Vol. 4 No. 1. June 2025
e-ISSN: 2829-6893

Development Of Science Learning Devices For Junior High School On Light And Optical Tools Oriented Towards Integrated Process Skills Character Education

Herti Vioni

Universitas Islam Negeri Syekh Ali Hasan Ahmad Addary Padangsidimpuan

email : vioni@uinsyahada.ac.id

Abstract

The materials development was conducted due to fact which indicated the limited learning materials in IPA subject in accordance with the students' needs and scientific thoughts. Besides, the existing learning materials had not been able to foster students' positive character values. This study was aimed at developing learning tools through Process Skills Approach which was integrated with Characters Building that is valid, practical, effective and worthy to be used in learning process. Thus, it was assumed that those learning tools could improved students' learning outcomes and positive character. This was a developmental research (research and development). The development model used was 4-D model which consisted of defining level (define), planning (design), developing (development) and disseminating (disseminate). In defining level, the curriculum, students and materials were analyzed in planning level, the learning tools such as syllaby, lesson plan, handout, student's worksheet, assessment of cognitive, affective, character psychomotor, project, and performance were designed. In developing level, the validity was tested through learning tools validation sheets. The practicality test was lested through lesson plan observation sheet, teachers' and student's response questionnaire, and the effectivity was tested through cognitives, affective, characters, psychomotor, project, and performance assesment with student's responses questionnaire. This research produced IPA learning tools for junior high school on light and optical instrument by using Process Skills approach orientation integrated with character building that was very valid, practical and effective.

Key Words *: The Learning Tools, Process Skills, Light, Optical Instruments, Character Building.*

INTRODUCTION

In 2025, learning in Indonesia will use an independent curriculum. However, there are still several schools that use the 2013 Curriculum. By data from Nadiem Makarim in 2024, 300 thousand educational units in Indonesia (around 80%) have used the independent curriculum, meaning that the remaining 20% of schools are still using the 2013 curriculum.

The school where I researched, namely SMP Negeri 20 Padang, is still using the 2013 curriculum. The formulation is based on a different perspective from the material-based curriculum, so it is very possible that there is a difference in perception about how the curriculum should be designed. The implementation of the preparation of the independent curriculum is part of continuing the development of the 2013 Curriculum by including attitude, knowledge, and skills competencies in an integrated manner, as mandated by Law 20 of 2003 concerning the National Education System in the explanation of article 35, where graduate competence is a qualification of graduates' abilities that includes attitudes, knowledge, and skills in accordance with agreed national standards. Through education, it is hoped that students will be able to develop themselves and empower the potential of nature and the environment for their lives.

In the development of the Independent Curriculum and 2013, character education is integrated. This character education is also in accordance with the Indonesian educational philosophy of the Ministry of National Education (2010c) which reads: "Education is an effort to empower students to develop into Indonesian human beings

In its entirety, science is one of the sciences that is applied directly to the development of technology that continues to develop rapidly and is used in people's lives so that a critical mindset is needed, the way is by providing wide opportunities for students to be active in learning activities and find concepts like a scientist.

With character education that is applied systematically and continuously, a child will become emotionally intelligent. This emotional intelligence is an important provision in preparing children for the future. Some important findings on this subject were published by a newsletter, Character Educator, published by the Character Education Partnership. Dalambuletin explained that the results of Marvin Berkkowitz's research (in Suyanto, 2010) showed an increase in the motivation of school students in achieving academic achievement in schools that implement character education.

Classes that are comprehensively involved in character education show a drastic decrease in students' negative behavior that can hinder academic success.

In science learning, there are pedagogical values or characters that can be obtained According to the Ministry of National Education (2010) are the attitude of loving the truth, the attitude of not being presumptuous, realizing the truth of knowledge is not absolute, the belief that the natural order is orderly, being tolerant of others, being careful, being careful and careful, the attitude of curiosity, and the attitude of optimism. From the pedagogical value of IPA, it can be seen that science makes a great contribution in forming positive characters in students.

