

Development of Learning Modules Using the Dick and Carey Model in Informatics Subject

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Abstract : This study aims to produce learning modules for informatics learning modules for the 10th grade that are appropriate to the Independent Curriculum and make it easier for teachers to present teaching material and make it easier for students to learn. The model which was used in this development was the Dick and Carey development model. The results of this development research are in the form of a learning module for informatics, which is designed systematically, operationally, in a directed manner and completed by some guides for teachers on how to use the language that the speakers easily understand. In the development process to obtain products that are appropriate with the objectives, validation is carried out by material experts, design experts, colleagues, and student responses. The results of validation by material experts obtained a total score of 161 percentage 87% worthy category, design experts obtained a total score of 138 with a percentage of 89% worthy category, while colleagues obtained a total score of 63 percentage 90% very worthy in the category. The test was carried out three times, the first on the individual test obtained an average total score of 34.33 percentage 86% worthy category, the second small group test obtained an average total score of 68 percent 91% very worthy in the category, and the three large group tests obtained average score 69.53 percentage 93% very decent category. Thus, when the product is developed it was concluded that the learning module was very worthy to use in learning Informatics subjects.

Keywords: Informatics, Learning Modules, Independent Curriculum

Introduction

At the start of the new 2022-2023 school year, the Government through the Ministry of Education and Culture announced the implementation of a new curriculum, the "Independence Curriculum". In this independent curriculum, there are several fundamental changes compared to the 2013 curriculum; one of them is that teachers are free to create and plan learning programs using learning outcomes that the Ministry of Education and Culture has set. The teacher also designed the learning elements in the learning outcomes to become a plot of learning objectives in the form of modules. Informatics is a subject in the independent curriculum that was born from the transformation of BTIK subjects in the 2013 curriculum, in the learning process a module is needed that is by the characteristics of students so that it can help students succeed in their learning.

Module is one of important things that is needed, module development is indeed needed. The limited learning resources can be a problem that impacts the learning process and learners' competence. Therefore, it is necessary to develop teaching materials or learning resources as learning modules.¹

The development of teaching materials (modules) must be related to the curriculum needs, meaning the learning materials we will develop must align with the curriculum. A teaching material could be a primary or supplementary one. A primary teaching material usually meets the demands of the curriculum, while a supplementary one intends to enrich or deepen the contents of the curriculum.

Unfortunately, teaching modules may be difficult to find or unmatched by the demands of the curriculum. If this happens, creating our module is a good option. We can refer to many sources, such as our experience or knowledge, information from experts and colleagues, books, mass media, or the internet. Though we have various modules related to the curriculum, developing our modules is still necessary. Since too many topics may confuse the students, making simpler modules as a guide for students should be considered.

Developing modules should also be able to solve problems or difficulties in learning. There are several learning materials that students struggle to understand or teachers are hard to explain. These difficulties may occur because the material is abstract, complicated, or uncommon. In addition, Damayanti (2020) and Kamil (2021) stated, "*Factors that cause learning saturation can be uninteresting learning methods, unsupported learning media, too much memorization, assignments (homework), and pressure from other subjects, also monotonous teaching method with no any relaxation, which cause students to feel bored and not enthusiastic while participating in learning activities.*"

During the teaching-learning process of Informatics Science for 10th Graders at SMA Negeri 1 Kembangbahu, there are Algorithms and Programming. Kurniadi (2015) in Andayati and Wiyarno (2019) stated that learning material will be easily understood by students with the help of learning media.² In Informatics learning activities at SMA Negeri 1 Kembangbahu, especially Algorithm and Programming, most students experience difficulties in understanding the materials. These happen because: 1) There are no teaching materials that suit the needs of students. 2) Students lack knowledge about Algorithms and Programming, which can be seen from the results of the initial pretest conducted by the writer. 3) There are no supporting textbooks for students. 4) the Limited number of computers used for practicing and factors that may cause damage if students are invited to practice before having the topics theoretically

Based on the problems and the data obtained above, the writer is interested in conducting a study entitled "The Development of Learning Modules Using Dick and Carey

¹ F S Azizha and N Umamah, "The Development of Patukangan Local Sites Situbondo E-Module for History Learning by Using Dick and Carey Model," JOUR, *IOP Conference Series: Earth and ...* (2020): 1–6, <https://iopscience.iop.org/article/10.1088/1755-1315/485/1/012131/meta>.

² Andayati and Wiyarno, "Pengembangan Modul Bimbingan Olimpiade Sains Informatika Pada Materi Pemrograman Dengan Model Pengembangan Dick & Carey." JOUR. *Jurnal Education and Development*, 2019. <http://journal.ipts.ac.id/index.php/ED/article/view/1164>

Model in Informatics Science at SMA Negeri 1 Kembangbahu". The results of this study are hoped to be able to help students while learning Informatics Science by referring to the modules presented here.

Method

This study uses a developmental research method. The writer chooses the Dick and Carey model as his method of teaching. It is a programmatic manner with systematic sequences of activities, which is aimed to solve the learning problems; the availability of learning resources according to students' needs and characteristics. The stages of developing Dick and Carey model consist of nine stages: identifying learning objectives, conducting learning analysis, identifying input behavior and student characteristics, formulating specific learning objectives, developing instruments for assessment, developing learning strategies, developing and selecting learning resources, designing and developing formative evaluations, and revising learning materials.³

Later, the teaching modules developed in this study are expected to have a high level of effectiveness in learning. Therefore, the writer defines a research design including five stages: content-expert and learning design trial stage, peer trial stage, individual trial stage consisting of 3 students, small group trial stage (6 students), and large group/field trial stage (30 students).

The data resulted here are quantitative and qualitative. Quantitative data are some information obtained through a product trial questionnaire. The data collected through this questionnaire are converted into percentages and explained qualitatively. Therefore, the qualitative data can be in the form of comments, responses, and suggestions based on the content experts', design experts', individual tests', small group tests', and field tests' results.

The data collected through a questionnaire here aims to collect reviews from content experts, learning design experts, individual tests, small group tests, and field tests. Therefore, the writer has attached a questionnaire format as an instrument.

The result of this developmental study will be descriptive qualitative. This method is commonly used to process data based on reviews from content experts, instructional design experts, and students. Moreover, the descriptive qualitative method is usually carried out by grouping into five alternative categories as presented in the following table:

Table 1 Scoring Scale⁴

Score	Category
5	Excellent
4	Good
3	Quite Good

³ Elvita, Johar, and Abidin, "The Development of Learning Tools Using Treffinger Model Assisted by Geogebra to Enhance Students' Creativity." *JOUR. Journal of Physics: Conference ...* 1460 (2020): 1–7. <https://iopscience.iop.org/article/10.1088/1742-6596/1460/1/012045/meta>

⁴ Sugiyono, *Metode Penelitian Kuantitatif Kualitatif* (Bandung: CV. Alfabeta, 2016).

Score	Category
2	Good Enough
1	Not Very Good

Based on the content experts' validation and the learning design experts' and students', the score is then summed up. The scores obtained from the questionnaire are converted into percentages and explained qualitatively. The percentage calculation can be done using this formula:

$$P = \frac{\sum x}{\sum x_i} \times 100\%$$

Note

P : The percentage of validation

$\sum x$: The total score obtained

$\sum x_i$: The maximum score obtained

Since this is a developmental study, we need to check whether the modules are eligible. We can calculate the module eligibility using the following criteria:

Table 2 Module Eligibility's Criteria⁵

Percentage	Qualification	Note
90%-100%	Very Proper	No Revision
75%-89%	Proper	Need Revision
65%-74%	Quite Proper	Need Revision
55%-64%	Less Proper	Need Revision
0%-54%	Not Proper	Need Revision

Result and Discussion

The product resulting from this development research is the first grade learning module for Informatics subjects according to the independent curriculum. This module is designed systematically, operationally, directed and accompanied by a guide for teachers, using language that is easily understood by the user so that it can facilitate the process of learning activities of students.

Product development trials were carried out on content experts, learning design experts, peers and target users, the first graders at SMA Negeri 1 Kembangbahu referring to the components of the trial subjects, so the data obtained in the trial steps will be presented sequentially as follows:

1. Material Expert Test

⁵ S Arikunto, *Prosedur Penelitian* (Jakarta: Rineka Cipta, 2019)

The material expert test was carried out by someone who understands the content of teaching materials developed by developers in the field of Informatics. Product feasibility data is obtained by providing modules and using a questionnaire containing questions about the content and components of the teaching material given to the material content expert. The following are the results of the assessment questionnaire from material experts.

