Development Of An E-Module Based On A Mind MAP Strengthening Student's Critical Thinking In Class IV SD

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Article Info	ABSTRACT
	21st-century learning requires high-level thinking skills including the 4Cs (critical thinking, communication, collaboration, and creativity) which can be pursued through developing e-modules. This research is research and development (Research and Development). The aim of the research is to develop an e-module on the Mindmap-based Part of Plants. The development process was adapted from the Plomp e-model development which consists of 5 phases, namely; the initial investigation phase; the design phase; the realization/construction phase; the evaluation, and revision test phase; and the implementation phase. This research was carried out in the odd semester of the 2022/2023 Academic Year with the research subjects being grade 4 students at UPT SD Negeri Bajang 02. The results of this study indicate that the e-module on plants based on mind mapping is declared valid with an average rating of 3,

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1. INTRODUCTION

Industrial Revolution 5.0 is a concept that is centered on teachers and students and is technology-based and emphasizes character, and exemplary education. In this era, teachers are expected to be able to solve various challenges and social problems by utilizing various innovations that were born in the era of the industrial revolution 4.0 to improve quality in the world of education. The development of the 5.0 industrial revolution era in the world of education demands to be more creative, innovative, productive, adaptive, and competitive. The development of technology today is very much needed because it is influenced by the times and changes in the curriculum, namely the independent curriculum. The independent curriculum through electronic media or what is called E-Modul is a support for learning in class, especially in grade IV Elementary School.

Mind map-based e-module is one of the interesting, practical, and effective teaching media. All information, both explanations of material that are paraded easily, is accessed on an Android phone and includes bright background color selection, beautiful image selection, practice questions in the form of a practical mind map, worksheets presented in the form of a google form link or quizzes, additional explanations material is also included a youtube link. All of this will be provided in one teaching media platform through mind map-based E-modules (Bryce, Wilmes & Bellino, 2016; Gormally, Sullivan & Szeinbaum, 2016). In the Law of the Republic of Indonesia Number 20 of 2003 Article 3, it is stated as follows:

The Pancasila Student Profile is an elaboration of national education goals whose preparation refers to the thoughts of the nation's founders and the Father of Indonesian Education, Ki Hajar Dewantara, the National Education System Law Number 20 of 2003 and various policies set by the government (Felicia, 2021). Six characters or competencies are formulated as key dimensions. The six dimensions are: 1) faith, fear of God, and noble character, 2) global diversity, 3) mutual coon, 4) independindepende reasoning, 6) creative.

Learning ingcreativity in elementary schools is very important. According to the opinion (Taraka018), science learning involves students' creativity. Both physical and mental creativity, and are directly related to everyday life. In line with this opinion, (Sari, 2019) explained that, the science learning process emphasizes providing studenxperiences so that in the end they find their own concepts of the serial being studied. The concept is found by finding out systematically so that science learning is not only giving assignments, but also being usd as a learning tool investigation process (Dewi, 2014).

Based on the results of interviews with fourth grade teachefourth-grade 02 State Elementary School, Blitar Regency with the initials "K" which was held on Monday, October 03 2022, information ,was obtained that the school in carrying out learning activities was fully face-to-face with the hours returning to normal according to instructions. The Blitar Regency Office is to go to school at 07.00 – 14.00. Ifromlearning activities the teacher provides material through blackboard media where the material is written by the teacher manually then students copy and take notes in their respective notebooks. The teacher also uses material from youtube that is displayed on the projector, but since the only projector machine at the school is broken, the material is delivered by writing on the blackboard only. For practice questions, students use the Student Activity Sheet (LKS). Student Activity Sheet (LKS) is used as an evaluation activity regarding the mastery of the material in students.

The obstacle faced by the teacher during face-to-face learning is that students do not understand the material being taught, seen from when students are in the process of carrying out the work on the questions on the Student Activity Sheet (LKS) there are still many students who are confused in giving answers. So from the problems that arise, the teacher must be creative and innovative in determining the selection of teaching materials.

Actually, the use oThet in schools is very easy, because at the Bitar Regen,cy State Elementary School, a wifi network has been provided that can be accessed at any time. In addition, every student already has an android phone that can be used to support learning. But in reality, teachers have never developed their own teaching media, teachers in delivering material use whiteboards and lectures, package books, LKS books (Student and Worksheets) with various publishers.

In learning activities, students are given the task of reading the material and then working on the questions in the LKS. The materials studied are textbooks and concrete media in the classroom or school environment as well as material through YouTube on a laptop. But in fact students doerstand in observing learning from YouTube only. As a result, in the content of IPAS Chapter 1 topic A, the material of plant body parts and their functions, most students do not understand and master the material. This is because students are less interested in studying the material in full and they only answer the questions in the LKS as best they can.

From the results of the interviews that have been described above, it is known that science learning for class IV still has problems, namely: (1) the discussion of material in natural and social science students' books has not stimulated students' understanding; (2) students are given the task of only working on evaluation questions in the LKS; (3) the teacher has never made his own electronic modu (4) the material is written on the blackboard manually only; (5) the content of IPAS still most students do not understand about plant body parts and their functions.

As a solution to the problems above, there is a need for research to develop teaching materials or E-Modules on plant body parts and their functions for fourth-grade studenfourth-gradeitar Regency State Elementary School. With the presentation of complete material, bright background colors, beautiful and clear image selection, attractively packaged so that it is easily understood by students according to the independent character of students. Learning modules are teaching materials that present complete material and sample questions. As explained by (Daryanto, 2013) the module is a book written with the aim that students are able to learn icany without being assisted by the teacher.

The module was chosen as a support for learning in the classroom, where the learning implementation is now carried out offline. On the other hand, modules must be able to be used online, offline, and in blended learning, sin out, hat in learning teachers can develop electronic

modules that utilize computers, laptops, or smartphones, In addition, mind maps are also a solution so that learning is more interesting and not boring. Mind Map-based modules will make students the character think critically about the material to be studied. So that with the mind map it can make it easier for students to understand the material with the E-Module guide. Based on the results of interviews, relevant theoretical studies, and previous research,

This research needs to be done because it is to solve problems, especially IPAS in Blitar Regency State Elementary Schools. This E-Module can be used as practical and interesting teaching materials. The E-Modul materiallay material in the form of written text equipped with supporting images that match the material and YouTube links, as well as evaluation questions in the form of a google form or quizziz which can be acquizzesusing a smartphone and the E-Modul also has an attractive appearance so that students will be more enthusiastic and motivated. does not seem boring when used in offline, online or blended learning pr,ocesses.

Important competencies needed in the 21st century as formulated in the 4Cs are: "(1) critical thinking aims to enable students to solve various contextual problems using critical and rational logics; (2) creativity (creativity) encourages students to be creative in finding various solutions, designing new strategies, or finding ways that were not commonly used before; (3) collaboration (cooperation) facilitates students to have the ability to work in teams, to be tolerant, to understand differences, to be able to live together to achieve a goal; and (4) communication (communication ability) facilitates students to be able to communicate widely, the ability to capture ideas/information, the ability to interpret information,

Based on the background described above, the problem can be formulated as follows. 1. How is the validity of the mind map-based e-module with strengthening the inaction of critical reasoning in the content of the Natural Sciences subject matter for plant body parts for class IV at the Blitar Regency State Elementary School according to material experts, teaching materials experts, and teachers? 2. How is the practicality, attractiveness and effectiveness of mind map-based e-modules by strengthening the character of critical reasoning in the content of the Natural Sciences content for the material of plant body parts in grade IV Blitar Regency State Elementary School according to grade IV students? In general, this development research aims to produce Mind Map-Based E-Module Development with Strengthening Critical Reasoning Characters Content of Natural Sciences Content Plant Body Parts Class IV State Elementary School Kab. Blitar valid, practical, attracts active, and effective.

To get, an answer from the problem formulation above, the objectives of this research are to: Describe the validity results of Mind Map-Based E-Module Development by Strengthening Critical Reasoning Characters Content of Natural Sciences Materials Plant Body Parts Class IV State Elementary School Kab. Blitar according to material experts, teaching materials experts, and teachers. Describing the results of the attractiveness, practicality, and effectiveness o,f Mind Map-Based E-Module Development by Strengthening Critical Reasoning Characters Content of Natural Sciences Materials Plant Body Parts Class IV State Elementary School Kab. Blitar according to grade IV students.

Therefore, it is necessary to develop innovative e-modules that contain all lecture materials and are able to train tactical thinking skills. The e-module in question is an electronic module made simpler based on mind mapping. Mind mapping can train students' critical thinking and analytical skills, besides that it allows students to be able to understand the relationship between concepts in learning (Martin, 2010).

2. METHOD

This research is research and development. This research was carried out in the odd semester of the 2022/2023 Academic Year at UPT SDN Bajang 02 Blitar with the product trial subjects being grade 4 students. The development model was adapted from the PLOMP model which consists of 5 stages, namely the investigation phase, the design phase, the realization phase, the test phase, the evaluation, the vision, and the implementation phase. (Plomp, 2013). The instruments used in the research include e-module validation sheets, student response

questionnaire validation sheets, and student response quand estiquestionnaires following is an analysis of data from the development of e-modules on plants. Validity analysis. The results of the assessment in the form of suggestions, comments, and input from experts were analyzed with validity criteria using categorization (Ratumanan & Laurens, 2006) which can be seen in Table 1 below:

Category Interval	Criteria
3.25 < x 4.00	Very valid
2, 50 < x≤ 3.25	Valid
1.75 < x 2.50	Not valid
1.00 < x < 1.75	Invalid

Practical Analysis

This is done by paying attention to the response to the developed teaching materials. Student response data was obtained thweregh a questionnaire using a Likert scale. The percentage of responses calculated by e-modules is said to be practical if more than 50% of them give a positive response to at least 70% of the number of aspects asked.

3. RESULTS

Investigation Phase (Prelimenary InPreliminary)

At this stage, the researcher identified problems related to the application of the independent curriculum for natural science subjects on materials about plants through an analysis of the achievement of learning objectives and the flow of learning objectives, materials, and an analysis of students' inistudent'ss. The results of the analysis are as follows: Science subjects in the independent curriculum on plants as subjects that get an average value of the order of two from the bottom after mathematics, this is because science is a subject that is considered abstract by students, especially material about plants where students do not able tareexplain well the parts and functions of plants, see the depth and breadth of the science subject matter, some learning achievements are not fulfilled optimally, with low grades in the science subjects. Learning that is not based on HOTS makes students only accustomed to remembering in the short term so that the subject matter is easily forgotten. In addition, the lack of learning resources that include plant material as a whole makes students understand the concept partially.

Design Phase

Product specifications that will be made in this development are: 1) Material in mind map-based e-modules, namely the shape and structure of plant body parts for grade IV SD.
2) The E-Module is approximately 51 slides containing the cover, Preface, Table of Contents, Instructions for Use of the E-Module, Introduction, Learning Outcomes (CP) and Learning Objectives (TP), Concept Map (Mind map), Picture material, YouTube link material, Student Worksheet, a summary of maa trial, evaluation questions, bibliography, and author's biography. The material is presented in the form of written text with the help of mind maps and pictures to support the material. 3) The use of mind map-based e-modules connected to the internet in the download process. E-modules can be used offline during learning and for evaluation questions in the form of a google form. 4) E-modules are in the form of soft files and hard files. The development steps use Microsoft power point 2powerpointp 2.0, and evaluation questions. 5) Using the PLOMP model which consists of 5 stages, namely the investigation phase, the design phase, the realization phase, the test phase, evaluation, and revision, and the Implementation phase. 6) The E-Modul file is approximately 1.6 MB in size by opening the drive link that is shared with users.

Realization/Construction Phase

At this stage the basic form of the product is produced as a result of the realization of the design phase. At this stage, teaching materials are made according to the design that has been designed. They develop the use of Microsoft power point 20powerpoint 2.0, and evaluation questions

Test, Evaluation ,and Revision (test, evaluation and revision)

At this stage, validation activities were carried out to 2 material ewitherts, 2 media and experts. The results of the validation of the developed teaching materials are as follows: Material Expert Validation Material experts provide an assessment of the developed teaching materials by assessing the relevance of the material contained in the e-module, its usefulness, and the use of appropriate language. The results of the material expert assessment can be seen in table 2 below:

No	Aspect	Validator 1	Validator 2	Average	Criteria
1	Material Relevance	3.6	4	3.81	Very Valid
2	Usefulness	3.5	3.8	3.63	Very Valid
3	Language	3.6	3.8	3.69	Very Valid
		3.57	3.87	3.72	Very Valid

Based on table 2, it is known that the assessment by material experts of the Plant Anatomy and Physiology teaching materials developed on the relevance aspect of the material is an average of 3.81 with a very valid category, the usefulness aspect of teaching materials with an average of 3.81.or 3.68 in the very valid category and the assessment on the language aspect on average of 3.61 in the very valid category The general assessment of the teaching materials developed by the material experts on the developed teaching materials is that the teaching materials are declared to be very valid, and suitable for use with minor revisions. The revision of the material expert is the need to add learning objectives to the developed teaching materials, as well as add picture descriptions. Media Expert Validation The developed teaching materials were validated by 2 media experts. Both provide an assessment. The results of the two assessments were then averaged to determine the quality of the teaching materials developed. The results of the media expert's assessment can be seen in table 3:

Table 3. Media Expert Assessment Results

No	Aspect	Validator 1	Validator 2	Average	Criteria
1	Submission Technique	4.0	3.5	3.8	Very Valid
2	Presentation Equipment	3.7	3.7	3.7	Very Valid
3	Cover Design	3.3	3.3	3.3	Very Valid
4	Content Design	3.3	3.6	3.5	Very Valid
5	Language	3.9	3.8	3.8	Very Valid
	Average	3.65	3.58	3.61	Very Valid

Based on table 3, it is known that the assessment by media experts of the IPAS module on Plants developed on the technical aspect of presentation is an average of 3.8 with a very valid category, the aspect of completeness of presentation with an average of 3.7 in the very valid category, cover design is average. - an average of 3.3 valid categories. The content design aspect has an average of 3.6 very valid categories, and the assessment on the language aspect isofn average of 3.8 very valid categories.

