

# E-module Development Model I Came to Facilitate Student Independence in Learning Mathematics

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**ABSTRACT**---- *To help students learn independently in online learning mathematics at the junior high school level, interactive e-modules are needed. The purpose of this research is to determine the steps for developing, prototyping, and evaluating the effectiveness of the e-Module Model I CAME in facilitating the independence of students in Class VII Semester I in learning algebraic forms at the SMP/MTs level. The Dick and Carey model of research and development (R&D) includes ten stages: a preliminary study, e-Module design, validation and testing, and final product. Individual trials, as well as small group tests and field tests for teachers and students using questionnaires, observation guidelines, and interviews, have been used to validate the e-Module. To determine the effectiveness of the e-Module, the data were analyzed using qualitative and quantitative data analysis, as well as one group pre-test and post-test analysis. The results of the study found that the e-Module product model I CAME developed was feasible and effective in facilitating students to learn independently on the algebraic form of material. The e-Module I CAME model fulfils the aspects of content feasibility, presentation, language accuracy, graphics, suitability of the presentation structure with the I CAME model, and student learning independence, which can increase student learning activities with the e-Module presentation structure and syntax of the I CAME model, and received a very positive response from students so that they could achieve a value above the KKM 75 and classical completeness above the predetermined 85%.*

**Keywords:** e-Modul, Model I CAME, Independent Learning, Mathematics

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## 1. INTRODUCTION

Learning mathematics online at the junior high school level faces implementation challenges. Throughout the mathematics learning process, the teacher must remain focused on guiding students to master the subject matter in accordance with the demands of the 2013 Curriculum, particularly experiencing behavioral changes in cognitive, affective, and psychomotor aspects of learning. Online learning is based on (Standar Proses Pendidikan Dasar dan Menengah, 2016) concerning the Standards Process, where the learning process makes use of information and communication technology to improve learning efficiency and effectiveness. The change in learning models from conventional face-to-face learning to distance learning occurred not only as a result of the Covid-19 pandemic but also in response to the development of information and communication technology. The Covid-19 pandemic is purely and simply the primary catalyst for accelerating the transformation of learning models from manual or conventional models to digital models.

According to the Directorate General of Teachers and Education Personnel (Kristina et al., 2020), the strategy for implementing online learning is the use of the internet network by students in the learning process to obtain learning outcomes similar to face-to-face learning with the following characteristics; (1) learners construct and create knowledge independently (constructivism); (2) learners collaborate with other learners in building knowledge and solving problems together (social constructivism); (3) forming an inclusive community of learners; (4) utilizing web media available via the internet, computer-based learning, virtual classes, and/or digital classes; and (5) interactivity, independence, accessibility, and enrichment (Kuntarto, 2017).

The synchronous and asynchronous models of online learning raise teacher concerns due to teachers' limited ability to control, guide, guide, and encourage student learning activities. Besides that, students require modifications to learning methods such as online discussions, instant messaging, blogs, the use of LMS, and e-books in order to reproduce the classroom experience through the exchange of information and social construction, not only between students and teachers but also among students. Students not only require teaching skills in preparing learning resources; but also in developing effective learning strategies (Nengrum et al., 2021).

Teachers are also particularly worried because online learning requires students' ability to learn independently,

specifically learning on the impulse of their abilities, self-choice, and self-responsibility, being able to set goals, make choices, and make decisions or perceptions of skills, affection, and self-regulation on how to meet their learning needs. Is able to take responsibility for formulating and delivering his learning, monitoring his progress forward into learning objectives, and self-assessing learning outcomes (Fatihah, 2016; Hadi & Farida, 2012). In Indonesia, independent learning has also become part of the curriculum, which requires students to be able to carry out the learning process independently after learning interactions in the classroom by constructing learning strategies and patterns (Livingston, 2012).

Students can learn online on their own by increasing their activity with online-based supporting applications such as Leksimo with reflection sheets, Google Form for evaluation, e-LKPD in electronic form for student assignments, and QR Code to facilitate student access to resources. Students can use learning and e-Modules as guides and teaching materials (N. S. Latif, 2021; S. Latif et al., 2022). Despite this, there are still many students that are unable to learn independently, especially in mathematics. As a result, it appears to require supporters to learn mathematics, (Armiati & Yanrizawati, 2020) via the web and interactive e-modules with appealing images, audio, video, and moving animations that provide variety, as well as feedback via formative tests on particular things or quizzes, (Sugihartini & Jayanta, 2017; Voithofer, 2005) have easy access to e-Modules that look similar to electronic books and can be opened using applications based on Android smartphones or IOS and laptops, and understand the subject matter presented by the teacher to give students a sense of interest and motivation to learn, (Syahrial et al., 2019) which is expected to impact the success of independent learning students Another concern for teachers is the necessary competencies, which also include professional competence in this technology field.

