Development of Jigsaw Methods and Digital-Based Design Methods in Gymnastic Learning

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Abstract---This research is motivated by the limited development of learning media for floor Gymnastics (artistic), especially for schools located in the regions or the village. This study aims to produce a product in the form of media from the development of the Jigsaw method and digital-android-based design. The subjects of this research were Students at the Sports Science Faculty who took basic and advanced or learning Gymnastics lectures with a total of 80 people for small group trials and 120 people for field trials. The data used in this research are qualitative and quantitative. This research was conducted using "Research and Development". The model that becomes the reference is the Borg & Gall development research model with 10 developments, in this research the researchers adopted the following Steps: 1) Preliminary Study (research and data collection); 2) Develop planning and analyze the media to be made; 3) Initial product development; 4) Conduct small group trials; 5) Product Revision; 6) Conduct field trials; and 7) Revise the final product.

Introduction

Artistic Gymnastics is one of the achievement sports that is taught in schools as a PJOK educational material that is popular in the community and the world. In addition to achievement sports, Gymnastics is also part of the learning material in education that is developed in the curriculum in schools and lectures. Gymnastics is used to show physical activities that require a wide range of motion, so it needs to be done using tight clothing or called a press body (Hedbávný et al., 2013; Zulbahri, 2016; Edouard et al., 2018; Zulbahri & Astuti, 2020; Pitnawati et al., 2019). From the characteristics and structure of the movement, Gymnastics can be said to be a suitable physical activity to be used as a physical education tool, because it is considered capable of contributing to the quality of motoric development and physical quality. Characteristics of motion were very important in increasing understanding of the principles of mechanics of motion and the laws of nature that work on a moving body. Gymnastic skills are always built on basic skills consisting of; 1) locomotor skills, namely movement to move places such as walking and jumping; 2) Non-locomotor skills, is call movements that do not move places such as bending; and 3) Manipulative skills, namely manipulating certain objects with limbs: hands, head, and feet (Amador & Mederer, 2013; Zulbahri, 2016, Zulbahri & Astuti, 2020; Astuti, 2021).

In the implementation of learning in schools and college, Gymnastics includes motoric activities that need to be extra careful to practice, because the level of risk and injury is also high if an error occurs in the movement. Therefore, there are also many students and students college who do not dare to practice it in learning. In addition to these problems, teachers in schools, especially those in the regions, also find it difficult to carry out floor Gymnastics lessons due to the lack of knowledge and also media that can be used as examples, references, and learning benchmarks. In this research, an artistic Gymnastics learning media will be developed in the form of a digital-android version (Blijlevens et al., 2018; Garcia et al., 2011). The learning media created contains steps in a series of movements as well as assistance developed through the Jigsaw method and the design method, namely the form of assistance carried out by the process of involving friends, assignments, groups, wall facilities, and others. The working mechanism is to digitize the learning carried out by teachers and lecturers.

Amador & Mederer (2013), explain that Jigsaw is a method that emphasizes learning together by dividing into small groups. Then Anita Lie suggested that Jigsaw is a method of cooperative learning designed to increase students' sense of responsibility towards their learning and the learning of others (Amador & Mederer, 2013). The Jigsaw learning model is a variation of collaborative learning, namely a group learning process in which each group member contributes information, experiences, ideas, attitudes, abilities, and skills to jointly improve the understanding of all members. Students not only learn the material being raised but they must also be willing to give and teach the material discussed to others. Meanwhile, Silberman explained that Jigsaw is a cooperative technique

that combines material from other students to form a coherent collection of knowledge or skills (Siberman, 2020).

Rahmawati (2010), said that the learning model through the Jigsaw approach is a learning approach that combines various potentials of students to generate a strong learning desire to find concepts systematically by involving the participation of all students to find inspiration naturally in their learning activities. Therefore, according to the explanation above, it can be interpreted that the Jigsaw method is very cooperative in providing an understanding of new materials and skills. In addition, the Jigsaw method emphasizes the responsibility of students to become an expert group and an origin group that has mutual responsibility to create a cooperative character among group members. In line with this, Ismail & Ichwan (2008), explained that the purpose of learning the Jigsaw method is to try to train students to get used to discussing and being responsible individually to help understand the subject matter.