Table 4 Comparison of Average Validator Ratings

No	Evaluation	Average	Category
1	Material Expert	3.70	Very Valid
2	Media Expert	3.61	Very Valid
	Average	3.66	Very Valid

The general assessment of the media expert's assessment of the e-module is stated to be very valid and suitable for use with minor revisions. The comments from media experts and material experts are; 1) some pictures please clarify and add elements ;2) the selection of ettelettersnot quite right; 3) It is necessary to add appropriate learning objectives. Based on the validator's input, several revisions were made.

Student response questionnaires were given to grade 4 students to assess the practicality of the products developed. students provide responses related to the material about plants given by the lecturer with the help of a mind map. The student responses can be seen in table 5.

Table 5 Student response questionnaire

No	Aspect	Items	Amount	Percentage	Criteria
1	Material Relevance	1	40	97.6	positive
		2	40	97.5	positive
		3	39	90.5	positive

		4	37	97.5	positive
		5	40	78.6	positive
		6	32	83.4	positive
		7	34	91.5	positive
2	Usefulness	8	38	92.3	positive
		9	35	80.5	positive
		10	37	86.9	positive
		11	38	86.4	positive
3	Appearance	12	39	82.3	positive
		13	38	97.8	positive
		14	36	87.6	positive
4	Language	15	39	93.7	positive
		16	41	80.7	positive
		17	38	100	positive
	Average		37.8	92.25	positive

Based on the specified criteria, the teaching materials developed have met the practical requirements because 92.25% of respondents gave a positive response to all the items asked (100%). Taking into account the assessments by material experts and media experts and supported by student responses to the teaching materials developed, it can be stated the module module on plant material 4ᵗᵍʳᵃᵈᵉth grade science class subject in the independent curriculum developed is feasible to be tested.

Implementation Phase (Implementation)

The IPAS e-module on plant material that has met the valid and practical criteria should be tested in a real class to measure its effectiveness, so the developed E-module is not tested. The developed E-Module has met the valid and practical requirements for use. This E-Module on Plants is made simply and includes plant material. Each chapter in the E-module begins with the presentation of a mind map created with the help of the free version of the draw mind master application. The mind map will provide an overview of the main points of material that students must understand for each chapter. Min map learning is expected to improve students' critical thinking. According to (Ichsan, 2019) mind mapping can make students creative.

3.2.Discussion

Mind maps made with miPowerPointowerpoints are more interesting than manual drawings. We are free to choose shapes, colors, insert pictures, and so on to support the main idea in the mind map. the. To strengthen the material that has not been included in the d map, an in-depth material is provided with pictures. Attractive pictures can make students more enthusiastic about learning (Sesen & Tarhan, 2010) (Hidayati & Wuryandari, 2012). The developed E-Module is easy to understand using simple language. This is supported by the assessment of both material experts and media experts providing an assessment of the grammar of the developed E-Module as being communicative. The use of language is important because good media must be communicative (Blaschke, 2014). Each chapter in the e-module is equipped with discussion questions that allow students to be able to analyze the problems given. Solving HOTS questions requires high analysis, evaluation, and creativity (Dewi & Riandi, 2016). In addition to training communication, discussion activities will increase students' HOTS because can always exchange ideas with their peers (Handayani & Priatmoko, 2013). This teaching material for Plant Anatomy and Physiology in the future is expected to be made in the form of e-modules so that it can be used using cellphones, tablets, or laptops. Because learning can be done anywhere. discussion activities will increase students' HOTS because they can always exchange ideas with their peers (Handayani & Priatmoko, 2013). This teaching material for Plant Anatomy and Physiology in the future is expected to be made in the form of e-modules so that it can be used using cellphones, tablets, or laptops. Because learning can be done anywhere. discussion activities will increase students' HOTS because they can always exchange ideas with their peers (Handayani & Priatmoko, 2013).

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4. CONCLUSION

The E-Module of the Natural Science subject on Plants with Mind Map was declared valid with an average rate of 3.66 in the very valid and practical category with 92.25% of respondents giving a positive response to all the items asked (100%).

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