## **2. METHOD**

This research is an R&D effort to create an e-Module product model I CAME for mathematics subjects at the Junior high school level on the subject of algebraic forms in Class VII Semester I. The e-Modul product is designed and tested for validity, practicability, and dependability. effectiveness by testing content feasibility, presentation feasibility, language accuracy, and graphics, through expert content testing, so that the level of learning independence is known, implementation of the e-Module I CAME model, and field testing for potential users.

The e-quality Module and feasibility are determined by test results in the form of a product test, which also includes validation of the e-Module design by material and media experts/experts on the four components of e-Module feasibility, namely material, language, presentation, and display/graphic aspects. The E-Module was tested three times: (1) one-on-one evaluation with three students, (2) small group evaluation with nine students, and (3) field trial with a large group of 26 students who were asked to use e-Modules in learning to assess clarity, impact, and feasibility.

During the validation and evaluation stages, data is collected in the form of quantitative data from the results of instrument filling in the form of questionnaires or questionnaires, observation sheets, and test instruments. To assess the efficacy of the e-Module, data were analyzed quantitatively using descriptive statistical analysis, frequency and percentage distributions, and one group pre-test-post-test Normalized Gain (N-Gain) analysis.

## **3. RESEARCH RESULT**

This research refers to the creation of learning modules in the form of e-Module Model I CAME for mathematics subjects at the junior high school and equivalent levels. This development research uses the Dick & Carey R & D Research Model, which employs a systems approach or systematic approach to the basic components of the learning system design, which include analysis, design, development, implementation, and evaluation, which consists of four major stages: needs analysis, product design, validation and evaluation, and final product.

In accordance with established research procedures, the research was carried out by first designing the specifications of the e-Module product to be produced. The method of constructing e-Modules with the open source Book Creator application was chosen so because the features available in the application are simple to use and provide convenience in the design and processing of the final product. As a measure of equality, the Module's design is based on technical and non-technical specifications. The technical specifications are as follows;

1. E-Modules are electronic modules that contain text, audio, video, pictures, illustrations, and animations;
2. The e-Module includes the explanation of the algebraic form for junior high school students;
3. E-Module created with the Open Browser Book Creator application program, which really is available online, <http://bookcreator.com>
4. Reader software does not require any special applications either on the desktop or the smartphone;
5. The e-contents modules are as follows: (a) The cover, identity of the e-Module, foreword, and table of

contents, and the introduction section contains the e-description, Module's instructions for using the e-Module, concept map, basic competencies, and did you know? (b) The main component/content of learning consists of four learning activities. The presentation is arranged as follows: introduction, connection, application, motivation, and evaluation. (c) The final preliminary would include a final test, a summary, a glossary, a bibliography, and an author biography.

Meanwhile, non-technical specifications have included a complete guide to using e-Modules, which is presented in the initial preliminaries of e-Modules and is equipped with lesson plans and syllabus that also include basic competencies, indicators, and objectives, learning resources, assessment, time allocation, teacher activities, and student activities. Which is presented as an electronic file and can be accessed through the link embedded in the e-Module.

These technical and non-technical specifications are used to create the initial design/Draft I e-Module I CAME model for Algebraic Forms at the Class VII SMP/MTs level. Several supporting applications, including Microsoft PowerPoint, Background Picture Editing, and Canva, are used in the design. Meanwhile, images in the form of png files can be accessed via the image provider page, such as pixabay.com. In addition to these applications, Microsoft uses the features to transfer files into.pdf files for material in the form of.pdf files. To make it easier for students to access the material, text files are stored on a "Google Drive" account. Doratoon, Powtoon, Videoscribe, and Kinemaster video editing applications were used to create material design videos. The materials for several videos created as e-Modul materials have been uploaded to Nila Sari Latif's YouTube page underneath the e-Book material playlist, with the URL address <https://studio.youtube.com/channel/UCKcxPTA8vR35K229Yd0yOqg/playlists>. Provision of online evaluation materials using the Quizizz application, and Google Form. Meanwhile, the provision of materials in the form of e-LKPD uses the Live Worksheet application with the URL address <https://www.liveworksheets.com/myworkbooks/>.

The result showed that the steps for preparing the e-Module design using the Dick & Carey model empowered the development of a feasible and effective product because it was developed with detailed steps and allowed revision of all stages of activities to obtain a better product.

