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# Feasibility of learning instrument with sainti-ka (characteristic of scientific) of Junior High Scholl on environmental pollution topic

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**Abstract.** This study aims to produce valid learning instrument with sainti-ka on environmental pollution topic to build the character of curiosity and responsibility of 7<sup>th</sup> grade of junior high school with scientific approach. This study was a research and development study. Borg and Gall development model was modified and used include only Define, Design, and Develop. This study produced learning instrument consisted of silabus, lesson plan, student work sheet, and achievement test. The results showed that the developed learning instrument are feasible to use and in the very good qualification.

## 1. Introduction

Education nowadays should form students who can face the globalization era, environmental problems, advancement of information technology, the convergence of science and technology, and knowledge-based economics. The ability to learn throughout life, learn to work together and solve problems must be equipped for students. Therefore, to prepare students to be competent for future, it is necessary to change the traditional learning paradigm that focuses on the material. This can create superior human resources.

Indonesia has abundant natural resources, but cannot progress if it does not have superior human resources. Therefore, competence for decent living depends on creativity and the ability to innovate. As mention by Monica et al that creativity and innovation competences are inherent to entrepreneurial competences and all them can be learned and taught as a generic/transferable meta-competence as part of the process of personal development embedded in educational environments [1].

In line with science and technology development and global needs, UNESCO established competencies for life in the 21st century, namely (1) creativity and innovation, (2) critical thinking skills and problem solving, (3) communication and collaboration, (4) social and cultural skills, and (5) information mastery. In addition [2] showed that having knowledge (cognitive domain) is not enough, but must be equipped with (1) the ability of creative-critical, (2) a strong character (responsible, social, tolerant, and so on), and (3) the ability to use information and communication.

Article 3 Act Number 20 Year 2003 about National Education System states that The National Education functions to develop capability, character and civilization of the nation for enhancing its intellectual capacity, and is aimed at developing learners' potentials so that they become persons imbued with human values who are faithful and pious to one and only God; who possess morals and noble character; who are healthy, knowledgeable, competent, creative, independent; and as citizens, are democratic and responsible [3]. In line with the Law above, the 2013 curriculum has been developed by the Indonesian government which is expected to produce reliable students and human



resources who can compete in the 21st century. This is as stated in Minister of Education and Culture Regulations Number 36 Year 2018 concerning Amendments to Minister of Education and Culture Regulations Number 59 Year 2014 concerning 2013 Curriculum, which is the 2013 Curriculum aimed to preparing Indonesian people to have the ability to live as faithful, productive, creative, innovative, and affective individuals and citizens and able to contribute to the life of society, nation, state and world civilization [4].

Teachers and society should be involved in curriculum. Curriculum emphasis should be in accordance with local needs and reflect the student characters and aspirations. Because of its importance, each curriculum is always evaluated and then adapted to the development of scientific and technological progress [5]. Curriculum development is carried out not only on knowledge, but also on the students' character formation. The students' character formation through learning and education in developed countries is done by applying an appropriate curriculum.

Pasani and Januarta (2015) suggested that character is something that is very important and needs to be developed, because someone who has good and strong character individually and socially will have good character and morals [6]. The results of the study praised [7] about the Character Descriptions of Students in Science Learning In Banjarmasin discussing the student's character who changed from the criteria of "starting to look" to "starting to develop". The findings indicate that character education can be integrated in science learning.

Gunawan (2012) states that character education is efforts that are designed and carried out systematically to instill the values of student behavior related to God Almighty, self, fellow human beings, environment, and nationality that are manifested in the mind, attitudes, feelings, words, and actions based on religious, legal, karmic, cultural, and cultural norms [8]. Khusniati (2012) takes an integrated character education in all subjects, one of which the subjects of Mathematics and Natural Sciences [9]. This means that the inclusion of the values of character education in the classroom, internalize through material and process of learning, from this activities we expect that the values will be embedded for all students and become their permanent character.

Learning with a scientific approach is one of approaches to develop students' character. As [10] stated, the learning objectives with a scientific approach are based on the advantages of the approach, including: (1) enhancing the intellectual ability, especially on higher order thinking skill; (2) to shape students' abilities in solving problems systematically, (3) the creation of learning conditions where students feel that learning is a necessity, (4) high learning outcomes are obtained, (5) to train students in communicating ideas, especially in writing scientific articles, and to develop students' characters. In line with [11] statement, one of the goals of learning with the scientific approach is to increase the intellectual capability of students, particularly critical thinking skills as the character of the learning in the 21st era.

The main activity of the students in learning the scientific method is the main characteristic of scientific learning [12]. Added by [13] that the most important thing that must be considered by schools to achieve the goals of education is not only focused on the cognitive, but the assessment of attitudes is also important to do.

Based on the description, it is necessary to develop the Science Learning Kit of Sainti-Ka (Scientific Character) to build the Junior High School students' character in Banjarmasin.

## 2. Methods

This research adapted and modified from Borg and Gall (1983) development model which is a type of Research and Development (R & D). The choice of this model is due to the procedures and steps taken in the Borg & Gall model which are more systematic and in accordance with the expected objectives of the research and development of learning instrument includes researching, developing and

validating learning products in the form of science learning instrument at Sainti-Ka (Saitifik-Character) to build the Junior High School students' character in Banjarmasin. The Borg & Gall development model consist of ten stages namely (1) research and collecting information, (2) planning, (3) early-stage product development, (4) preliminary field testing, (5) product revision, (6) main field trials, (7) operational product revision, (8) operational field trials, (9) final product revisions, and (10) dissemination and implementation. The development model used is limited to the fifth stage of product revision (main product revision) of the ten stages.

Product trials in development research aim to make product perfectly by practicing it in field directly. The trial is carried out through the following stages: (1) research and collecting information stages about (a) the curriculum applied, the number of hours required, (b) the existence of natural science subjects at junior high school / equivalent, (c) the availability of learning instruments; (2) the planning stage (setting goals, determining the qualifications of the parties involved in research and development, determining work procedures, and product feasibility testing); (3) early-stage product development (beginning with a needs analysis where the results of the analysis lead to the need to develop learning instrument); (4) preliminary field test phase (validation and preliminary trial preliminary field test consists of 6-12 students who have taken the subject matter), and (5) product revision stage (carried out on the draft learning set. Revisions are based on the results of the validation of the material expert and the learning set expert by considering the suggestions given. After the validation results are obtained, further improvements to the learning set draft are made so that a product that meets the validity criteria is produced.

The subjects of this study were students of class VII SMP Negeri 13 Banjarmasin. Validation sheet is instrument used for collecting data to obtain data about the validity of the learning tools from three experts. The data analysis technique used is quantitative descriptive data which is used to analyze the validation data. The draft quality of the Sainti-Ka learning tools was compiled and analyzed by experts before the preliminary trial, so that quantitative data was obtained. Then the data is analyzed to obtain the expected final research product, the Science Learning Tools of Sainti-Ka (Scientific-Character) to build the character of curiosity and responsibility of Junior High School students in the 2013 Curriculum Science subjects in Banjarmasin.

Percentage analysis obtained using quantitative descriptive data analysis. Percentage analysis technique is used to present data which is the frequency of responses of test subjects to products analyzed using percentage formulas to determine the validity criteria of the learning tools being developed. The collected data in the validation sheet is basically qualitative data, because each statement point is divided into qualifications that are very insufficient, lacking, sufficient, good, and very good. The data is first converted into quantitative data in accordance with the score. Changes are made using the following formula:

$$P = \frac{\Sigma \text{Total Questionnaire Scores}}{n \times \text{max score} \times \text{total respondents}} \times 4$$

Information:

$P$  = declare percentage rating

$n$  = states the total number of questionnaire items

Data from the assessment of the learning tools developed were analyzed descriptively, determining the feasibility criteria and product revisions in Table 1 below [14]:

**Table 1.** Feasibility and Revision Product Criteria

Level of Achievement (%)	Qualification	Explanation
<b>81-100</b>	Very good	No revision needed/ valid
<b>60-80</b>	Good	No revision needed/ valid
<b>41-60</b>	Sufficient	Revision/ not valid
<b>21-40</b>	Lacking	Revision/ not valid
<b>0-20</b>	Very Insufficient	Revision/ not valid

### 3. Result and Discussion

The product from this research and development is science learning tools Sainti-Ka (Scientific-Character) consist of lesson plan, teaching materials, student worksheet and students achievement test for class VII in SMP Negeri 13 Banjarmasin on the Environmental Pollution subject. The preparation of learning tools has been adjusted to the Core Competencies (KI) and Basic Competencies (KD) as well as with the scientific approach and two characters inserted in this learning tool namely the curiosity and responsibility. The learning tools was validated by three validators, consisting of two lecturers as experts and a teacher as an educational practitioner. The instrument was validated in the form of lesson plans, teaching materials, student worksheets and students achievement test. Based on the results of the validation of the learning tool by the validator, the device developed was appropriate to be used in learning.

The learning tools consist of five meetings, namely (1) environmental pollution, (2) and (3) water pollution, (4) air pollution and (5) containing soil pollution material. Each lesson plan was designed with a scientific approach and contains the curiosity and responsibility as characters expected by students after learning. After the instrument feasibility test was conducted by experts, the learning tools developed then validated using a validation instrument.

#### 3.1. Lesson Plan Validation

The results of the lesson plan validation can be seen in Table 2.

**Table 2.** Result of Lesson Plan Validation

Aspect	Percentage (%)	Qualification
<b>Format</b>	100	Very Good
<b>Language</b>	98.33	Very Good
<b>Content</b>	97.46	Very Good
<b>Validity</b>	98.60	Very Good
<b>Reability</b>	98.05	Very Good

Calculation of the results of the lesson plan validation can be seen in Table 2. The results indicate that the lesson plan is designed in all three aspects of format, language and contents of the RPP are included in very good qualifications with an overall validity percentage of 98.60%. Based on this, it can be stated that the lesson plans designed are feasible to use. The lesson plan is used in accordance with the 2013 curriculum format with a clear numbering system.

The results of the validation and the suggestions given by the validator become a reference for researchers in making revisions. The suggestions given by the validator for lesson plan can be seen in Table 3.

**Table 3.** Suggestions from Validators for Lesson Plan

Validator	Aspect
<b>I</b>	Need to add an alternative book or supporting references)
<b>II</b>	Learning media can be added by utilizing the environment around schools, for example rivers or landfills in schools or videos of environmental pollution, and given project assignments to students to make videos about environmental pollution around their homes
<b>III</b>	The media can be developed even better, teaching materials and student worksheet do not include the media but are learning resources

Lesson plan is designed based on a scientific approach and instills curiosity and responsibility character refers to the attachment of Minister of Education and Culture Regulations Number 65 Year 2013. Learning steps are designed with a scientific approach in each of its activities, namely introduction, core, and closing. The indicators of curiosity and responsibility are inserted too.

Lesson planning tool development research is an innovation for learning process. By this way, a valid, practical, and effective product will be generated [15]. When the lesson plans are appropriate to use, it is hoped that they can achieve one of the learning objectives, namely developing student character behavior.

### 3.2. Learning Material Validation

The result of learning material validation can be seen in Table 4.

**Table 4.** Result of Learning Material Validation

Aspect	Percentage (%)	Qualification
<b>Format</b>	94.44	Very Good
<b>Language</b>	94.74	Very Good
<b>Content</b>	98.61	Very Good
<b>Presentation</b>	98.25	Very Good
<b>Benefit</b>	100	Very Good
<b>Validity</b>	97.21	Very Good
<b>Reability</b>	96.23	Very Good

These results indicate that the results of the assessment of teaching materials which include format, language, content, presentation and benefits are stated to be classified as very good with a percentage of validity of 97.21%. This finding shows that teaching material that has been developed is feasible to use.

The results of the validation and the suggestions given by the validator become a reference for researchers in making revisions. The suggestions given by the validator for teaching material can be seen in Table 5.

**Table 5.** Suggestions from Validators for Learning Material

Validator	Aspect
<b>I</b>	Letters should be bigger and need improvement / revision of some typo or writing format
<b>II</b>	-
<b>III</b>	Fonts / font types are made larger

Good teaching materials must pay attention to the accuracy, suitability between competencies that must be mastered by students from content aspect and its relevance [16]. This competency has been included in the evaluation aspect of teaching material in the teaching material validation instrument which includes the format of teaching materials, language, content of teaching materials, presentations, and benefits / uses. This indicates that teaching materials have been considered very good based on the results of validation from practitioners and academics.

### 3.3. Student Worksheet Validation

The result of student worksheet validation can be seen in Table 6.

**Table 6.** Result of Student Worksheet Validation

Aspect	Percentage (%)	Qualification
<b>Format</b>	95.83	Very Good
<b>Language</b>	100	Very Good
<b>Content</b>	96.21	Very Good
<b>Validity</b>	97.35	Very Good
<b>Reability</b>	98.31	Very Good

Calculation of the results of the student worksheet validation can be seen in Table 6. The results show that the student worksheet assessment aspects which include the format, language and contents of the student worksheet are in very good qualifications with an overall validity percentage of 97.35%. Based on this, it can be stated that student worksheet which is designed to be feasible for use.

The results of the validation and the suggestions given by the validator become a reference for researchers in making revisions. The suggestions given by the validator for student worksheet can be seen in Table 7.

**Table 7.** Suggestions from Validators for Student Worksheet

Validator	Aspect
<b>I</b>	Letters should be bigger and need improvement / revision of some typo or writing format
<b>II</b>	Work procedures need to be added to the student worksheet, videos can be added about environmental pollution, not just answering questions as increasing the digging of student knowledge
<b>III</b>	Enlarged the space, and visual images about air pollution etc

The use of student worksheet has a very big role in the learning process, so as if the use of

student worksheet can replace the position of a teacher. The student worksheet designed has fulfilled the components stated by [17] consisting of information components, problem statements, questions / orders, as well as open or guided questions. In addition, the preparation of student worksheet has been adjusted to the characteristics of students and the characteristics of environmental pollution material.

This student worksheet consists of five activity sheets, namely (1) environmental pollution; (2) water pollution, (3) the impact of water pollution, (4) air pollution, and (5) soil pollution. In each student worksheet contains the title, learning objectives, pictures and events related to the wetland insight environment that is linked in everyday life to explore students' knowledge.

### 3.4. Achievement Test Validation

The level of students' understanding after learning is measured using the learning achievement test. The learning achievement test is arranged in reference to the basic competencies to be achieved, then translated into indicators and learning objectives. Learning achievement tests are designed to measure the level of cognitive abilities of students consisting of 20 multiple choice questions. The results of the achievement test validation can be seen in Table 8.

**Table 8.** Result of Achievement Test Validation

Aspect	Percentage (%)	Qualification
<b>General</b>		
<b>Construction</b>	93.75	Very Good
<b>Item validity</b>	90.00	Very Good
<b>Validity</b>	91.88	Very Good
<b>Reability</b>	93.27	Very Good

Calculation of achievement test validation results can be seen in Table 8 above. These results indicate that the results of the achievement tests include general construction and the item validity stated very good qualification with a percentage of validity of 91.88%. These findings indicate that the learning achievement test that has been developed is feasible to use.

The results of the validation and the suggestions given by the validator become a reference for researchers in making revisions. Suggestions from validators for achievement test can be seen in Table 9.

**Table 9.** Sugsesstions from Validators for Achievement Test

Validator	Aspect
<b>I</b>	Need to revise formulation language so that the purpose of the problem is right with the measured indicator
<b>II</b>	-
<b>III</b>	-

The results of the assessment of learning tools both lesson plans, teaching materials, student worksheet and achievement test include several aspects of assessment. As for the validity assessment results for lesson plan by 98.05%, teaching materials by 96.23%, student worksheet by 98.31% and achievement tes by 93.27% all included very good qualifications. The advantages of the learning tools compiled are in terms of the scientific approach used in accordance with the demands of the 2013 curriculum and includes the character values in it, namely the curiosity and responsibility. The advantages of this learning tool are there are indicators of curiosity character and responsibility in



learning activities that are packaged in a scientific approach.

Akker et al (2007) explain that validity is one of the indicators of quality (high quality intervention) before examining practicality and effectiveness [18]. The validity aspect of a learning tools must be related to two things, namely 1) the learning tools developed is based on a strong theoretical rational, in this case the learning tools refers to the characteristics of learning with a scientific approach; 2) there is internal consistency, in this case the learning device has been interconnected between the scientific approach and the content of the characters in it namely curiosity and responsibility.

The findings in this study are in line with the results of [9] The results of his research on the implementation of the scientific approach, the inculcation of character and conservation in the growth material stated that the scientific approach used in lesson plan provides a positive influence on cognitive, affective and psychomotor learning outcomes and achieving established classical completeness. The development of an integrated ipa module characterizes the theme of environmental management for the class VII junior high school [19].

#### 4. Conclusion

According to the results and discussion above, the developed learning instrument with sainti-ka (scientific-character) of junior high school on environmental pollution topic obtained a positive assessment from material expert and educational practitioner and it is considered as feasible and in the very good qualification. Suggestion for next study are development of learning tools can be done by inserting other characters in learning to develop these characters in science learning by studying or observing the subject matter first, and in order to consider the timing of the preparation of learning tools and field trials.

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