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E-Module Validity With *SETS* (*Science, Environment, Technology, and Society*) Approach Integrated Characters in Measurement Materials for High School Physics Learning

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ABSTRACT

Character education is a special concern for national education goals. As a result of the nation's character, which has become ingrained in the ideals of the Indonesian nation's personality, being lost in schooling at this time. Learning closely relevant to daily issues might help develop good character. The minister of education in particular has announced the government's autonomous learning curriculum. The autonomous curriculum is an extracurricular study-based competency-based program designed to improve students' soft skills and character. As a consequence, it requires adjustments to processes, media, and sources or teaching materials. Measurement materials for learning physics in high school have been developed using a method called character-integrated SETS. In order to produce teaching materials that suit the needs, a number of tests are needed. One of the tests carried out is the validity test. This article presents the results of the expert validity test on the developed e-module. This research is a development research using the 4D model (Four-D model), which is limited to three stages, namely define, design, and develop. The research subjects consisted of 3 lecturer validators from the Physics Department of Faculty of Mathematics and Natural Sciences Padang State Univercity. Validity is viewed from the components of material substance, visual communication display, learning design, software use, SETS (science, Environment, Technology and Society) approach components, and character assessment. Data validation results were analyzed using Aiken's V formula. The average value of e-module validation is 0.85 with a valid category so that e-modules are produced which are valid.

Keywords :E-Module; Approach SETS (Science, Environment, Technology and Society); Character Education; Measurement; 4D Models.

I. INTRODUCTION

The curriculum currently proclaimed by the government, especially the minister of education, is the independent learning curriculum. The independent curriculum is a competency-based curriculum with intra-curricular learning and strengthening the profile of Pancasila students for the development of students' soft skills and character. The independent curriculum is a refinement of the 2013 curriculum. The independent curriculum focuses on developing student learning outcomes as a whole which includes literacy, numeracy and character competencies [1]. The concept of an independent learning curriculum emphasizes giving freedom in the field of education. In this case, the teacher acts as a facilitator for students in providing learning**.** The world of national education needs to be designed to be able to give birth to a generation that has advantages in the current era of globalization. For this reason, one of the government's efforts to improve the quality and quality of education is to make new policies related to the curriculum, namely character education.

A system of instilling character values that includes knowledge, awareness or will, and actions to uphold these values, both towards God Almighty, oneself, others, environment, and nationality so that they become perfect human beings, is known as character education [2]. Character education therefore aims to provide students the information they need to have strong mental comprehension, good mental attitudes, and good mental abilities.

Character education must be viewed as a deliberate and planned process rather than an unintentional one. In other words, character education entails a sincere attempt to comprehend, cultivate, and promote ethical ideals

for both the individual and for all people. This will be effectively achieved through character-based learning through careful planning.

Character education consists of several types. First, character education based on religious values, this type of Education is the moral conservation truth of God's revelation. The second is character education based on cultural values, such as good manners, Pancasila, literary appreciation, and admirable national and historical personalities (culture preservation). The third sort of education is character education that is focused on environmental concerns (environmental conservation). Fourth, self-potential-based character education, or personal attitude, is the outcome of an awareness process aimed at empowering self-potential and is intended to raise educational standards (humanist conservation). Self-potential-based character education is a series of actions done with full awareness and planning to help children learn how to overcome obstacles and reach their full potential [3].

Character education is not just a process of forming subjective personal character. This can be confirmed from the importance of standard behavior (values/morals) that schools have, even at home and in society. This standard behavior becomes a kind of life in common which is built on superior values that have been agreed upon and which in turn becomes a benchmark in assessing character learning itself. Character development, according to Ki Hajar Dewantara, include working to improve a child's character (inner strength, character), mind (intellect), and physique. These components cannot be split apart in order to improve the perfection of children's lives [4].

Numerous pillars support character education. The Indonesia Heritage Foundation states that children should be taught the following nine (9) pillars of character in order to help them become people of character: 1. Love of God and the truth; 2. Independence, responsibility, and discipline; 3. Have trust; 4. Be respectful and polite; 5. Having a sense of love, concern, and being able to work together; 6. Confident, creative, and never give up; 7. Have a sense of justice and a leadership attitude; 8. Good and humble; 9. Having tolerance and love of peace [5].