The e-Modul product is categorized into three levels. The Level is a collection of access levels in e-Modules that helps students progress through their learning activities. The e-Module is divided into three aspects: Level 1, Level 2, and Level 3. Level 3 contains learning resources, e-LKPD, feedback/questions and answers, quizzes, and evaluations. Cover, Part A Introduction, Part B Learning Activities, Part C Closing, and Back Cover consist e-Module level 1. The schematic illustrates the technical specifications application of the e-Module. The flowchart of the use of the I CAME e-Module model for student independent learning is presented in Figure 1.

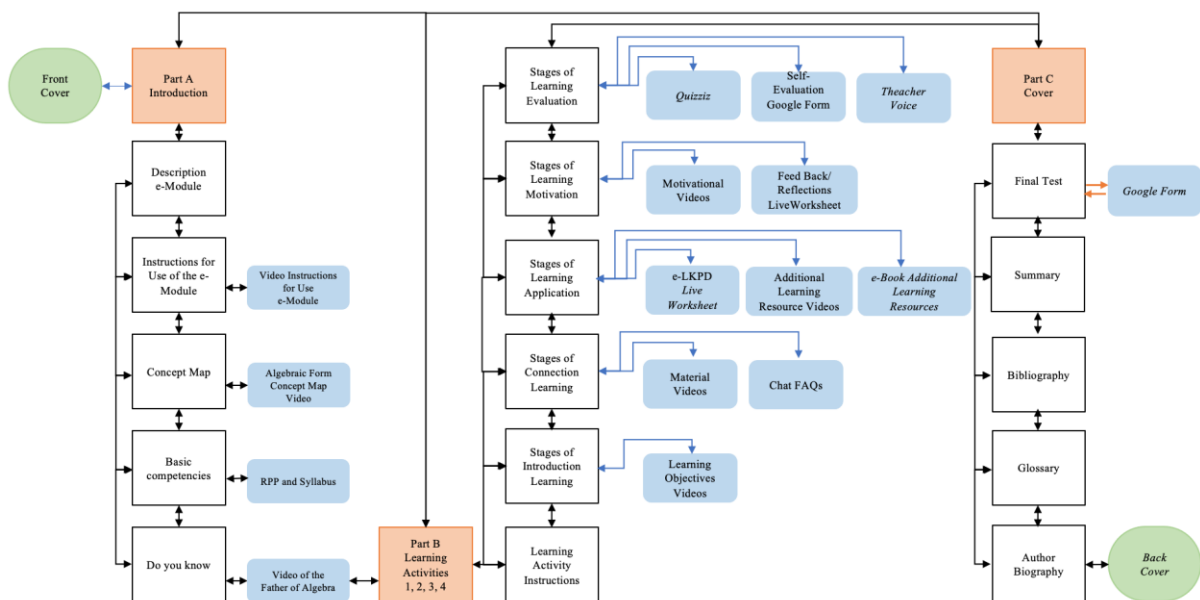


Figure 1. Flowchart of the Use of e-Module Model I CAME to Facilitate Independent Learning of Students.

The results of the e-Module design were validated, tested, and revised to obtain a recapitulation value of the effectiveness of the CAME I e-Module model to facilitate students' independence in learning mathematics in detail as

shown in Table 1.

**Table 1. Recapitulation of the Results of the Development of the e-Module Model I CAME**

No	Indicator of e-Module Development	Achievement	Criteria (%)	Remarks
1	Need for e-Module	> 50	73 > 50	Fulfilled
2	Eligibility of e-Modules			
	Material expert and practitioner validation	≥ 61	90,86 ≥ 61	Fulfilled
	Design Expert Validation	≥ 61	85,40 ≥ 61	Fulfilled
3	Evaluation of e-Modules			
	The results of individual trials on teachers	≥ 61	94,00 ≥ 61	Fulfilled
	The results of individual trials on students	≥ 61	83,00 ≥ 61	Fulfilled
	The results of small group trials on students	≥ 61	83,00 ≥ 61	Fulfilled
	Student learning outcomes	KK ≥ 85	55,56 ≤ 85	Not Fulfilled
4	Effectiveness of e-Modules for independent learning			
	Student response	≥ 61	85,00 ≥ 61	Fulfilled
	Student activity	≥ 61	95,00 ≥ 61	Fulfilled
	Implementation of e-Modul usage	≥ 61	90,94 ≥ 61	Fulfilled
	I CAME model implementation	≥ 61	83,13 ≥ 61	Fulfilled
	Independent learning	≥ 70	86,46 ≥ 70	Fulfilled
	Student learning outcomes	N-Gain > 0,7	0,76 > 0,7	Fulfilled
	KKM 75	KKM ≥ 75	81,15 ≥ 75	Fulfilled
	KK 85	KK ≥ 85	88,46 ≥ 85	Fulfilled

Table 1 shows that the results of developing e-Module products begin with a needs analysis with a percentage value of 50% of teachers and students requiring e-Modules in learning. The needs analysis is the basis for designing the e-Module design. From the results of the analysis of the initial design of the e-Modul which was validated by material experts, practitioners, and media experts, it was revised to produce Draft I with a validation value of material experts and practitioners of 90.86% in the very feasible category and media expert validation of 85.40% which means the product e-Module is in the very feasible category and does not require major revisions but revisions based on suggestions and input from experts/experts and practitioners.

The results of the revision of Draft I to Draft II were then evaluated through individual trials to teachers, with a score of 94% being in the very positive category, as well as for students, with a score of 83% also in the very positive category both in the material, language, presentation elements. , and graphics. The results of the small group evaluation of students with a score of 83% are in the very positive category both in the material, language, presentation, and graphic elements with the number of students who achieve minimum completeness, with a value of 55.56% but have not achieved classical completeness. with a value of 85%. Based on suggestions and input from students on the e-Module Draft II, it becomes the basis for making minor revisions and producing e-Module Draft III products.

The results of the validation and evaluation in the form of trials indicate that the e-Module Draft III product is suitable for use in learning activities which then become a product prototype to be tested in large groups to determine student responses, student activities, student learning independence, implementation of the use of e-learning. Modules, the implementation of the CAME I model learning, as well as to find out the minimum learning mastery of students.

The effectiveness of the e-Module is seen from the responses of the students, the activities of the students, the implementation of the use of the e-Modules, the implementation of the CAME I model, the independence of students' learning, and the learning outcomes of students. The results of the analysis of the student's response to the e-Module Model I CAME in, very positive, with an average percentage value of 85% with a very positive category in the aspects of the material, language, presentation, and graphics which means the product does not require revision. In addition, the activeness of students, with an average percentage of 95% which means that the learning activities of students are very active, the implementation of the use of the e-Module is very good with an average percentage of 90.94%, while the implementation of the model I learning CAME with an average percentage value of 83.13%, which means that the I CAME model is implemented very well as long as the e-Modul is used by students.

The results of using the e-Module I CAME model were also obtained from the level of independence of students, with an average of 86.46 which means that in general students can learn independently using e-Modules. This is also evidenced by the results of observations on the independence activities of students while using the e-Module, 83% have to learn independence. In addition to these data, evidence that e-Modules are also effectively used is seen from the high N-Gain acquisition value. of 0.76, students who achieved a minimum completeness score of 75 in the posttest were 23 students or about 88.46%, and only 3 students or 11.54% were incomplete; and met the completeness requirements of more than 85% of classically students who achieve a value above or equal to a minimum completeness value of 75.

#### **4. DISCUSSION**

A good e-Modul product is an e-Modul product that is by the selected and validated development stages and is tested to determine the level of product feasibility. The findings of this study are in line with the results of research (Syahrial et al., 2019) that the use of the Dick & Carey model is appropriate to use to develop mathematics modules because it has detailed details so that products that are suitable for use in learning can be obtained. The findings of this study are by research findings (Nalarita & Listiawan, 2018; Prastowo, 2013) that e-Modules are a form of interactive teaching materials, namely: a combination of two or more media (audio, text, graphics, images, animations, and videos) that the user manipulates or treats to control command and/or the natural behavior of the presentation. Therefore, the e-Module I CAME model, which was developed using an electronic format, can be used by utilizing links as navigation that makes students more interactive and, equipped with video tutorials, animations, and audio presentations to enrich the learning experience (Depdiknas, 2011; Layanan Informasi Publik Di Lingkungan Kementerian Pendidikan Dan Kebudayaan [JDIH BPK RI], 2017).

This is because the resulting e-Module design can be used properly by students. After all, it is equipped with navigation and usage guides and has a variety of learning resources. The e-Modul itself is an electronic-based module that has an interactive nature because students can communicate with the teacher via chat or directly via telephone, ease of navigation, display attractive images, audio, video, and moving animations that provide variety, as well as feedback via certain formative tests or quizzes (Sugihartini & Jayanta, 2017; Voithofer, 2005). From the prototype of the product, it is known that the e-Module has several advantages, including because the e-Module can be accessed without using a special application. This affects the ease of use of the application made.

The prototype of the e-Module I CAME model is also in line with the findings of Bob Hoffman and Donn Ritchie who designed the design of each online course/training module using a five-step model called the I CARE system (Hoffman & Ritchie, 1998; Ramadhana et al., 2020) in facilitating students access assignments as a stage to practice solving questions to better understand the material well. The I CAME model which was adapted from I CARE by replacing the extend and reflect learning stages with motivation and evaluation fosters the interest and motivation of students to learn in the next learning activity in the e-Module. This can be seen in the ability of students to complete all stages of CAME I through the use of e-Modules. Completeness of assignments through e-LKPD, evaluation through online forms, and additional motivation provide additional insight and motives for students to complete a learning series consisting of 4 learning activities with stage I CAME.

The use of e-Modules as the main learning resource for online learners requires a certain pattern or learning model which is at the same time a stage for learners to learn independently. The e-Modul model as the basis for learning design refers to the I CAME (Introduction, Connection, Application, Motivation, and Evaluation) model which is an adaptation of the I CARE (Introduction, Connect, Apply, Reflect, Extend) model (Hoffman & Ritchie, 1998; Ramadhana et al., 2020). The organization of the material and learning stages in the e-Module in the design structure of the e-Module uses the I CAME learning model, for mathematics subjects, the subject of Algebraic Forms shows that by adapting and changing from Reflect motivational stages in each learning activity in the e-Modul, participants Students have high enthusiasm and curiosity to continue learning in the next learning activity. Likewise, for adaptation with modifications from Extend to Evaluation, it can help students in addition to completing tests, they can also find out test results directly which also encourages students to be able to repeat the material in previous learning activities and be serious about participating in the next learning activity.

An important component of the results of the development of the e-Module I CAME model is the presentation of the learning stages that must be completed by students. In the development of this e-Modul, the stages used in the e-Modul are I CAME (Introduction, Connection, Application, Motivation, and Evaluation), so that the presentation of this model is designed in the form of navigation on one page making it easier for students to complete the learning steps. According to these stages. The use of the I CAME model in e-Modules in the perspective of constructivism learning theory will cause students to carry out a continuous adjustment process to build cognitive structures based on curriculum demands (Stoffova, 2016). The results of the development of the e-Module I CAME model by selecting materials for learning that will be developed in learning (Kurt, 2015) each stage are presented sequentially as follows:

1. Introduction contains indicators, learning objectives, benefits of learning materials, outlines of learning materials, and stages of learning. The design of the introduction stage consists of instructions so that students can listen to and understand the introduction of learning materials so that students can understand what they have to achieve (Maknun, 2015) through video shows during the lesson independently.
2. Connection (Connecting) to facilitate students to build connections between the knowledge they already have with new knowledge that will be studied later, as well as connecting the subject matter with contextual/real problems and examples. The connection stage design consists of instructions for studying family planning materials which are presented in the form of videos and a question and answer icon to ask questions if there are contents that are not understood. The activities of students at this stage are to build connections between



the knowledge they already have with new knowledge from their learning outcomes (Wiley & Agency for Instructional Technology, 2002) independently through the presentation of learning videos.

3. Application (Actions/Activities) contains e-LKPD as a guide for student activities to practice and apply knowledge independently according to the learning objectives to be achieved. The activities/practices given relate to real-world problems. The application design consists of assignments in the form of e-LKPD and additional learning resources in the form of videos and e-books to help students complete assignments on e-LKPD and to guide students to practice and apply the new knowledge and skills acquired (Bastable, 2003) after completing the connection stage.
4. Motivation contains a positive message to increase the motivation and enthusiasm of students in completing the stages of learning activities. The provision of motivation in addition to this stage; has also been integrated with the entire series of learning. At the motivation stage, the e-Module is designed in the form of text and video as well as a feedback icon to guide students independently in obtaining additional learning experience guidance, and students can get encouragement and inspiration in increasing their learning activities (Anderman et al., 2011; Kim & Pekrun, 2014) and help students to stay focused, more enthusiastic, not bored when taking online lessons independently in using e-Modules.
5. The evaluation contains test assessment instruments and self-assessments using digital applications. The design evaluation stage contains instructions for taking quizzes and self-evaluations as well as information in the form of voice for the introduction of the next material, intended as self-evaluation material to determine the extent of the abilities and attitudes of students after participating in each learning activity (Oliver, 2000).

All these stages are presented with the help of navigation in the form of icons. The navigation model in the e-Modul makes it easier for students to access and complete learning activities according to the model set by the teacher. This navigation model is by the results of research on the development of applications and e-Module devices (Lim et al., 2006) that e-Modules are important to consider the architecture, functionality, user interface, and application implementation to meet the requirements of interactivity, ease of learner control and the type of learner in use. E-Module. The study's main findings from the questionnaire survey and interviews with students indicate the importance of content that is meaningfully divided by learning object, learner type, level of interactivity, and learner control.

This development shows that one of the main elements of e-Modules that needs attention is product specifications that can support and achieve learning objectives. From the results of the development, it is known that the initial product design was made based on the technical specifications of the product such as the content of the product form, product layout, product navigation, and application as a technology-based product into consideration. The designed e-Modul product contains materials and guidelines and instructions for using e-Modules this step is by the view (Ahmed et al., 2017) to write specifications on parts of the software system to provide specifications that are quite precise and complete so that other parts of the software can be written to interact with the specified parts but the e-Modul still requires no information in the form of instructions from each e-module element. This is different from the view (Ahmed et al., 2017) that the effectiveness of an application design that is connected does not require additional information in its utilization.

The results of the development of the e-Module I CAME model can facilitate students in carrying out independent learning which is known from the implementation of the use of e-Modules as teaching materials, the implementation of the CAME I model as an online learning stage that can be completed by students, the activeness of students using e-learning. The modules are by the stages, the independence of students in using e-modules, and the percentage of students who reach the minimum completeness criteria of 75. The development of electronic modules is an alternative that can be used by teachers in preparing teaching resources and materials for students in learning, especially when asynchronous online learning. This is because online learning requires students to be able to learn independently without any direct interaction between teachers and students. The independent learning process in cognitive learning theory is a mental process and structure that occurs as a result of learning both online and offline. Online learning with or without the help of the right facilities with inappropriate models and approaches will cause students to experience obstacles in their learning. This is because students do not directly interact with teachers during asynchronous online learning.

The use of e-Modules in facilitating students' independent learning includes learning steps, material in the form of interactive videos, sounds, and other teaching materials, which are also elements of the findings of this study. The results of this development are by research (Sugihartini et al., 2017; Voithofer, 2005a) that the e-Modul itself is an electronic-based module that has interactive properties because of the ease of navigation, attractive display of images, audio, video, and moving animations that provide variations. , as well as feedback through certain formative tests or quizzes.

The findings have fulfilled the important elements of e-Module being presented as teaching materials in online learning. Through the e-Module, students can participate in learning activities well independently. This means that the developed e-Module product does not allow students to learn without guidance from the teacher. This finding is in line with the general agreement about independent learning that students do not fully learn on their own, but are still facilitated by the teacher so that students can process and combine information without teacher intervention (Winne & Jamieson-Noel, 2002). The

interactive presentation of e-Module products can help students to take part in learning activities independently. E-Modules are presented interactively so that students can interact through interactive features such as providing feedback, assignments, e-LKPD, and questions and answers including the Motivation feature in the form of text, sound, or video, at the end of each stage of learning activities to increase student motivation. Learn independently using e-Module.

This means that students can work independently using the e-Module I CAME model. The findings of this study are in line with the view (Armiati & Yanrizawati, 2020) which shows that the use of e-modules can facilitate students' independent learning where students do not learn alone but are still guided and guided through e-modules to process, and integrate information obtained from e-Module. Independent learning with e-Modules adheres to the principle of students as learning centres which have developed for a long time as one of the new paradigms of learning that is no longer teacher-centered (Tsai, 2009).

The e-Module I CAME model can facilitate students to find their knowledge and skills and competencies when using e-Modules in the view of cybernetic theory where students obtain and process information coherently according to the organization of learning, as well as provide students with learning experiences in stages. Which has been designed by the teacher through the e-Modul which is the philosophical basis of the humanistic theory that puts forward experience as a learning process. The development of this e-Module is also in line with constructivism learning theory that people generate knowledge and form meaning based on their experiences, based on personal experience, and active involvement of students in the construction of meaning and knowledge which in multiple intelligence theory can solve their problems from various sources including in mathematics lessons as part of science knowledge (Ertmer & Newby, 2013). The e-Module I CAME model facilitates students in providing stimulus in the form of interactive video presentations and responses through feedback, chat, and self-evaluation features as a form of independent learning experience given behaviourism theory and cybernetic learning theory (Haythornthwaite & Andrews, 2011).

The effectiveness of an e-module is largely determined by the ability of students to understand the procedures for using e-modules. This means that to make e-Modules effective as teaching materials for students, it is necessary to consider the clarity of information and guidelines in the use of e-Modules. The findings of this study are by the results of research (Pramana et al., 2020) that an effective e-Module for students' independent learning is an e-Module that meets the readability and clarity of information. The legibility and clarity of this information are important so that students are assisted in carrying out independent learning. Through e-Module learning, independence can be increased with the support of teaching materials that are easy to use, and have language that is easy to understand, in addition to being equipped with features to help use the e-Module. The effectiveness of using the e-Module I CAME model shows that the ability of students to master the subject matter as measured by the results of the pre-test and post-test is in the high category. This condition is created because students can learn certain subjects by reading modules or e-modules, or viewing and accessing e-learning programs without assistance or with limited assistance from others (Musriadi et al., 2016).

This finding is in line with the view that learning mathematics (Syahrial et al., 2019) through the web (online) will have advantages that can provide flexibility, interactivity, speed, and visualization in the learning process. Based on the results of the analysis, it is known that the e-Module product model I CAME can facilitate students in carrying out independent learning. The self-development of students is known from the implementation of the use of e-Modules as teaching materials, the implementation of the CAME I model learning as an online learning stage that can be completed by students, and the activeness and independence of students using e-Modules according to the stages, as well as the test results of students who achieve the minimum completeness criteria of 75 with an effective category based on the results of the analysis of the N-Gain value.

The advantage of the e-Modul model I CAME is that the material is presented in an organized manner so that the independent learning process of students is more focused and well-structured because the quality of learning can be improved and pursued with learning strategies through the components of learning strategies and the development of learning strategies (Kurt, 2015). In addition, ease of use is the main consideration for product development so that students can easily access assignments through e-LKPD, helping students coherently complete assignments and find out the scores of students' work results. The results of the e-Modul trial also show that there are aspects that cannot be achieved perfectly with the use of the e-Modul model I CAME, namely:

1. The use of e-modules is relatively low in building social systems because students learn independently using e-modules learning, so interactions between students and other students and students and teachers are mediated by applications that are not real-time. Learning with e-modules adheres to the principle of students as learning centers that are no longer teacher-centered so that the teacher's role is limited. Therefore, in the development of e-Modules, it is necessary to consider the features that can facilitate students to be able to build a social system in independent learning.
2. The e-Modul uses a non-portable supporting application with the book creator application so that when it is accessed there is no popup menu available. Therefore, when students access the e-LKPD and feedback through a live worksheet, self-evaluation, and final tests using Google forms, and quizzes, students must switch windows (switch windows) from the e-Module application to the supporting application.

3. The timing of the students' test completion has not been determined precisely. At the time of the test, the students doing the post-test ran out of time in working on the questions, because in addition to the multiple-choice form, they also worked on the description form and some questions using a stimulus so that they needed time to read carefully.
4. The limitations of supporting devices owned by students such as electronic devices and internet network connections, including the limited ability and expertise of teachers in making the required image designs are limited so that some images; and icons do not have the right resolution.

## 5. CONCLUSION

Research on the development of learning modules in the form of e-Module Model I CAME for mathematics subjects at the SMP/MTs level in facilitating students' independent learning uses the Dick & Carey development model. The e-Module product model I CAME developed is feasible and effective in facilitating students to learn independently in algebraic form material. The e-Module I CAME model fulfils the aspects of the appropriateness of the content, presentation, the accuracy of language, graphics, suitability of the structure of the presentation with the I CAME model, and independent learning of students. The e-Module I CAME model is effective in (1) facilitating students to learn independently, (2) increasing students' learning activities in a synchronous learning, (3) the e-Module is implemented very well according to the structure of the e-Module presentation, (4) the implementation of learning is very good by the syntax of the CAME I model, (5) student responses are very positive towards the use of e-modules as teaching resources and materials, and (6) student learning outcomes can reach scores above KKM 75 and classical completeness above 85% which has been set.

## 6. BIBLIOGRAPHY

- [1] Ahmed, K., Chung, E.-S., Song, J.-Y., & Shahid, S. (2017). Effective Design and Planning Specification of Low Impact Development Practices Using Water Management Analysis Module (WMAM): Case of Malaysia. *Water*, 9(3), 173. <https://doi.org/10.3390/w9030173>
- [2] Anderman, L. H., Andrzejewski, C. E., & Allen, J. (2011). How Do Teachers Support Students' Motivation and Learning in Their Classrooms? *Teachers College Record*, 113(5), 969–1003.
- [3] Armiami, A., & Yanrizawati, Y. (2020). Analisis Pemanfaatan Media Daring dalam Pembelajaran Matematika Ditinjau dari Kemandirian Belajar Siswa di Kelas XI SMAN 1 Koto Balingka. *JURNAL EKSAKTA PENDIDIKAN (JEP)*, 4(2), 197–202. <https://doi.org/10.24036/jep/vol4-iss2/507>
- [4] Bastable, S. B. (2003). *Principles of Teaching and Learning for Nursing Practice* (2nd Ed.). JONES AND BARTLETT PUBLISHERS. <http://eprints.qums.ac.ir/1682/1/Principles%20of%20Teaching%20and%20Learning%20for%20Nursing%20Practice.PDF>
- [5] Depdiknas. (2011). *Panduan Pelaksanaan Pendidikan Karakter*. Dirjend Dikdasmen.
- [6] Ertmer, P. A., & Newby, T. (2013). Behaviorism, Cognitivism, Constructivism. *Performance Improvement Quarterly*, 26(2), 43–71.
- [7] Fatihah, M. al. (2016). Hubungan Antara Kemandirian Belajar dengan Prestasi Belajar PAI Siswa Kelas III SDN Panularan Surakarta. *At-Tarbawi: Jurnal Kajian Kependidikan Islam*, 1(2), 197–108. <https://doi.org/10.22515/attarbawi.v1i2.200>
- [8] Hadi, S., & Farida, F. S. (2012). PENGARUH MINAT, KEMANDIRIAN, DAN SUMBER BELAJAR TERHADAP PRESTASI BELAJAR SISWA PADA MATA PELAJARAN IPS KELAS VII SMP NEGERI 5 UNGARAN. *Dinamika Pendidikan*, 7(1), Article 1. <https://doi.org/10.15294/dp.v7i1.4913>
- [9] Haythornthwaite, C., & Andrews, R. (2011). *E-Learning Theory and Practice*. Sage Publications. <https://doi.org/10.4135/9781446288566>
- [10] Hoffman, B., & Ritchie, D. (1998). *Teaching and Learning Online: Tools, Templates, and Training*. California State University.
- [11] Kim, C., & Pekrun, R. (2014). Emotions and motivation in learning and performance. In *Handbook of Research on Educational Communications and Technology* (pp. 65–75). Springer New York. [https://doi.org/10.1007/978-1-4614-3185-5\\_6](https://doi.org/10.1007/978-1-4614-3185-5_6)
- [12] Kristina, M., Sari, R. N., & Nagara, E. S. (2020). MODEL PELAKSANAAN PEMBELAJARAN DARING PADA MASA PANDEMI COVID 19 DI PROVINSI LAMPUNG. *Idaarah: Jurnal Manajemen Pendidikan*, 4(2). <https://journal.uin-alauddin.ac.id/index.php/idaarah/article/view/16945>
- [13] Kuntarto, E. (2017). Keefektifan Model Pembelajaran Daring dalam Perkuliahan Bahasa Indonesia di Perguruan Tinggi (The Effectiveness of Online Learning Models in Indonesian Language Lectures in Higher Education). *Indonesian Language Education and Literature*, 3(1), 99–110. <https://doi.org/10.24235/ileal.v3i1.1820>



- [14] Kurt, S. (2015, November 23). Dick and Carey Instructional Model. *Educational Technology*. <https://educationaltechnology.net/dick-and-carey-instructional-model/>
- [15] Latif, N. S. (2021). Upaya Meningkatkan Aktivitas Belajar Matematika Peserta Didik Kelas VII pada PJJ Melalui Leksimo. *Jurnal Didaktika Pendidikan Dasar*, 5(3), 843–866. <https://doi.org/10.26811/didaktika.v5i3.339>
- [16] Latif, S., As, U. S., Supriatna, M., & Ilfiandra, I. (2022). Developing A Cultural Intelligence Instrument for Guidance and Counseling Teachers. *Journal of Educational Science and Technology (EST)*, 8(1), 9–16. <https://doi.org/10.26858/est.v8i1.19653>
- [17] Lim, C. P., Lee, S. L., & Richards, C. (2006). Developing Interactive Learning Objects for a Computing Mathematics Module. *International Journal on E-Learning*, 5(2), 221–244.
- [18] Livingston, K. (2012). Independent Learning. In N. M. Seel (Ed.), *Encyclopedia of the Sciences of Learning* (pp. 1526–1529). Springer US. [https://doi.org/10.1007/978-1-4419-1428-6\\_895](https://doi.org/10.1007/978-1-4419-1428-6_895)
- [19] Maknun, J. (2015). The Implementation of Generative Learning Model on Physics Lesson to Increase Mastery Concepts and Generic Science Skills of Vocational Students. *American Journal of Educational Research*, 3(6), 742–748. <https://doi.org/10.12691/education-3-6-12>
- [20] