Validity of Basic Electronic 1 Module Integrated Character Value Based on Conceptual Change Teaching Model to Increase Students Physics Competency in STKIP PGRI West Sumatera

A Hidayati1, A Rahmi1, Yohandri2 and Ratnawulan2
1Department of Physics Education, STKIP PGRI Sumatera Barat, Padang 25137, Indonesia
2Department of Physics, Faculty of Mathematics and Science, Universitas Negeri Padang, Jl. Prof. Hamka, Padang, Sumatera Barat, Indonesia 25131

*auliyahidayati030888@gmail.com

Abstract. The importance of teaching materials in accordance with the characteristics of students became the main reason for the development of basic electronics I module integrated character values based on conceptual change teaching model. The module development in this research follows the development procedure of Plomp which includes preliminary research, prototyping phase and assessment phase. In the first year of this research, the module is validated. Content validity is seen from the conformity of the module with the development theory in accordance with the demands of learning model characteristics. The validity of the construct is seen from the linkage and consistency of each module component developed with the characteristic of the integrated learning model of character values obtained through validator assessment. The average validation value assessed by the validator belongs to a very valid category. Based on the validator assessment then revised the basic electronics I module integrated character values based on conceptual change teaching model.

1. Introduction
Education is the process of socialization towards intellectual, social, moral maturity in accordance with human dignity. In other words that education is a process of transfer and refinement that will involve and include various aspects in order to achieve the expected. Education goals plays a very important role in the survival of a nation. Good education is education that can increase the human resource character to face global competition. A nation will be faced with various developments that occur in all aspects of life both in the economic, social, cultural, science and technology (Science and Technology). One of science supporting technological development is Physics.

Physics is studied from primary and secondary education to universities. One of the compulsory courses of Physics is Basic Electronics. There are several concepts discussed in Basic Electronics, including electrical components, circuits, diodes, capacitors, transistors, operational amplifiers, and signal processing. Basic Electronics Lecture at STKIP PGRI Sumatera Barat is divided into two stages, namely Basic Electronics 1 and Basic Electronics 2.
Basic Electronics 1 is the Scientific and Scientific Study Group in the Physics Education Study Program STKIP PGRI Sumatera Barat with 3 credits of course. The basic materials studied in Basic Electronics 1 are the concept of electronics components, basic electrical law, voltage and current dividing circuit and equivalent circuit, charging and discharging capacitor, passive signal processing circuit, RLC circuit, and transistor as amplifier.

It is expected that by studying Basic Electronics 1 students are able to develop scientific thinking ability and apply it in various aspects of life. In the face of global challenges like today, students are required to apply theories obtained in real life, for example the manufacture of automatic alarms, light detectors, flip-flops, and many other simple tools. In addition to apply theory, the most important thing students must have is to the values of the characters so that the theory obtained can be used properly and not abused.

Character education is not a new thing but has existed since the beginning of independence. This is felt because number of graduates who are smart and skilled in solving problems and intelligent brain, but do not have a strong mentality. This is because character education requires habits to be trained to become a habit. Character education is concerned with values and norms that must be developed and practiced in everyday life.

Based on the observations that researchers do, found the lack of learning resources. The textbook used in the Basic Electronic 1 course is "Electronic Principle 3rd edition" by Albert Paul Malvino, Ph.D. the language converted by prof. Barmawi. This book is difficult to understand by students because the language of the book is still less standard, not communicative and less in line with the characteristics of students. The companion book circulating in the market is more suitable for Electrical Engineering students, so that students are less motivated to learn independently. Another cause is that the book used is more emphasized on the mission of delivering the material, but not in material understanding. As a result, lecturers have difficulties in completing the planned chapter material, as more time is spent on explaining material and practice questions. In addition, there is no Basic Electronics 1 textbook which integrates character values.

To overcome the problems, a media that can familiarize the students to learn continuously and directed in the form of a module is required. The module is a self-contained, self-contained unit consisting of a series of learning activities designed to help students achieve a number of clearly defined and specific objectives (Nasution: 2008). With the integrated module character values are expected to motivate students to learn as well as improve students' understanding that aims to improve the competence of Physics education program students in STKIP PGRI West Sumatra.