Table 3. Results of the Material Expert Assessment Questionnaire

No	Evaluation Details	Score	
		Total	Maximum
1.	The title of the teaching material is by the material	5	5
2.	The suitability of the chapter title with the description of the material	5	5
3.	Material depth level	4	5
4.	Degree of accuracy of concepts and definitions.	4	5
5.	Conformity of the formulation of learning outcomes and learning objectives with the contents of the material exposure in each learning activity	5	5
6.	The accuracy of making a study plan to achieve maximum learning results	4	5
7.	Example accuracy	4	5
8.	The structure of the description of the content/material in each learning activity can increase students' understanding	4	5
9.	Clarity of description of the material in each learning activity	5	5
10.	Suitability of the material description with the Flow of Learning Objectives (ATP)	5	5
11.	The structure of the examples of questions in each learning activity can increase students' understanding	3	5
12.	Explanation of examples of questions given	4	5
13.	Appropriateness between pictures/illustrations and material	4	5
No	Evaluation Details	Score	
		Total	Maximum
14.	The linkage of tasks in the form of work in group activities provided with the material	4	5
15.	The suitability of the selection of summary content with the main ideas contained in the	5	5

	description of the material in each learning activity		
16.	Conformity between questions in student worksheets (LKS) in each learning activity with indicators of learning outcomes	3	5
17.	Compatibility of competency test questions with the concepts being studied	4	5
18.	The structure of the description of the content/material in each learning activity can increase students' understanding	4	5
19.	Serving systematic consistency in learning activities.	4	5
20.	Presentation clutter.	5	5
21.	The material can be a guide for students to do practicum independently	5	5
22.	Introduction	4	5
23.	Introductory section	5	5
24.	Content section	5	5
25.	Summary	4	5
26.	Practice questions at the end of each learning activity	4	5
27.	Accurate sentence structure.	5	5
28.	sentence effectiveness.	5	5
29.	terminology.	4	5
30.	Message readability	5	5
31.	The accuracy of the use of language rules.	4	5
32.	The ability to motivate messages or information.	4	5
33.	Ability to encourage critical thinking.	4	5
34.	Appropriateness of students' intellectual development.	4	5
35.	Compatibility with the level of emotional development of students.	5	5
36.	Consistency and integration between learning activities	5	5
37.	Consistency and coherence between paragraphs	4	5
Total Score		161	185

It is known that the total score of the results of the material expert assessment questionnaire is 161 out of a maximum score of 185, so the percentage calculation is 87%.

After being converted with a validity level, the Dick and Carey model learning module is included in the proper qualifications.

The revisions that have been made to improve the modules were developed by suggestions and comments from material experts, namely:

- a. Additional examples are needed to help students understand the material.
- b. Additional questions or LKS (Student Worksheets) are needed so that students are more skilled and independent

2. Learning Design Expert Test

After the product has been tested by a material expert and revised, a learning design expert test is carried out. Following the results of the expert assessment questionnaire.

Table 4. Assessment Questionnaire Results Design Expert

No	Evaluation Details	Score	
		Total	Maximum
1.	Module size compliance with ISO standards.	5	5
2.	Appropriateness of the size of the material contained in the module.	5	5
3.	The appearance of the layout elements on the front, back and back cover harmoniously has rhythm and unity (<i>unity</i>) and consistency.	4	5
4.	Displays center of view (<i>center point</i>) good.	4	5
5.	The composition and size of the layout elements (titles, authors, illustrations, logos, etc.) are proportional, balanced and in tune with the layout of the contents (according to the pattern).	5	5
6.	The color of the elements of the layout is harmonious and clarifies the function.	3	5
7.	The size of the book title font is more dominant and proportional than the size of the book, the author's name	3	5
8.	The book title color contrasts with the background color	4	5
9.	Don't use too many combinations of fonts	5	5
10.	Describe the contents/teaching materials and reveal the character of the object	5	5
11.	Shape, color, size, proportion of objects according to reality.	4	5
12.	The placement of layout elements is consistent based on the pattern.	5	5
13.	The separation between paragraphs is clear	5	5

No	Evaluation Details	Score	
		Total	Maximum
14.	Printable area and proportional margins	4	5
15.	The margins for two adjoining pages are proportionate	5	5
16.	Spacing between text and illustrations is appropriate	4	5
17.	The placement of learning activity titles, learning activity subtitles, and page/folio numbers does not interfere with understanding.	5	5
18.	The placement of illustrations and captions (<i>caption</i>) does not interfere with understanding.	4	5
19.	Placing ornaments/illustrations as a background does not interfere with the title, text, or page numbers.	4	5
20.	Placing titles, subtitles, illustrations and captions does not interfere with understanding.	5	5
21.	Don't use too many fonts	5	5
22.	The use of letter variations (<i>bold, italic, all capital, small capital</i>) not excessive.	5	5
23.	Normal text layout width.	4	5
24.	Spacing between lines of normal text arrangement.	4	5
25.	Space between letters (<i>kerning</i>) normal.	5	5
26.	The level/hierarchy of titles is clear, consistent and proportionate.	4	5
27.	Word cutting sign (<i>hyphenation</i>)	5	5
28.	Able to reveal the meaning / meaning of the object.	4	5
29.	Accurate and proportional shape according to reality.	5	5
30.	The presentation of the whole illustration is harmonious.	4	5
31.	Creative and dynamic.	5	5
Total Score		138	155

It is known that the total score of the design expert's assessment questionnaire is 138 out of a maximum score of 155, so the percentage calculation is 89%. After being converted

with a validity level, the Dick and Carey model learning module is included in the proper qualifications.

