Development of the science learning tools for junior high school based on group investigation with skill process approach in heat and the movement learning materials

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Abstract. Good learning device can develop thinking ability and motivation of the students in understanding the facts, concepts, principles, and procedures. One of the learning tools that support these objectives is a model group investigation with Process Skills Approach. This study aims to develop devices based science teaching junior high school learning model with the model group investigation science process skills approach to material heat and displacement with valid criteria, practical and effective in learning. This type of research is the development of research. Development model used is the model 4-D comprising the steps define, design, development and disseminate. Product trials conducted in the classroom SMPN 7 Sijunjung VII.1 and the proliferation of devices is done in class VII.4 SMPN 7. The instrument consisted of a sheet of validation and observation sheet. Type of data collected activity and student learning outcomes. The collected data were analyzed descriptively. Based on the results obtained define phase learning device development needs. Results obtained at the design stage prototype learning device that consists of a syllabus, lesson plans, handouts, student work sheet and assessment sheets for heat and displacement of material designed according to the steps of learning model group investigation with the approach of science process skills. The development phase obtained validity value of 91%, the value of the practicalities of 83.3% and a value of 86.4% effectiveness. At the disseminate stage, learning devices are obtained with a practical value of 85.4% and the effectiveness of learning devices is 85% when distributed in other classes.

1. Preliminary
Act No. 20 of 2003 on National Education System explained that education is a conscious and deliberate effort to create an atmosphere of learning and the learning process so that learners are actively developing the potential for him to have the spiritual power of religion, self-control, personality, intelligence, noble character, as well as the skills needed him, society and the nation state. To realize the goal of national education, the government has done a variety of ways such as increasing the qualification and certification, allowances certification, competency testing and the measurement of performance, the provision of training for teachers who have not yet qualified.

Of the many elements of educational resources, the curriculum is one of the elements that make a significant contribution to realizing the potential quality of the development process of learners. Curriculum as defined in Article 1 Paragraph (19) of Law No. 20 of 2003 is a set of plans and arrangements regarding the objectives, content and learning materials as well as the means used to
guide the implementation of learning activities to achieve specific educational goals. Starting the school year 2013/2014 the government will impose a new curriculum called the curriculum in 2013. The process of learning to the curriculum in 2013 for all levels of education be implemented using a scientific approach. The learning process should touch the three domains, namely the attitude, knowledge and skills. The end result is an increase and balance between the ability to be a good man (soft skills) and people who have the skills and knowledge to live a decent (hard skills) of learners that includes aspects of competence attitudes, skills and knowledge.

Ministry of Education [4] explains that science is the study of phenomena in nature. IPA obtain the truth of the facts and phenomena of nature through activities empirically obtained through laboratory experiments or outdoors. Science learning activities include four main elements, namely: attitudes, processes, products, and applications. The fourth element that is characteristic of the whole science that can not be separated from one another.

Based on the analysis conducted on the questionnaire of learners in class VII SMPN 7 Sijunjung of 76 students who were given a questionnaire 89% answered bored follow the lessons given by lecture, 90% would have preferred method of group discussion of the lecture, and 76% chose the easier understand the science subjects if performed by laboratory. It is clearly seen that the learners feel bored during the study. Of course, these conditions then affect the attitudes and learning outcomes of students during the learning activities.

These problems certainly need a solution, including the need to develop a learning tool is expected to help in improving learning outcomes and learner motivation, and can stimulate learners to be more active. Learning tools are developed, namely the syllabus, lesson plans, handouts, student worksheets and assessment sheet with valid criteria, practical and Effective.

Learning tools created using the model group investigation with the approach of science process skills. Model group investigation that is learning that emphasizes the participation and activity of learners to find their own material (information) lessons to be learned through the materials provided, conveying the idea and write it in the form of the reports submitted by the end of the learning process.

2. Research methods
This type of research is research & development (R and D) to produce a product that is a learning tool. According to Sugiyono [14], research is the development of research methods used to produce a specific product and test the effectiveness of the product. According to Thiagarajan (1974: 5) using the 4D model development process consists of four stages define, design, development, and disseminate. Rochmad (2012) states define stage consists of five phases: a preliminary analysis of the end, the students analysis, task analysis, material analysis and the analysis of learning objectives. The design phase consists of constructing phase bercacu test criteria, the selection of media, format selection and preliminary design of the device. The development phase comprises an expert assessment and development trials. While on disseminate phase consisting validity testing phase, adoption, diffusion and packaging. This study is limited to the development stage, because to disseminate devices that are built require more schools.

Data analysis techniques in the form of product validation analysis, analysis of the practicalities and effectiveness analysis. To calculate the value of the validity and practicalities of learning tools, the researchers conducted an analysis of data through a calculation using the equation:

\[ N = \frac{X}{Y} \times 100\% \]  

Information:
N = Value (validity and practicalities)
X = Score obtained
Y = Maximum score
(Modified from Riduwan, 2009: 89)
Categories validity and practicalities of learning tools based on the final value obtained is shown in Table 1 below.

| Category is valid and practical Learning Tool |
|----------------------------------------------|
| interval | Category           |
| 0-20     | Very valid and practical |
| 21-40    | Not valid and practical |
| 41-60    | Less valid and practical |
| 61-80    | valid and practical    |
| 81-100   | Very valid and practical |

(Modified from Riduwan, 2009: 89)

Value effectiveness of the learning device seen from the results of student learning in the form of competence attitudes, knowledge and competence competency skills during the learning process.