Based on observations to the school, the classical completeness obtained from daily tests 1 and 2 and the MidSemester 2 Exam is less than 85% which is the standard of classical completeness set by the school. In more detail, it can be seen in Table 1.

Table 1. Results of Daily Exams 1 and 2 as well as Mid Semester 2 Exam, grade VIII for the 2023/2024 school year for Science Subjects

No Test	Type	Complete Class
1	Daily Repeat	78.7%
2	Daily Repeat	74.3%
3	Mid Exam Semester 2	80.21%

Based on the data available on Table 1 can be seen that the students' scores are very less than classical completeness, this is due to the learning method used by the teacher is not appropriate, because learning takes place with the lecture and note-taking methods only, so that students are less active in learning. This method of learning is not in accordance with science subjects obtained through discovery and requires students to think creatively critically, creatively, and independently. Many students' behavior is not in accordance with the prevailing norms such as making noise in class, in exams they like to cheat, they like to doodle on the table, and they like to lie. This indicates that the positive character of students is still weak, it also results in low learning outcomes.

Efforts to overcome low learning outcomes have been acknowledged by the government, starting from making draft laws, Presidential Regulations, ministerial regulations and local government policies to regulate the implementation of learning and learning activities properly with the aim of improving student learning outcomes. One example of the government's efforts is with the maker of Ministerial Regulation No. 41 of 2007 concerning process standards regarding the use of the learning process, the implementation of the

learning process, the assessment of learning outcomes and the supervision of the learning process, with the aim of motivating Students so that they can participate actively, as well as provide enough space for initiative, creativity, and independence in accordance with the talents, interests, and physical and psychological development of students, and ultimately an increase in learning outcomes.

Educational science experts, both domestic and foreign, also continue to share efficient and effective methods and models to improve learning outcomes relevant to the times. Science learning in junior high school can no longer use the lecture method because science learning as a process means that students are not only given about the principles or concepts of a material, but also how the process of finding the principles or concepts is. One of the alternative approaches in science learning is to use the process skills approach because it provides opportunities for students to be able to find facts, build concepts, through activities or experiences like scientists. The process skills approach is essentially a management of learning and learning activities that focuses on actively and creatively involving students in the process of obtaining learning outcomes. A process skills-oriented approach is an insight or model for the development of intellectual, social and physical skills that are sourced from basic abilities that in principle these intellectual skills already exist in students. So that the process skills approach can develop these skills, students can carry out learning activities directly in finding facts and concepts.

METHOD

The research is included in research and development, which produces a product. According to Gay (in Emzir, 2007) in the field of education, the main goal of research and development is not to formulate or test theories, but to develop effective products for use in schools. Products are developed to know specific needs with detailed specifications. Based on the above understanding, the researcher will develop a valid, practical and effective learning tool for light materials and optical devices in grade VIII of junior high school.

This Learning Tool includes Syllabus, Learning Implementation Plan (RPP), Handout, and Student Activity Sheet (LKS), developed with a 4-D model (four-D models), which consists of four stages. According to Thiagajaran (in Trianto 2010), the four stages are define, design (design), develop and disseminate.

RESULTS OF RESEARCH AND DISCUSSION.

Development Results This chapter shows the results of research on the development of learning tools oriented to the integrated process of character education skills approach

in science subjects with light learning materials and optical tools using 4-D models development models. The process starts from curriculum analysis, student analysis, material analysis to the validation process. The devices that are already valid are then tested on class students. After collecting research data, the results of the data collection are described. The description of the research data is described as follows.

1. Results of the Definition Stage

The definition stage aims to define the learning conditions by analyzing the learning objectives of the material developed by the learning tool by analyzing each stage of the learning tool components. The analysis of these components is as follows.

In the curriculum analysis, the Core Competencies required for light materials and optical devices are KI 1, KI 2, KI 3, KI 4 and KD 1.1, KD 2.1. KD 3.6, and KD 4.5. Based on the results of observation, the syllabus and lesson plan used already contain character values, but it is not clear how they are implemented in each learning process, and the characters chosen are not compatible with science learning that prioritizes scientific characters. These characters are also not selected whether they are easy to observe by teachers. After the researcher asked about the lesson plan, the teacher did not make it himself but downloaded it from the internet. The RPP is also inconsistent in its implementation in schools and only as a school archive.