The suggestions from design experts are as follows:

- a. The cover is given a bright or harmonious color to convey moods, create images, attract attention, and identify objects.
- b. In order for the identity elements of the book to be clearer and more attractive, the font on the book title should be larger than the other elements on the book cover.

3. Peer Trial

After the product has been tested by a design expert and revised, it is followed by a peer test. The peer trial was conducted by an Informatics subject teacher at SMA Negeri 1 Kembangbahu. Next the results of the assessment questionnaire from peer trials.

Table 5. Peer Assessment Questionnaire Results

No	Evaluation Details	Score	
		Total	Maximum
1.	The physical appearance of the module attracts the interest and attention of students	5	5
2.	The outline of the content at the beginning of the chapter helps to understand the content of the material	4	5
3.	The learning achievement in the chapter is clear	5	5
4.	Learning objectives in chapters are clear	5	5
5.	The font size used in the module is easy to read	5	5
6.	The font used in the module is easy to read	3	5
7.	The font color used in the module is easy to read	5	5
8.	Between the pictures and the material in this module is appropriate	4	5
9.	The examples given help you understand the material	5	5
10.	Instructions for assignments and exercises given are easy to understand	5	5
11.	Assignments and exercises can help improve students' understanding of the material	4	5
12.	The summary at the end of the chapter is very clear	4	5
13.	The sequence of presentation of the material in this module is easy to understand	5	5
14.	Exposure to the material in this module is easy to understand	4	5

Total Score	63	70
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The results of peer trials obtained a total score of 63 from a maximum score of 70, then the percentage calculation is obtained by a percentage of 90%. After being converted with a validity level, the Dick and Carey model learning module is included in the very proper qualification.

4. Target

a. Individual Trial

The individual trial is the result of draft III as a development product revised based on input from content experts, instructional design experts and colleagues. Furthermore, in individual trials conducted by 3 (three) the first grade students of SMA Negeri 1 Kembangbahu with high, medium, and low ability levels.

From individual trials produced the total average score is 34.33 out of a maximum score of 40. Based on the calculation, the percentage is 86%. After being converted with a validity level, the learning module with the Dick and Carey model is included in the proper qualifications

b. Small Group Trial

After Draft III was revised into Draft IV, a small group tryout was carried out by asking to assess the first graders of SMA Negeri 1 Kembangbahu on Draft IV of the learning module. This small group test consisted of 6 (six) first grade students of SMA Negeri Kembangbahu.

From small group trials resulted the total average score is 68 of the maximum score of 75. Based on the calculation, the percentage is 91%. After being converted with a validity level, the Dick and Carey model learning module is included in the very proper qualification.

c. Large Group Trial

Large group trials were carried out after Draft IV was revised into Draft V, followed by field trials. Field trials were carried out on the first grade students of SMA Negeri 1 Kembangbahu. The students who were used as respondents for the field trial were 30 the first grade students.

From small group trials resulted the total average score is 69.53 out of a maximum score of 75. Based on the calculation, the percentage is 93%. After being converted with a validity level, the learning module with the Dick and Carey model is included in the very proper qualification.

Conclusion

Based on the results and discussion, it can be concluded that the feasibility of learning modules using the Dick and Carey model in the Informatics subject at SMA Negeri 1 Kembangbahu shows that the results of product feasibility are based on the results of

material expert validation that the percentage level of eligibility is 87% and is within the worthy criteria. In the design expert validation assessment, the feasibility percentage level of 89% is within the worthy criteria. From the results of the practicality of the Dick and Carey-based learning module based on the assessment responses from colleagues, it shows that the percentage of feasibility is 90% which is in the very worthy criteria. While the results of student responses were carried out through three stages, namely individual tests, small groups and large groups with the results of obtaining an average percentage of the feasibility level of 90% in the very worthy criteria. So that as a whole the learning module in Informatics class X is very suitable to be used as a learning medium or teaching material in Informatics subject matter of algorithms and programming.

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