in the questionnaire. The Formative Class Evaluation (FCE) can be stated valid.

Table 2. Formative Class Evaluation (FCE) score category

SCORE	SCORE	CATEGORY
2,77 – and more	5	Best
2,58 – 2,76	4	Good
2,34 – 2,57	3	Medium
2,15 – 2,33	2	Less
2,14 – and less	1	Very Less

Source: (Mahendrayana, 2017)

The FCE questionnaire sheet will be filled in by students after the teacher has finished providing the learning materials. Students fill out the FCE sheet by checking one of the alternative answers listed in the questionnaire without any influence from other friends (Tri Mahendra, 2017). The three alternative answers are "Yes", "No" and "Don't Know" are given a score for each answer, the score of each answer is as follows:

- a. Answer "Yes" with a score of 3
- b. Answer "No" with a score of 1
- c. Answer "Don't Know" with a score of 2

Then, the results are analyzed to obtain the conclusions based on the categories on the table 3 below:

Tabel 3. A score category of the worksheet instrument of *Formative Class Evaluation (FCE)*

Component	Question item	Category				
		Very good	Good	Moderate	Less	Very Less
Result	1. Memorable experience	3,00-2,62	2,61-2,29	2,28-1,90	1,89-1,57	1,56-1,00
	2. Skill	3,00-2,82	2,81-2,54	2,53-2,21	2,20-1,93	1,92-1,00
	3. Knowledge	3,00-2,85	2,84-2,59	2,58-2,28	2,27-2,02	2,01-1,00
	The score component	3,00-2,70	2,69-2,45	2,44-2,15	2,14-1,91	1,90-1,00
Willingness	4. Sincerity	3,00	2,99-2,80	2,79-2,56	2,55-2,37	2,36-1,00
	5. Fun	3,00	2,99-2,85	2,84-2,60	2,59-2,39	2,38-1,00
	The score component	3,00	2,99-2,81	2,80-2,59	2,58-2,41	2,40-1,00
Method	6. Fit in learning	3,00-2,77	2,76-2,52	2,51-2,23	2,22-1,99	1,98-1,00
	7. Learning effort	3,00-2,94	2,93-2,65	2,64-2,31	2,30-2,03	2,02-1,00
	The score component	3,00-2,81	2,80-2,57	2,56-2,29	2,28-2,05	2,04-1,00
Cooperation	8. Attitude to friends	3,00-2,92	2,91-1,71	2,70-2,46	2,45-2,25	2,24-1,00

Component	Question item	Category				
		Very good	Good	Moderate	Less	Very Less
9.	Cooperation learning	3,00-2,83	2,82-2,55	2,54-2,24	2,23-1,97	1,96-1,00
The score component		3,00-2,85	2,84-2,62	2,61-2,36	2,35-2,13	2,12-1,00
The total score		3,00-2,77	2,76-2,58	2,57-2,34	2,33-2,15	2,14-1,00

Table 4. Questionnaire Sheet of *Formative Class Evaluation* (FCE)

Name : Gender :

Absent Number : School :

Class : Day and Date :

Fill out the questionnaire (No. 1-9) by giving check (√) to one of the answer box provided.

No.	Pertanyaan	Jawaban		
1.	In PJOK class earlier, is there something make you interested?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't Know
2.	In PJOK class earlier, do you get a new motion experience that you never get before?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't Know
3.	In PJOK class earlier, do you understand with one of the topics that being taught?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't Know
4.	In PJOK class earlier, do you do the motion truly?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't Know
5.	In PJOK class earlier, do you follow the instruction happily?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't Know
6.	In PJOK class earlier, do you feel that you are Learning by being forced?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't Know
7.	In PJOK class earlier, do you practice very hard?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't Know
8.	In PJOK class earlier, do you study with your friend in a friendly situation?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't Know
9.	In PJOK class earlier, do you help each other in learning at the class?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't Know

Table 5. The worksheet of the Assessment Skill

Name : _____ Class: _____

No	Essential Indicator	Movement description	Yes (1)	No (0)
1.	Initial stance position	a. Feet		
		b. Body		
		c. Hand and Seeing		
2.	Motion	a. Feet		
		b. Body		
		c. Arm and Hand		
		d. Seeing		
3.	Position and Final stance	a. Feet		
		b. Body		
		c. Hand and Seeing		
Acquisition/Maximum score X 100% = Score result				

Table 6. The Interval KKM of PJOK Score

Interval		
88 - 100	A	Very Good
76 - 87	B	Good
64 - 75	C	Enough
≤ 63	D	Less

RESULTS

Tabel 7. The Score Recapitulation of Pencak Silat Skill

Meeting	Score
First	45,5
Second	54,8
Third	60,6
Fourth	67,3
Total	228,2
Average	57,05

The score obtained in week 1 with the application of STEM was 45.5. In week 2 without the application of STEM is 54.8. From week 1 and 2 the value obtained by students has been seen even though it is not too significant. In week 3 with the application of STEM, the score was 60.6. Comparison from week 2 which did not apply STEM with week 3 by applying STEM experienced a significant increase in value. At the 4th week meeting without the application of STEM students get a score of 67.3. This happened because of the influence of the application

in the previous weeks. The total score obtained for 4 weeks of meetings amounted to 228.2 with an average score obtained of 57.05.