The textbooks used by teachers are from old books whose curriculum is still KTSP and KBK. The book is owned by the teacher only, while the students do not have a handbook and each science class is only filled with recording activities to pursue the material achievement target.

Analysis of the assessment tool, it was found that the assessment was only emphasized on written assessment which covered the cognitive realm only and did not pay attention to the character of the student. The observation results also indicate that there is no clear category regarding character assessment that is easy to observe and suitable for science subjects.

Student analysis is a study about the characteristics of students who are in accordance with Learning tool development design. The results of the analysis of students showed that the class of 35 students had an average age of 14-15 years, consisting of 18 female students and 17 male students. Students in junior high school VIII are 14-15 years old and are in the formal operational stage. From Piaget's description (in Trianto 2010: 71), it can be concluded that at the formal operational stage, students are already systematic and include complex processes. Its operations are not only limited to concrete things, but can also be in other operations. However, in learning activities, the

interaction between teachers and students, and between students and students has not been optimal, so students are less active in the learning process. Students tend to be passive and less enthusiastic because the scientific character of students is still weak. The average student has not been able to formulate problems and find concepts in learning

The concepts of light and optical devices that will be taught are in accordance with the 2013 Curriculum. The light materials and optical tools in the handouts and LKS are taken from several books based on the 2013 curriculum which are prepared according to the needs of students, using a process skills approach and integrating character values in it. Essential concepts that will taught in light materials and optical tools are:

a. Definition of light and properties of light.
b. Mirrors and lenses.
c. Human eyes and faceted eyes in insects.
d. Optical Tools (Lups, Microscopes, and Telescopes)

2. Results of the Planning Stage

a. Determining the Learning Approach The learning approach chosen in learning on light materials and optical tools is a process skills approach. Light materials and optical tools will also be integrated into it character values that are suitable for science learning and are easily observed by observers.

b. Preparation of character-based toolsBased on curriculum analysis, material analysis and student analysis, the design of learning tools is carried out using an integrated process skills approach of character values. The integrated character is a character that is easy to observe and adapt to science subjects, namely scientific characters, plus other supporting characters. The designed tools include syllabus, lesson plans, handouts, LKS and assessments that are integrated into character values. The devices produced in the learning tool design process are:

1) Syllabus

The syllabus is a reference development of lesson plans that contain learning identities, KI, KD, learning materials, indicators of competency achievement, character values, learning activities, assessment, time allocation and learning resources. Learning activities include the steps of the process skills approach.

2) Learning Implementation Plan (RPP)

The RPP is designed systematically which contains the components of writing the RPP stated in Ministerial Regulation 41 concerning process standards, and follows the steps for preparing the RPP. The learning activities designed are adapted to the process skills approach and integrated with character values. The RPP is also

equipped with an example of an assessment rubric. The researcher designed 4 lesson plans, where each lesson plan is used for one meeting that is adjusted to the time allocation for each meeting.

3) Handout

The handout created is tailored to the process skills approach. Handouts are made with the aim of making it easier for students to learn at school and learn independently without the guidance of teachers at home. The handout contains learning objectives, competency standards and competencies to be achieved, material content, supporting information, sample questions, and evaluations. Handouts have also been integrated with character values so that students be able to master the material while developing students' positive character.

4) LKS

The LKS is designed according to the sequence. of process skills approaches, namely formulating problems, hypotheticing, collecting data, testing hypotheses, inferring, and communicating the results of the findings in front of the class. The experiments and observations in the LKS start from phenomena and are made simple with the intention that the purpose of the experiment is understood by parastudents and students understand more about the concept of light and optical tools.