The Ministry of National Education has established 18 more character characteristics that will be taught to or ingrained in Indonesia's youth and future generations. These values of character are as follows: 1. Spiritual, 2. Sincere, 3. Acceptance, Four. Discipline, 5 Work hard, 6. Ingenious, 7. Individual, Eight. Democratic, 9. Inquisition, 10. Passion for a country, 11. Love your country, 12. Recognize successes, 13. Amicable and sociable, Love the tranquility, 15. Enjoy reading, 16. Protect the environment, 17. Take care of others 18. Regarding [6].

The low character of students is caused by several factors such as, education currently only prioritizes the mastery of scientific aspects and the intelligence of students. If students have achieved grades or graduated with adequate academic grades above the KKM (Minimum Completeness Criteria), education is considered successful, but the formation of national character and cultural values in students is increasingly marginalized. In addition, the low character of students is also caused by a lack of teaching materials in the form of integrated character education modules [7]. The modules used in learning have not been integrated into character so that it is the cause of not being able to achieve some student competencies.

The solution to solving these problems is by using resources for instruction in the form of modules. The module is a printed instructional tool whose contents are summaries of information described in straightforward language, making it easier for students to understand [8]. Modules, which educators create by modifying the materials and fundamental skills, may also be referred to as one of the learning instruments required in the learning process [9]. Technology and information development go hand in hand the use of electronic modules (e-modules) is an option that teachers can choose to help the student learning process at this time [10].

The term "e-module" refers to a module that may be accessed and used electronically via computers, laptops, tablets, or even smartphones [11]. Since e-modules include interactive media including video, music, animation, and other elements that students may play and repeat while utilizing e-modules, they have an advantage over printed instructional materials [12]. Because they may present lesson plans that are comprehensive, entertaining, interactive, and carry strong cognitive functions, e-modules are regarded as innovative. Modules are used to help students comprehend the information offered either independently or under the assistance of educators who have created engaging module content [13]. An approach is required in order for the e-module to be more targeted, one that is in line with the SETS (Science, Environment, Technology, and Society) approach.

The SETS approach can be interpreted as a learning process that connects science and technology related to its use for society as well as saving the environment from damage or caring for the environment [14]. The SETS approach aims to provide contextual science learning, students are brought into situations to utilize science concepts in the form of technology for the benefit of society, and can think about the various possibilities that occur as a result of the process of transferring science in the form of technology, explaining the relationship between the elements of science discussed with other elements in SETS. Students can discuss the SETS approach from various directions based on the basic knowledge possessed by students.

The advantages of the SETS learning approach are; a) Student learning experiences and activities will always be relevant to the level of student development, b) The activities chosen are in accordance with the wishes of students, c) All learning activities are more meaningful for students so that learning outcomes will last longer, d) The SETS approach can foster student skills , f) Presenting activities that are pragmatic in accordance with problems that are often encountered in the student environment, for example, cooperation, tolerance, respect for the opinions of others and communication [15].E-modules developed based on the approach *SETS* character integratedin physics subjects. Educational materials This consists of measuring physics content, connected e-module information development technology, environmental impact and impactsocial relevant questions, discussion questions, and training. Usage teaching materialsthis is expected to make student better understand its use in physics And Technology,as well as the impactto the environment and public. The purpose of this study is to produce teaching materials in the form of E-Modules with a valid SETS (Science, Environment, Technology and Society) Approach in Character Measurement Materials as High School Physics Learning Media.

II. METHOD

To achieve the objectives of this study using a type of development research with the development model used in this study is the 4D model which is limited to only 3 stages, name ly*define* (definition), *design* (planning), and *develop* (development). The instrument used in this study was a validation instrument filled out by three expert lecturers from the Physics Department of Padang State Univercity. The validation instrument is filled using a Likert scale.