Table 8. The Result Recapitulation of The Questionnaire of *Formative Class Evaluation*

Meeting	Result	Willingness	Method	Cooperation	Average
1st	2,49	2,27	1,63	2,01	2,1
	4	2	1	1	1
	Good	Very Less	Very less	Very less	Very Less
2nd	2,57	2,40	1,78	2,22	2,24
	3	3	1	2	2
	Moderat	Moderate	Very less	Less	Less
3rd	2,66	2,56	1,89	2,44	2,63
	4	3	1	3	4
	Good	Moderate	Very less	Moderate	Good
4th	2,70	2,79	2,15	2,71	2,58
	4	5	2	4	4
	Good	Very Good	Less	Good	Good
Total	2,60	2,50	1,86	2,34	2,38
	4	3	1	3	3
	Good	Moderate	Very less	Moderate	Moderate

The value of the FCE questionnaire obtained in week 1 with the application of STEM with an average of 2.1 with category 1 is very poor. In week 2 without the application of STEM with an average of 2.24 with a category of 2 less. In week 3 with the application of STEM, the average was 2.63 with a category of 4 good. At the 4th week meeting without the application of STEM students get an average of 2.58 with a category of 4 good. This happened because of the influence of the application in the previous weeks. So that the average result for 4 weeks of meetings is 2.38 with a category of 3 moderate.

DISCUSSION

The research was carried out at Junior High School Number 19 Palembang. Before carrying out the research activities, first the researchers held a discussion and made an agreement with PJOK teacher regarding the time for carrying out the research, materials, methods, and samples to be used. Then the researcher submitted a research permit letter from the Faculty of Teacher Training and Postgraduate Education, Sriwijaya University to the school to obtain permission and approval to carry out the research activities at Junior High School Number 19 Palembang. It is done, so that the researcher can do the research smoothly in accordance with the research procedures.

The distribution of data regarding the results of the pencak silat skills test was obtained in week 1 through STEM-based learning treatment with the average score obtained 45.5, in the 2nd week without treatment students got an average score of 54.8, in this case an increase due

to the good influence of previous learning. From the existing results, it can be seen the difference between the 1st meeting where treatment was carried out using STEM on the LKPD and the 2nd week where no treatment was carried out. In the 1st week of treatment, students tried to understand STEM-based learning material by showing quite good results, due to adjustments in receiving different material from usual learning. In the 3rd week with STEM treatment students got an average score of 60.6.

From the existing results, it can be seen the difference between the 2nd meeting where no treatment was carried out and the 3rd week where treatment was carried out using STEM on the LKPD. In the second week of treatment, students followed learning as usual without doing STEM-based learning. Students try to understand the learning material as usual without linking learning to STEM material. Although on the other hand, an increase in student learning can be seen because of the influence of the previous meeting. Then at the 4th meeting without treatment the students got an average score of 67.3. Pencak silat skills themselves include a series that combines physical, technical, and mental skills. Movement skills include mastery of basic techniques such as correct body posture, proper footwork, and proper hand movements. These techniques are an important foundation for building more organized movements in pencak silat.

Then the results of the differences between the 3rd week where treatment was carried out using STEM on the LKPD and the 4th meeting where no treatment was carried out. In the 3rd week of STEM-based meetings, students begin to understand the existing material by relating the material to a more diverse range of STEM learning so that they can develop students' thinking patterns more creatively. Students are invited to develop pencak silat learning through STEM, so that they can know more about the material being studied. The results of the Formative Class Evaluation (FCE) questionnaire in the 1st week with STEM learning treatment with an average score of 2.1 received a score of 1 in the very poor category, in the 2nd week without treatment the results obtained an average of 2.24 got a score of 2 in the poor category. Then in the 3rd week with STEM learning treatment students got results with an average of 2.63 and got a score of 4 with a good category, then in the 4th week without treatment, students got results with an average of 2.58, getting a score of 4 in the good category.

Changes in yield increased due to the influence of previous treatment. Gradually improving results can reflect an increase in students' understanding and involving in the learning process. The FCE questionnaire is used to evaluate the effectiveness of teaching methods and students' understanding of the learning process. By changing teaching methods through STEM, it can be more interactive and applicable, student participation can be

increased. In the STEM approach, students are given new experiences in learning so they can understand the learning material deeply. Changing the learning materials and delivering information can be contributed to improve a better outcome.

CONCLUSION

Based on the results of the discussion described, a conclusion was drawn regarding the application of the STEM approach to PJOK subjects in pencak silat materials to help students understand the material deeply with different learning methods so that it can make students play a more active role in learning. Then this approach is very effective in building students' understanding of the learning material as seen from the continued increasing in skill results demonstrated by students.

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