5) Assessment

The assessment designed includes assessments for the cognitive, affective, psychomotor domains, project assessments, performance assessments, and character behaviors. The cognitive realm is related to the intellectual ability of students. The affective assessment observed is the attitude and character of students in learning. The psychomotor assessment observed is the skill in carrying out experimental activities based on the LKS guidelines. The designed assessment includes authentic assessments, namely performance assessments and project assessments.

3. Results of the Development Stage

The results of the validator's assessment on the validation sheet, which consisted of 2. experts/lecturers of postgraduate physics at the State University of Padang, 1 expert/lecturer of UNP educational technology and 2 science practitioners/teachers from the school. The following is a discussion and analysis of data from the development stage.a.

a. Validation of Learning Tools

The validation process at this early stage has not yet provided an assessment, only provides suggestions and there are validators who immediately give assessments to be revised and given again to be given the next assessment. The revised learning tools are handed back to the validators. Validators are

asked to provide assessments and opinions on the learning tools that have been designed. Validation is complete when the validator has declared that the designed device is valid and ready to be tested. The validation results for the devices that have been produced are described in the following description The syllabus validation results are at a percentage of 81.8% to 87.4%. 5 validators gave scores with very valid categories, so that the percentage of the average syllabus score obtained was 84.54% with very valid categories.

The handout is worth testing because the average validation results of the five validators show a very valid percentage of 91%. The average assessment was obtained from two validators who gave a score above 80%, namely, 86% and 89%. Three validators gave ratings above 90%, namely 94%, 93%, and 93%.

The assessment for the LKS given by the five validators was 86.2%, 97.4%, 92.2%, 87.1%, and 85.3%. The average of the percentage is 89.6 which is in the very valid category. LKS can be tested on students because the average score of LKS validation is in the very valid category. The assessment instrument is worth testing for students because of the five validators who gave a percentage of 89.7. 94.1, 95.5, 86.7, and 92.6. The five values from the validators were averaged, so a percentage of 91.7 was obtained with a very valid category.

b. Practicality of Learning Tools

Practicality data is taken from the results of observations on the implementation of lesson plans, teacher and student response questionnaires.

The implementation of RPP I, RPP II, RPP III and RPP IV is in the very practical category. The average implementation of the RPP is 93.86%. Based on the average results.

The implementation of the RPP, in general, the implementation of leaming using a process skills approach on light materials and optical tools was carried out as planned.

The results of the teacher response questionnaire showed that the percentage of each learning tool was 87.5% for the syllabus, 84.3% for the lesson plan, 92.5% for the handout, 87.5% for the LKS, and 85.0% for the assessment tool. All of these percentages are included in the category of very practical as soon from the average percentage otrained in the use of handouts is 87 45% and in the of LKS is 86.53%

c. Effectiveness of Learning Tools

At the first

People anend, they take a cognitive test at the end of the lesson. At the first meeting. 31 pouple completed and 4 students did not complete, with the average percentage of all students being 81.23. In the second mesting, 14 people completed and madent did wa

samples, with an average score percentage of $4.11. meaning that there was an increase in studen chitis scores in The second mecting was compared to the first meeting.

At the third meeting, the level of completeness of students was the same as the second meeting, only the average score of students was 85.43, which means that the score began to increase compared to the students' scores in the second meeting. Meanwhile, in the fourth meeting, all students were in the complete category with an average score of 90.48. The average score in the four meetings was 85.26 of converted to the 2013 assessment, the score was given an A-predicate), while the percentage of madents classical learning completeness was 95.71%, which was greater than the school's learning completeness of 85%.

The results of affective assessments from the lint meeting to the foxath mecting showed that students affective expericoce an iniprovement. The verage grade of the class is 88.1 (if converted acourding to the assessment in the 2013 Curriculum, the classification is very good). The first meeting with an average percemage was 86 8, the second meeting wat 67.5. the third morting was 88.2 to the fourth nocting was 89.9.

The average psychomotor learning outcome of students as a whole is 86.75 (if converted so the 2013 Curriculum samem, then prychomotorisn very good classification) meaning that de photor value the accuracy of movement in grape starting mem preparing marrials and assembling practicum tools, active participation of students, and recording and discussing the results of experiments are classified as very good). This means that the development of learning tools on light materials and optical tools that use the skills approach of the integrated process of character education can improve student learning outcomes in cognitive, affective and psychomotor assessments.

The authentic assessment which includes the project assessment obtained an average of 2.76 and the performance of 2.93 is in the good classification, while the performance assessment means that the students are able to participate in process skill-oriented learning. In the project assessment, students have been able to write reports well, even though the results are not perfect.

In the character assessment, the positive character of students is already at the level of starting to develop (MB) and becoming a habit (MK)In every meeting, from meeting I to meeting IV, students' positive character is always developing and their level is increasing. In the first meeting, the positive character of the students was at the level of starting to be seen (MT) and starting to develop (MB). Until the fourth meeting, all characters were at the level of starting to develop (MB) and become habits (MK), even the

character of diligence and creative thinking became a habit in students.

Education today It is very necessary for students to prepare themselves in the era of globalization. Various efforts are made to improve education. Education must also be in line with positive attitudes and behaviors. Learning tools oriented to the integrated process skills of character education are one of the tools that can be used as a reference for teachers in compiling learning tools.

Based on the data from the trial results of the development of IPASMP learning tools on light materials and optical tools oriented to the integrated process skills approach of character education in a limited scope, a device that meets expectations is obtained, namely a device that is very valid, practical and effective.

CONCLUSION

Based on the development and testing that has been carried out on junior high school science learning tools on light materials and optical tools oriented to the skills approach of the integrated process of character values, the following conclusions are obtained. The validation results of 5 validators show that the learning tools on light materials and optical tools oriented to the integrated process skills approach of character education are very valid. The results of observer observations on the implementation of the lesson plan by the observer, which was supported by a questionnaire of teacher and student responses Demonstrate learning tools on light materials and optical tools oriented Integrated process skills approach Character education is very practical. The analysis of learning outcomes in the cognitive (written), affective (attitude), psychomotor, project, performance, and character-behavioral assessment shows that the learning tools on light materials and optical tools are oriented to the integrated process skills approach of character education are very effective.

REFERENCES

Emzir. 2011. Quantitative and Qualitative Educational Research Methodology. Jakarta: Raja Grafindo Persada.

Fadlina, F., Artika*, W., Khairil, K., Nurmaliah, C., Abdullah, A., 2021. Penerapan Model Discovery Learning Berbasis STEM pada Materi Sistem Gerak Untuk Meningkatkan Keterampilan Berpikir Kritis. Jurnal Pendidikan Sains Indonesia 9, 99–107. https://doi.org/10.24815/jpsi.v9i1.18591

Himsar dan Yenni. 2023. Integrasi Ilmu Fisika Pada Materi Besaran dan Satuan terhadap Alqur'an dan As-sunnah Untuk Mewujudkan Pradigma Teoantropoekosentris.

Lubis, Yenni., 2024. "Application of Interactive Virtual Multimedia in Physics Learning" *Darul Ilmi: Jurnal Ilmu Kependidikan dan Keislaman* [Online], Volume 12 Number 2, 202-213

Ministry of National Education. 2010a. Grand Design of Character Education. Jakarta: Ministry of National Education.

Ministry of National Education. 2010c. Strategic Plan of the Ministry of National Education 2010-2014. Jakarta: Ministry of National Education.

Muslich. Masnur. 2011. Character Education Answering Multidimensional Crisis Challenges. Jakarta: Bumi Aksara.

Permendiknas number 22. 2006. Content Standards for Secondary11 Primary Education Units.Jakarta: Ministry of Education.

Suyanto. 2010. The Urgency of Character Education, (online), (http://mendikdasmen.kemdiknas.go. id/web/pages/urge accessed 3 January 2024).

Trianto. 2010. Integrated Learning Model in Theory and Practice. Jakarta: Bumi Aksara. Law number 20 of 2003 concerning the National Education System. Jakarta: President of the Republic of Indonesia