Table 1. Likert scale

Likert scale	Assessment
1	Strongly Disagree
2	Disagree
3	Undecided
4	Agree
5	Strongly Agree

(source: [16])

The content validity coefficient was determined using the Aiken's v formula after the respondents completed the product validity questionnaire. Results of the evaluation of the physics lecturer at Padang State University by up to n different persons for the product to ascertain how well the product represents the components being measured.

The formula used according to [17] is as follows:

$$v = \frac{\sum s}{[n(c-1)]}$$

$$s = r - l_0 \quad (1)$$

After the validity results are processed using this formula, the determination of the validity of the product is valid or not is determined by the score interpretation criteria obtained. The criteria used in determining e-module validation with the character-integrated SETS approach to measurement material can be seen in table 2.

Table 2. Product Validity Criteria

Interval	Category
0,4 ≤	Invalid
0,4 < V ≤ 0,8	Valid
0,8 < V	Very Valid

(source:[18])

The value of the V index ranges from (0) to one (1). where less than 0.4 is categorized invalid, the range from 0.4 to 0.8 is categorized as valid and more than 0.8 is categorized as very valid.

III. RESULTS AND DISCUSSION

1. RESULTS

According to the findings of the validation stage study, each component of the e-module's validation assessment had an average value thanks to the integration of the SETS (Science, Environment, Technology, and Society) method into the character assessment materials. The developed e-module includes six elements for the creation of ICT-based teaching materials: (1) the content; (2) the presentation of visual communication; (3) learning design; (4) the use of software; (5) the assessment of the SETS (Science, Environment, Technology and Society) approach; and (6) character evaluation. Figure 1 displays the validity value data plot's outcomes.

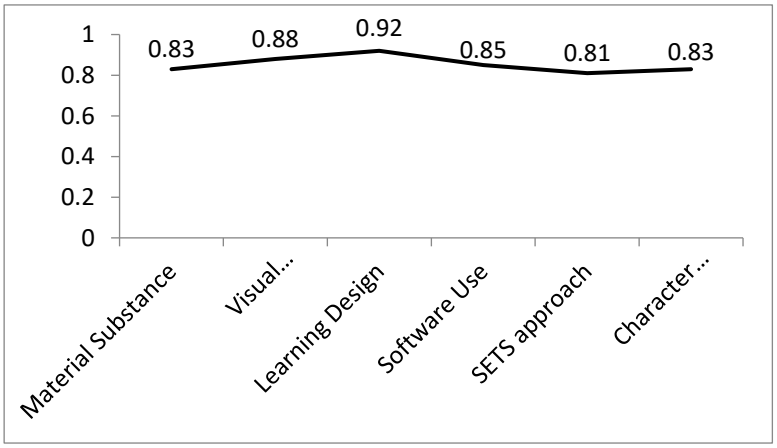

Figure 1. E-Module Validity Results with the SETS Approach (*Science, Environment, Technology and Society*) Character Integrated.

Based on Figure 1 it can be seen that the value of the validity component includes 0.83; 0.88; 0.92; 0.85; 0.81 and 0.83. The average value of e-module validation is 0.85 with a valid category so that a valid e-module is produced.

The results of the data plot for the value of each material substance indicator can be seen in Figure 2.

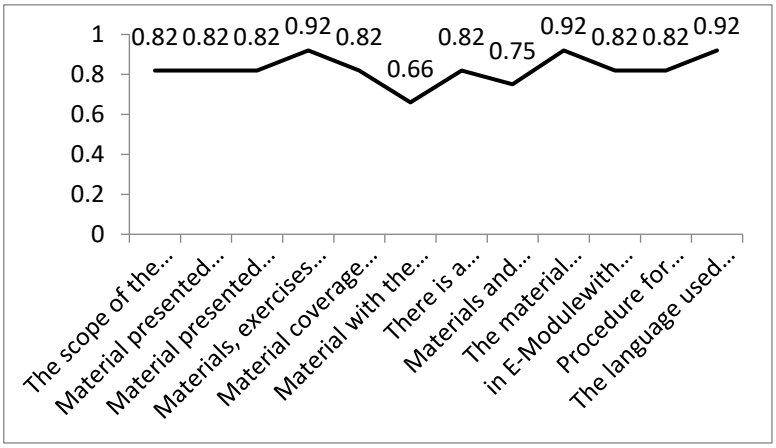

Figure 2. The results of the Material Substance.

The indicator values for material substance vary from 0.66 to 0.92, as shown in Figure 2. Of the four indications, two are rated as moderate (0.66 and 0.75), ten are rated as valid (0.83–0.92), and two are rated as moderate (0.66 and 0.75). The material substance indicator's average validation value for a valid category is 0.83.

Six indications make up the visual communication display: (1) navigation; (2) letters; (3) media; (4) color; (5) animation; and (6) layout. Figure 3 displays the findings of the data plot for the value of each indicator on the visual communication display component.

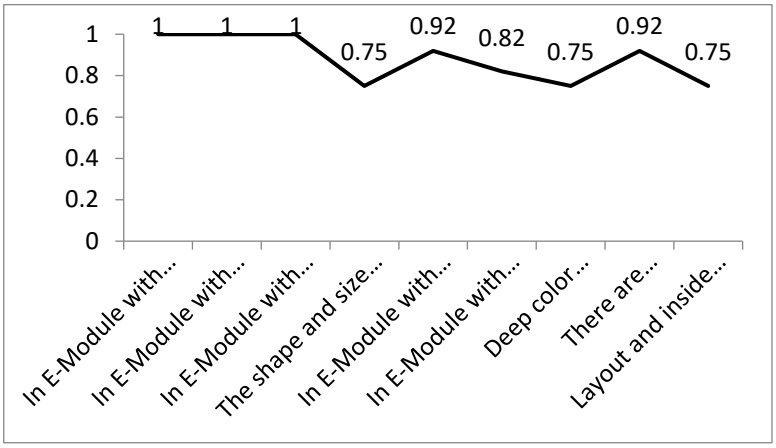

Figure 3. The results of the Visual Communication Display.

As seen in Figure 3, the indicator's value on the visual communication display ranges from 0.75 to 1.00. Among the nine indications, three are rated as moderate (0.75), while six are deemed legitimate (0.83–1.00), for a total of nine indicators. As a consequence, 0.88 valid category was determined as the overall outcome of the visual communication display component evaluation.

Six indications make up the learning design component: a title, general information, material, exercise, work steps, compiler, and references. Figure 4 displays the findings of the data plot for the components of the learning design's validity value..

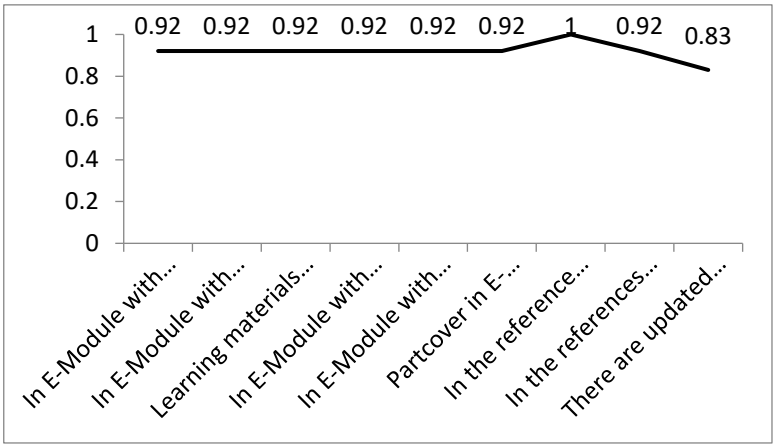

Figure 4. The results of the validity of the Learning Design

Based on Figure 4 it can be seen that the indicator values in the learning design range from 0.83 to 1.00. There is 1 indicator 0.83 and 7 indicators ranging from 0.92 to 1.00. All indicators in the learning design are classified as valid with an average learning design indicator of 0.92 being a valid category.

The component of using the software consists of 3 indicators, namely (1) interactivity; (2)*software* supporters; and (3) authenticity. The result of the data plot is the validity value of the utilization component*software* can be seen in figure 5.

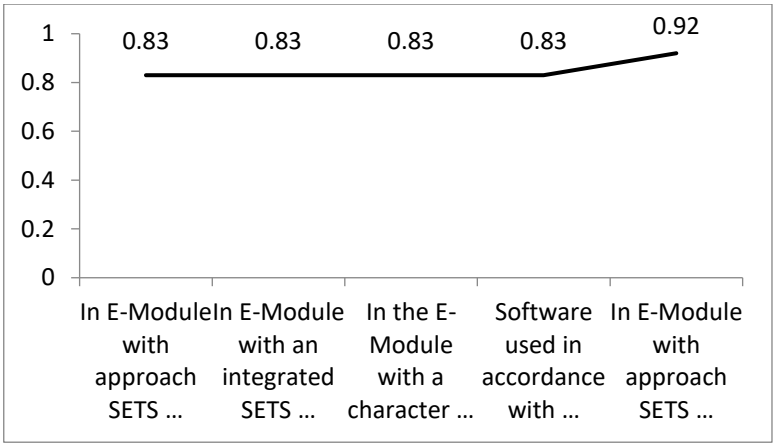

Figure 5. The results of the validity of using the software

Figure 5 demonstrates that the three software use indicators each have a valid category value of 0.83, and one indication has a valid category value of 0.92. All indicators in the learning design are classified as valid with an average indicator of software use being 0.85 in the valid category.

Approach assessment component *SETS (science, environment technology and society)* which consists of 4 indicators namely (1)*science*; (2) *environment*; (3) *technology*; and (4)*society*. The results of the data plot for each indicator of the e-module assessment component using the Character Integrated SETS (Science, Environment, Technology and Society) approach can be seen in Figure 6.

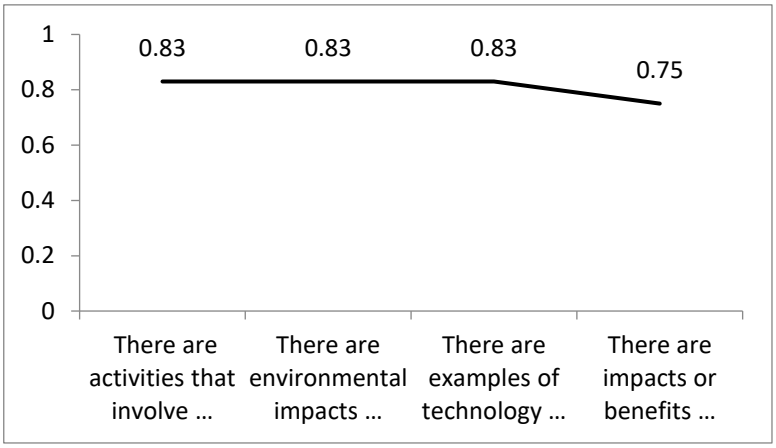

Figure 6. The results of the validity of using the approach *SETS*

Based on Figure 6 it can be seen that the approach *SETS (science, environment technology and society)* ranged from 0.75 to 0.83. Of the four indicators, there is 1 indicator in the moderate category, which is worth 0.75 and 3 indicators in the valid category, with a validation value of 0.83. The average validation value of the SETS (Science, Environment, Technology and Society) approach assessment component is 0.81 with a valid category.

The character assessment component consists of 5 indicators, namely (1) the value of faith in God Almighty; (2) be responsible; (3) cooperate; (4) critical thinking and (5) honest and thorough. Results of data plots for each indicator e-module assessment components with the Character Integrated SETS (Science, Environment, Technology and Society) approach can be seen in Figure 7.

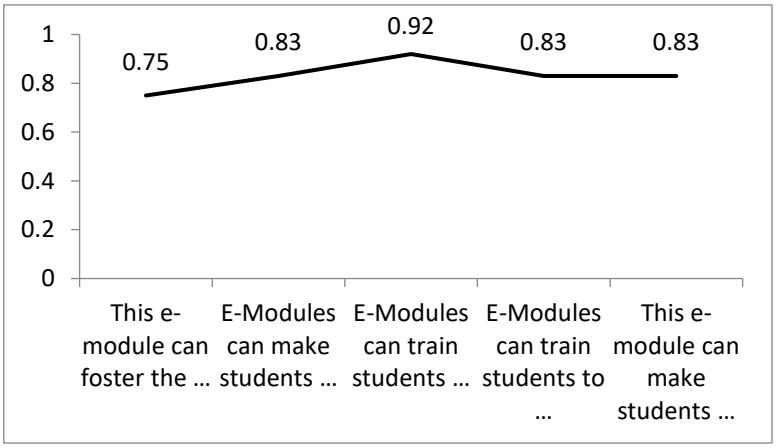

Figure 7. Results of character assessment

Based on Figure 7 it can be seen that the character assessment ranges from 0.75 to 0.92. Of the five indicators, there is 1 indicator in the moderate category, which is worth 0.75 and 4 indicators in the valid category, with a validation value of 0.83-0.92. The average validation value of the character assessment component is 0.83 with a valid category.

2. Discussion

The research results obtained are the results of validation by experts. The discussion of the research results obtained is as follows: Based on the results of data analysis carried out on making e-modules with the SETS approach (*Science, Environment, Technology and Society*) Integrated Character validated by three physics lecturers at Faculty of Mathematics and Natural Sciences, Padang State University. Validation was carried out on six components, namely material substance, visual communication display, learning design, software use, SETS

approach assessment (*Science, Environment, Technology and Society*) and character assessment. The results of the validity analysis show that the developed e-module has an average of 0.85 with a valid category.

In terms of the substance of the material, the developed e-module obtained a validity value of 0.83 with a valid category, this indicates that the developed e-module complies with the criteria [19] which states that the teaching materials developed must be in accordance with the applicable curriculum.

In terms of visual communication display, the developed e-module has a value of 0.88 and is classified as a valid category. In the display of visual communication already using good navigation. The E-module also uses appropriate, proportional, and attractive fonts and uses good images, animations, videos. The e-module also contains clear and precise instructions for using the e-module. In accordance with research that has been done before, it states that the appearance of teaching materials will make users interested in using them [20].

In terms of learning design, the developed e-module obtained a validity value of 0.92 in the valid category. The e-module is said to be valid in the learning design component because in the e-module it has fulfilled the learning outcomes that will be achieved both the titles presented in the e-module are in accordance with the material contained therein. The e-module has also included a flow of learning objectives regarding measurement material and there are learning objectives that are made in accordance with the learning objectives of measurement material. The e-module also contains the author's name and clear source of the images and videos contained in the e-module [21].

In terms of software utilization, The developed e-module obtains a validity value of 0.85 with a valid category. The developed e-module is interactive in nature which can provide feedback to users, and the developed e-module is the original work of the researcher [22].

In terms of the assessment of the SETS Approach (*Science, Environment, Technology and Society*), the developed e-module obtained a value of 0.81 with a valid category. The e-module already meets the indicators of the SETS approach, such as involving the application of natural phenomena, environmental impacts or benefits related to science, examples of technology related to science, and impacts or benefits of learning communities related to science [23].

In terms of character assessment, the developed e-module obtained a value of 0.83 in the valid category. The e-module has fulfilled character assessment indicators such as the value of faith in God Almighty, students who are responsible for their learning processes and outcomes, train students to work together, train students to apply a scientific approach to train critical thinking and can make students honest and thorough [23].

IV. CONCLUSION

Based on the research that has been done, a product is produced in the form of an e-module with an approach *SETS* (*Science, Environment, Technology and Society*) integrated character in measurement material for high school physics learning. In terms of material substance, visual communication display, instructional design, software use, SETS Approach assessment (Science, Environment, Technology, and Society), as well as character assessment, the designed e-module has a validity value with valid criteria. In e-modules with an integrated SETS (Science, Environment, Technology and Society) approach, the characters are declared valid and suitable for use in the learning process.

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