In the learning of physics lecture method is not fully suitable for use because in the process of learning physics is not enough just to hear and memorize. Physics learning is more emphasized on conceptual understanding. One of the learning models that emphasizes conceptual understanding is the Conceptual Change Teaching (CCT) learning model developed by Driver and Oldham (Chen Hu Lin: 2010).

Learning Model CCT is a learning model that has stages to generate student conceptual changes. CCT learning model is based on the view of constructivism paying attention to the experience and the concept of early students. Through CCT, learning is related to the context of daily life environment, so that students more easily understand the contents of the lesson, linking the content of the lesson with the environment around the students will make a more meaningful learning. CCT learning patterns with various activities leads to learning more interesting and fun for students, so as to improve student learning outcomes.

In previous research, the researcher has done the development of CCT based physics learning device on Dynamic Electrical material. From the results of these studies show that the learning devices based on CCT on dynamic electrical materials can improve student learning outcomes (Auliya: 2014). This study is limited to a single subject of dynamic electricity. Furthermore, the researcher will develop CCT based module in Basic Electronics 1 course. Based on the background, the researcher is interested to develop Basic Electronics 1 module integrated values of Character based on CCT model to improve student physics competence in STKIP PGRI West Sumatra.
2. Research Method
Development of learning module Basic Electronics 1 integrated character values based on CCT model by using Plomp model which is divided into three stages: preliminary research, prototyping phase, and assessment phase. In the preliminary research phase, the researcher performs a preliminary analysis or problem identification, needs analysis, concept analysis or material content, and a review of the literature required in the lesson.

Concept analysis aims to determine the content and learning materials needed in module development. In the concept analysis, the researcher identifies the essential concepts of Basic Electronics 1 material. Next, an analysis of student characteristics to determine the module development model will be used. In addition, researchers also conducted a study of the available literature.

The next stage is the phase of design and realization (prototyping phase) where the formulation or design of the module. The design of modules is made in accordance with established indicators and based on the format that is tailored to the needs of the researcher. In this phase, there is a formative evaluation which includes self-evaluation, expert reviews, one-to-one, and small group, and field test. However, in this study, the research is only done until one to one stage.

The designed module is validated by an expert. The input of the validator is used to fix and revise the module developed so that a valid module is generated. At the one-to-one stage, a design trial has been developed to students and lecturers who become testers. The results of this trial are used to revise the designs that have been made. The result of the assessment of the validator is analyzed by using the Likert scale which is converted to the value using equation 1.

\[ p = \frac{f}{n} \times 100 \]  

where:
- \( p \) = value of validity
- \( f \) = scores obtained
- \( n \) = maximum score (Modified from Riduan, 2009: 89)

The module validity category based on the final value obtained can be seen in Table 1.

| Interval   | Kategori     |
|------------|--------------|
| 0 – 20     | Very invalid |
| 21 – 40    | Invalid      |
| 41 – 60    | Less valid   |
| 61 – 80    | Valid        |
| 81 – 100   | Very valid   |

3. Results and Discussion
3.1 Module Validity
Based on the initial investigation conducted on the students, the design of integrated module of conceptual values based on conceptual change teaching, researchers develop modules with some problems in advance based on the phenomenon encountered in real life with the aim to bring the idea of students to the material. Then students are guided in learning activities that will eventually reconstruct their knowledge.

Module validity is seen from the instrument of validity by experts. The results of validity by experts are used to determine the feasibility of modules and guidelines in revising the product to produce a more perfect module. Assessment by experts includes content validity, construct validity
and language validity. The results of the assessment can be seen in Table 2. Based on Table 2 it can be
seen that the assessment of each validator is 90.5, 74.3, and 92.6 with an average value of 85.8 with
very valid category. The average value of validator for each module component can be seen in Figure
1. Based on the validation result, it can be concluded that the basic electronics 1 module integrated the
values of character based on the conceptual change teaching model are in very valid category.