3. Results and discussion

The development phase conducted validation of the draft syllabus, lesson plans, handouts, student worksheets and assessment sheet. The purpose of this development phase is to produce a valid learning tools and practical Effective. Validation is done by five validator which consists of two lecturers in Physics, 1 lecturer in Indonesian Education and 2 science teachers at SMPN 7 Sijunjung. The results of the development phase are as follows:

3.1. Validation Assessment Learning Tool

In the validation activities, experts and practitioners were asked to assess the learning tools that have been made. Assessment includes content validity, construct validity, and validity of the language. Validator asked to provide an assessment and suggestions for improvements to the syllabus, lesson plans, handouts, student worksheets and assessments that have been designed. Based on the evaluation of the validator, the obtained results are in Table 2 below.

| Table 2. The results validate learning device |
|----------------------------------------------|
| Learning Media | Rate validator (%) | Category |
| Syllabus        | 93.3               | very Valid |
| RPP (learning plan) | 88.4             | very Valid |
| Handout         | 95.6               | very Valid |
| Student worksheet | 88.6              | very Valid |
| The assessment sheet | 86.8            | very Valid |
| Average         | 90.5               | very Valid |

Based on the data in Table 2, the result that is very valid learning tool with an average value for all indicators, namely 90.5% categorized as very practical. It can be concluded that the device has been in line with expectations dikembangkah students and teachers so that students can easily accept learning provided and this device meets the criteria valid.

3.2. Practicalities assessment Learning Tool

Data obtained practicalities of learning tools based on assessment for learning using lesson plans that have been designed, a teacher of the developed learning tools, and assessment of learners to handouts and worksheets for the students that they use during the learning activities. Results practicalities of learning tools developed can be seen in the following three.

Table 3. The results of the practicalities of learning tools
Based on Table 3 above the average value obtained practicalities of research instrument is 83.8% categorized as very practical. Thus, it can be concluded that based Learning Tool Learning Model Group Investigation approach to the material science process skills and displacement developed heat is very practical to use in the learning process.

3.3. Effectiveness Assessment Learning Tool

Data effectiveness of the learning device based on the results obtained VII.1 grade students of SMPN 7 Sijunjung which includes competency of knowledge, attitudes, and skills development and student questionnaire responses. The results of the effectiveness of the learning device can be seen in Table 4.

| Effectiveness Data       | Value (%) | Category    |
|--------------------------|-----------|-------------|
| Competence Knowledge     | 92.5      | Very effective |
| Competence Spiritual Attitude | 85.5   | Very effective |
| Competence Social Attitudes | 83.1   | Very effective |
| Competence Skills        | 84.3      | Very effective |
| Average                  | 86.4      | Very effective |

Based on Table 4, it is known that the learning device developed very effective in the category with an average value of 86.4%. Thus, it can be concluded that the learning model based learning device group investigation with science process skills approach to the material and the displacement developed heat is effectively used in the learning process.

3.4. Dresseminate Learning Tool

At this stage the device distributed learning science class VII SMP-based learning model group investigation with science process skills approach to material heat and displacement with a valid category, practical and effective a different class or a different school. At this stage of deployment of the practicalities of data will be retrieved and disseminated efektifitas devices. It is intended as a comparison with the data at this stage of development. Spreading device VII.4 classroom learning is done in SMPN 7 Sijunjung.

The results of the deployment of the data obtained from the practicalities of votes RPP implementation observation and questionnaire responses graders VII.4 SMPN 7 Sijunjung towards a learning tool. Results practicalities of learning tools can be seen in Table 5.

| Data practicalities     | Value (%) | Category    |
|-------------------------|-----------|-------------|
| RPP implementation      | 87.1      | very Practical |
| Student Response Questionnaire | 83.6   | very Practical |
| Average                 | 85.4      | very Practical |

Based on Table 5, note that the device is in the category of learning is very practical with the mean value of 85.4%. So it can be concluded that the device is deployed are in accordance with the
expectations of students and teachers so that students can easily accept learning provided and this device meets the criteria practical.

Data effectiveness learning device is obtained based on the results of student learning which includes competency of knowledge, attitudes, and skills. Results The effectiveness of the learning device can be seen in Table 6 below.

| Table 6. Results of Effectiveness of Learning Tool |
|--------------------------------------------------|
| **Effectiveness Data**   | **Value (%)** | **Category**   |
| Competence Knowledge     | 83.9          | Very effective |
| Competence Spiritual Attitude | 88.2      | Very effective |
| Competence Social Attitudes | 82.8      | Very effective |
| Competence Skills        | 85.2          | Very effective |
| Average                 | 85.0          | Very effective |

Based on Table 6, it is known that the learning device developed very effective in the category with an average value of 85.0%. Based on the results we can conclude the effectiveness of the learning device learning device developed meets the criteria effective as between expectation and experience has been consistent and student learning outcomes obtained already at a very good category

4. Conclusion

Based on the above it can be concluded that there have been software development IPA junior classes the second semester VII Group investigation based learning model with process skills approach to heat the material and the displacement through pendefenisian stage, the design, development and deployment. At this stage of development needs analysis pendefenisian front-end, the students analysis, task analysis, material analysis and the analysis of learning objectives. In the prototype design stage of learning has been done to construct phase beracuan test criteria, the selection of media, format selection, preliminary design. At the development stage made a very valid device with a value of 90.5%, very practical with a value of 83.8% and is very effective with a value of 86.4%. At the disseminate stage, learning devices are obtained with a practical value of 85.4% and the effectiveness of learning devices is 85% when distributed in other classes.

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