Lee Marning & Lucking (1991), from their research it can be understood that students who are taught by the Jigsaw method are more likely to like their friends in compared a study group to their liking for their classmates who are not members of their study group to their friends. It means the formation of harmony in one group's thinking because in the Jigsaw method students have the responsibility to form views and achieve the same goal. Students depend on other friends in studying the material to create a cooperative group atmosphere and benefit others.

According to the researcher needed it was adapted several theories. Aspects of collaboration skills that will be developed in this research were improving students' cooperative abilities in the aspects of 1) students completing project assignments together; 2) discussing project planning appropriately; 3) exchanging opinions; and 4) cohesiveness in completing project tasks. One of the things that can support students' ability to work together is to apply a design or project model to PJOK learning. In this learning activity, students complete a project in groups to complete a product. The group consists of heterogeneous student characters, they are trained to be able to complement and give each other, so that cohesiveness and togetherness are established to complete the project well. Students and their teams carry out their project of making albums according to the Steps of the design model that have been instructed by the teacher. Ardianti et al. (2019), suggests that the project design method is one of the learning models characterized by the activity of designing and carrying out a project to produce a product. Kosasih (2017), explains that project-based learning is a learning model using a project as its goal. Pratiwi et al explained that the design model is a learning model that can build students' abilities by involving project work that produces real work that can be shown such as reports, product creation, and completion of written assignments given by the teacher (Delignières et al., 1998; Li, 2020; Batsunov, 2021).

From this explanation, we can conclude that learning with the Jigsaw method there will be permanent changes in attitudes and behavior resulting from experience and the learning process (Pratiwi, 2015). Meanwhile, in learning this setting and creation of certain conditions are such that it supports the student's

learning process and does not hinder it (Siregar & Nara, 2010). In implementation at schools and the College, learning with Jigsaw developed with several branches of knowledge by the objectives and results to be achieved through these learnings, including Physical Education, Sports, and Health. Physical Education subjects Sport and Health are part of general education in schools that aim to develop aspects of physical fitness, movement skills, critical thinking skills, social skills, reasoning, emotional stability, moral action, aspects of a healthy lifestyle, and introduction. Physical education subjects, sports, and health are subjects that are taught at every level of education (KEMENDIKBUD, 2014).

In the physical education curriculum, there are seven aspects developed, including gymnastic activities: simple dexterity, dexterity without tools, dexterity with tools, and floor Gymnastics, as well as other activities. Gymnastics is a physical activity with the richest movement structure" (Zulbahri, 2016). From the characteristics and structure of the movement, Gymnastics can be said to be a suitable physical activity to be used as a physical education tool, because it is considered capable of contributing to the quality of motoric development and physical quality" (Zulbahri, 2016). Characteristics of motion are very important in increasing understanding of the principles of mechanics of motion and the laws of nature that work on a moving body. Gymnastic skills are always built on basic skills consisting of 1) locomotor skills, namely moving places such as walking and jumping; 2) Non-locomotor skills, namely movements that do not move, relying on body joints that form different positions that remain in one point such as bending; and 3) Manipulative skills, namely manipulating certain objects with limbs: hands, head, and feet (Zulbahri, 2016).

To make practice gymnastic movements easier it is necessary to carry out a direct and indirect assistance approach which is a form of exercise with the involvement of friends to help each other in movement activities an indirect assistance approach with the help of tools, as well as the Jigsaw method which is the implementation of group exercises and design methods by assigning motion to students and students. In other words, when the approach and method are implemented, teachers and lecturers can try to correct the mistakes or shortcomings of students in the process of movement that is carried out so that of course it will accelerate the mastery of motoric skills when carrying out movements compared to individual exercises (Zulbahri, 2016). On the other hand, the approach and method of this exercise will also reduce the risk of injury when practicing gymnastic skills. This approach and method of exercise can be used for various forms of gymnastic movements such as standing with two hands (handstand), standing with head (headstand), rolling, wheeling, etc. All the steps and forms of exercise assistance in learning floor Gymnastics will be published in digital-android learning media.

Media can serve as an introduction to convey information from sender to receiver. Then with the learning media, all materials and physical tools are used to implement teaching and facilitate student achievement towards teaching objectives (Margono et al., 2012). Learning media as a tool in the learning process can be used inside and outside the classroom. The media is used in the context of communication and interaction between teachers and students in the learning process (Siregar & Nara, 2010; Nurhasan, 2014). In this research, the learning

media made based on digital-android, which is a messenger tool that combines two or more media elements, including text, images, graphics, photos, sound, film, and animation in an integrated manner that is packaged in a digital-android (Siregar & Nara, 2010; Sadiman, 2009; Kustandi & Sutjipto, 2013).

The development of Lectora-based learning media which contains the steps and techniques of this approach and method combines two approaches and two methods so that it has a high novelty value. The first step is believed to be able to make learning Gymnastics a sport that students like. In addition to the use of technology, the achievement of learning achievement in Gymnastics is determined by many other factors. Therefore, it is necessary to design learning media with the Jigsaw method and design (Hars & Calmels, 2007; Rudd et al., 2017; Jackman, 2020). The working concept in this research is the creation of a digital-android-based video containing a series of motions that can make it easier for teachers and lecturers to direct and evaluate students learning, so it was more effective and efficient learning. And it can be studied by students and also can be practiced outside class in hours. An example of its movement can be seen in the following Figure 1 below.

Figure 1. Illustration of the execution of the movement

Method

This research was conducted by Research and Development, a research method used to produce certain products, and to test the effectiveness of these products. Research and Development aim to discover new knowledge through "basic research" or to answer specific questions about practical problems through "applied research" which is used to improve educational practices (Sugiyono, 2011). In this research, Research and Development are used to produce digital-android learning media. The specific purpose of this research is to design a learning media for Gymnastics that utilizes digital-android technology so that it is expected to be able to answer the problems that have been faced so far. This research is by one of the main research designs of Universitas Negeri Padang related to the development of sports media, modules, and instruments.

This research was carried out at Universitas Negeri Padang, from June to November 2021. The subjects of this research were FIK Universitas Negeri Padang students who took basic and advanced Gymnastics/learning courses with a total of 80 people for small group trials and 120 people for field trials (Gabel, 1998; Perry, 1983; Peter, 2015). The model that becomes a reference of this research was the Borg & Gall development research model with 10 developments, in this research the researchers adopted the following Steps: 1) Preliminary Study (research and data collection). Conducting observations, interviews, and field observations; 2) Develop a Plan. Researchers plan and analyze the learning media that will be made; 3) Initial product development. Researchers produce learning media. After the production is complete, validation is carried out by media experts and material experts; 4) Conduct small group trials. The media that had been revised based on a one-on-one trial was then tested in small groups with a total of 80 students and college students; 5) Product Revision. Fixed media errors and deficiencies; 6) Conduct field trials. The number of students and students in the operational group trial was 120 people, and 7) Revise the final product. The data from the main field trials are used as reference material in product revision and are the final result in media development (Gall et al., 1996).

The work design in this research is to design a digital android, then validated by media experts and material experts, then tested in small groups and large groups until the final product revision Step as finalization in media development. More details can be seen in Figure 2 below.
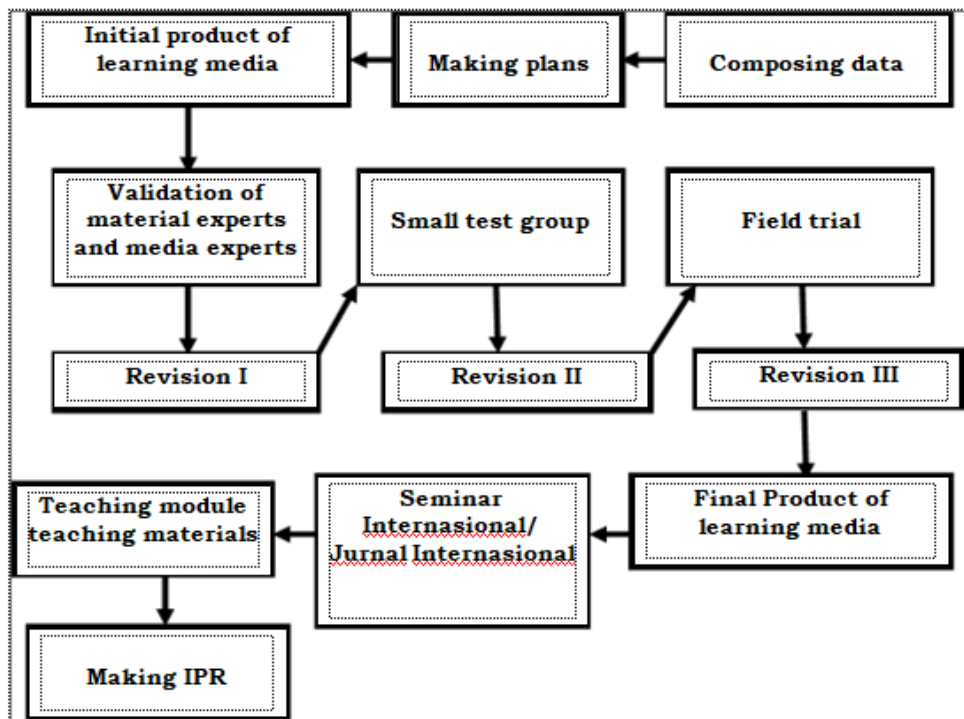

Figure 2. Research flow chart

Then, for the conversion of quantitative data to qualitative data, guidelines are used in the conversion of scores on the five-scale assessment criteria, for more details, we can consider the following Table 1 below.

Table 1
Results of conversion of quantitative to data qualitative

Interval	Criteria
X >	Very good
3,40 < X ≤ 4,21	Good
2,60 < X ≤ 3,40	Enough good
1,79 < X ≤ 2,60	Not good
X ≤	Very not good

The validators who became material experts and media experts in this development research were the Gymnastics Lecturer in the Department of Sports Education and Education Technology Lecturer at Universitas Negeri Padang. Validation is done by providing learning media product results (Vuillerme et al., 2001; Chiat & Ying, 2012).

Results and Discussions

Initial product

The manufacture of learning media products is carried out based on analysis that has been done previously. The design process begins with drafting a concept, collecting the required materials, and integrating by utilizing a computer program into a form of learning media. The following is an initial view of the learning media product before being validated by material and media experts.
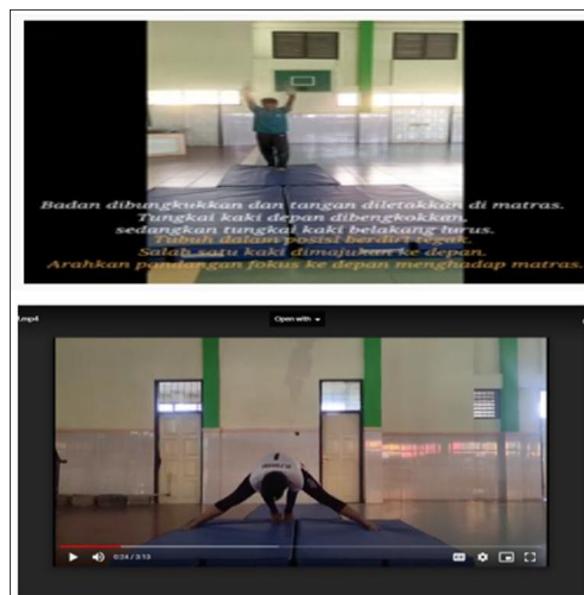

Figure 3. Early media products result

Step I validation and revision by material dan media expert

In this validation, researchers and material experts discuss the quality of the material in the learning media (Singh & Parmar, 2016; Rinartha et al., 2018). The evaluation given by the material expert in the form of a description of each item of the basic movements is accompanied by photos of the movement steps to make it more visible, clarify the step and smoothness of the movements carried out. Step I evaluation was carried out on June 9, 2021, and the following data were obtained.

Table 2
Score of quality aspects of learning material by material expert material step I

No	Rated aspect	Scoring scale					Criteria
		1	2	3	4	5	
1	Overall movement accuracy		v				Not enough
2	Movement Step accuracy			v			Enough
3	smoothness and beauty of motion	v					Not enough
Total		0	0	6	4	0	
Skor total		6					Not good
mean score		2					

Then for media validation, it is done by providing a form of learning media. In this validation, researchers and media experts discuss the quality of videos and images in learning media. The evaluation given by media experts in the form of room lighting needs to be considered. Step I evaluation was carried out on June 15, 2021, and the following data were obtained.

Table 3
Scores of quality aspects of learning materials by media expert media on step I

No	Rated aspect	Scoring scale					Criteria
		1	2	3	4	5	
1	Video lighting and media images	v					Not good
2	Media image and video clarity	v					Not good
3	Video and motion picture recording side		v				Not good
Total		0	4	3	0	0	Not very good
Skor total		4					
mean score		1,33					

Step II validation and revision by material dan media expert

In this validation, researchers and material experts discuss the quality of the material in the learning media. The evaluation given by the material expert in the form of a description of each item of the basic movements is accompanied by photos of the movement steps to make it more visible, clarify the Steps and smoothness of the movements carried out. Step II evaluation was carried out on July 20, 2021, and the following data were obtained.

Table 4
Score aspect quality of learning material by step II material expert

No	Rated aspect	Scoring scale					Criteria
		1	2	3	4	5	
1	Overall movement accuracy	v					Good enough
2	Movement Step accuracy		v				Good enough
3	smoothness and beauty of motion		v				Good enough
Total		0	0	3	8	0	
Skor total		8					Good enough
mean score		2,67					

Then for media validation, it is done by providing a form of learning media. In this validation, researchers and media experts discuss the quality of videos and images in learning media. The evaluation given by media experts in the form of room lighting needs to be considered. Step II evaluation was carried out on August 31, 2021, and the following data were obtained.

Table 5
Score aspect quality of learning material by media experts in step II

No	Rated aspect	Scoring scale					Criteria
		1	2	3	4	5	
1	Video lighting and media images			v			Good enough
2	Media image and video clarity		v				Good enough
3	Video and motion picture recording side			v			Good enough
Total		0	0	6	4	0	
Skor total		8					Good enough
mean score		2,67					

Step III validation and revision by material and media experts

In this validation, researchers and the material experts discuss the quality of the material in the learning media. The evaluation given by the material expert in the form of a description of each item of the basic movements is accompanied by photos of the movement steps to make it more visible, clarify the Steps and smoothness of the movements carried out. Step III evaluation was carried out on September 9, 2021, and the following data were obtained.

Table 6
Material quality aspects learning by a material expert in step III score

No	Rated aspect	Scoring scale					Criteria
		1	2	3	4	5	
1	Overall movement accuracy				v		Good
2	Movement Step accuracy				v		Good
3	smoothness and beauty of motion				v		Good
Total		0	0	3	8	0	Good
Skor total		12					

mean score	4

Then for media validation, it is done by providing a form of learning media. In this validation, researchers and media experts discuss the quality of videos and images in learning media. The evaluation given by the media experts in form of room lighting needs to be considered. Step III evaluation was carried out on September 19, 2021, and the following data were obtained:

Table 7
Material quality aspects learning by a material expert in step III score

No	Rated aspect	Scoring scale					Criteria
		1	2	3	4	5	
1	Overall movement accuracy				v		Good
2	Movement Step accuracy				v		Good
3	smoothness and beauty of motion				v		Good
Total		0	0	6	4	0	
Skor total		12					Good
mean score		4					

Discussions

Step I validation and revision by material and media experts

In step 1 the revision of the results from material and media experts assessed material on the criteria that are not good with the average obtained, namely at a score of 2. Meanwhile, the results of the assessment for the media are on very poor criteria with the average obtained, namely the score of 1.33. The suggestions and revisions made to the input of material experts and media experts can be seen in the following Table 8 below.

Table 8
Suggestions for improvement from material experts and revision step 1

Suggestion	Revision
A description each movement item is included with slowing down the movement by clarifying the Steps of motion, including with an explanation of the motion	Repeat video creation with per movement item and perform motion slowdown in motion Steps, including explanations
Additional step-by-step photos. Adding motion photos in motion Steps	Add motion steps photos. Adding motion photos in motion Steps

The suggestions and revisions made to media expert input can be seen in the following Table 9 below.

Table 9
Suggestions for improvements from media experts and revisions step I

Suggestion	Revision
Video lighting needs attention	Recreate video with better lighting
The clarity or quality of videos and images need to be improved	Repeat making videos using a camera with better quality

The results of the improvement in the form of the video series of movements in Step 1 revision are in the following Figure 4 below.

Figure 4. Some forms of motion video series after revision 1

Step II validation and revision by material and media experts

On results revision of the material and media experts in Step II, it can be concluded that the results of the assessment for the material are in fairly good criteria with the average obtained at a score of 2.67. While the results of the assessment for the media, namely the criteria are quite good with the average obtained, namely a score of 2.63. The suggestions and revisions made to material expert input can be seen in the following Table 10 below.

Table 10
Suggestions for improvement from material experts and revision step II

Suggestion	Revision
Refine the technique movement properly	Repeat video creation with motion smoothing

Suggestions and revisions were made to media expert input and it can be seen in the following Table 11 below.

Table 11

Suggestions for improvements from media experts and revisions step II

Suggestion	Revision
Take videos from various sides	Added video creation from multiple angles

Result improvement in form of a series of motion videos in Step II revision is in the following Figure 5 below.
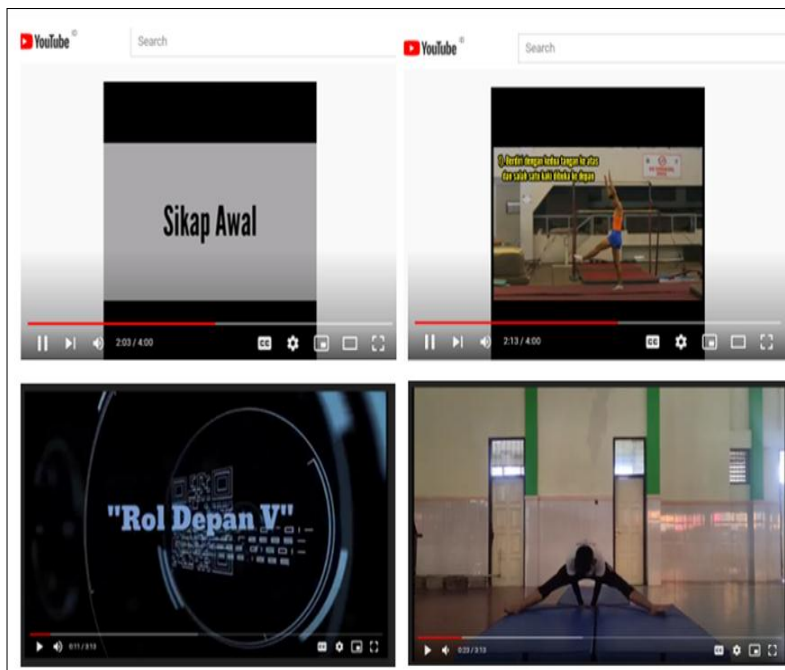

Figure 5. Several forms of motion video series after revision II

Step III validation and revision by material and media experts

Results assessment for the material is on good criteria with the average obtained at a score of 4. Meanwhile, the results of the assessment for the media are on good criteria with the average obtained, at a score lack of 4. The results of the improvement in the form of the video series of movements in the Step III revision are in the following Figure 6 below.
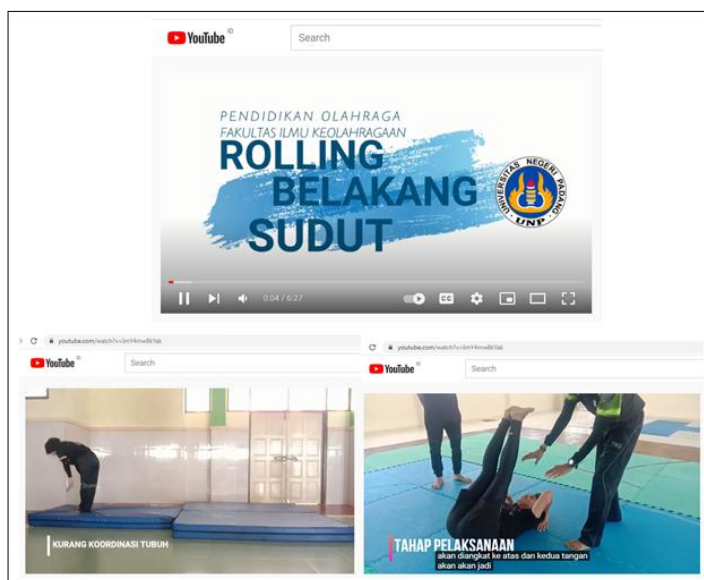
Figure 6. Several forms of motion video series after revision III

Conclusion

Based on the results of research development of learning media products for floor Gymnastics, it can be concluded that the steps taken in developing learning media are carried out through several Steps, it called the preliminary Step which consists of analyzing needed and determining the material, the initial product manufacturing Step, the evaluation Step consisting of validation of material experts and media experts, small group and field trials. After carrying out the development Step, learning media products were produced to Step III revision for practice material with a score of 4 with good criteria and media with a score of 4 in the good category.

Acknowledgments

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