### Table 2. Expert Validation Results

|                | Validator 1 | Validator 2 | Validator 3 | Average Validator | Category   |
|----------------|-------------|-------------|-------------|-------------------|------------|
| Content validity | 90.4        | 67.3        | 94.2        | 83.9              | Very valid |
| Construct Validity | 91.7        | 80.6        | 94.4        | 88.9              | Very valid |
| Language Validity  | 89.3        | 75          | 89.3        | 84.5              | Very valid |
| Average          | 90.5        | 74.3        | 92.6        | 85.8              | Very valid |

![Figure 1. Average Rating Component Assessment Module](image)

#### 3.2. Description of Product Module

Based on the existing weakness, then the module is revised. Revisions include weaknesses in writing
and content submitted by three experts. The weakness can be seen in Table 3.

### Table 3. The Weaknesses on Modules to be Revised

| Weakness in Module |
|--------------------|
| **Validator 1**    |
| 1. How to Write Kirchoff |
| 2. The use of sentences |
| 3. Create an equation number |
| **Validator 2**    |
| 2. The color of the module cover is less bright |
| 3. Review the accuracy of each phase |
| **Validator 3**    |
| 2. The writing is less clear |
After the module is revised as per the suggestion, we get a module that can be used in learning. Modules are made in accordance with the design that has been prepared. Module design includes Cover, introduction, content, type and font size and so on. The cover, introduction and module contents are shown in Figures 2, 3 and 4.

Figure 2. Cover of the module
Figure 3. Print Screen of the Introduction

Figure 4. Content of the module
The modules developed are in accordance with the systematics of module writing. In addition, the issues presented in the module are related to the material covered and close to the student environment. The module also has a clear reference list. For the stage of rearranging ideas, the statements presented can help lead students in building their own knowledge. Problems designed to assist students in applying the knowledge they have built.

The module presentation component is also rated highly valid by the validator. This is because the module is presented systematically. The module presentation is done in sequence according to CCT model. Furthermore, the design of the display used is simple and interesting, the language used is easy to understand by students, and the font used is clearly read. The use of language in the module is already communicative and clear. Based on the assessed aspects, the validated module has been declared valid by the validators.

4. Conclusions
Based on the results of the assessment of the validator obtained the result that the development of basic electronic module 1 integrated values of character-based conceptual change teaching model categorized very valid.

Acknowledgments
Thank you to Ministry of Research, Technology and Higher Education of the Republic of Indonesia that has funded this work through Research of Inter-University Cooperation under contract No. 073/STKIP-UP3M/PGRI-SB/2017.

References
[1] Auliya Hidayati. 2013. Through our Research-Based Physics Learning Support the Implementation of the Curriculum. Proceedings of the National Seminar on Physical Learning. 2 Nov 2013 PPs UNP.
[2] Depdiknas. 2008. Guidance on Teaching Materials Development. Jakarta: Directorate of High School Development.
[3] Kemendiknas. 2011. Character Education Implementation Guide. Jakarta: Kemendiknas.
[4] Lin, Chen-Hu, et al. 2010. "Utilizing A Concept Map As The Teaching Strategy Based on Conceptual Change Theory For The Course Information Technology and Society". Joint International IGIP-SEFI Annual Conference 2010, 19th-22th September 2010, Timava, Slovakia.
[5] Nasution, 2008. Berbagai Pendekatan dalam Proses Belajar Mengajar. Jakarta : Bumi Aksara.
[6] Neale, D., Smith, D. & V. Johnson, V. (1990). Implementing Conceptional Change Teaching In Primary Science. Elementary School Journal 91: 109-131.
[7] Plomp, Tjeerd. 2010. An Introduction to Educational Design Research. Enschede: University of Twente.
[8] Purwanto. 2007. Module Development. Jakarta: Depdiknas.
[9] Tessmer, M. 1998. Planning and Conducting Formative Evaluations. Philadelphia: Kogan Page.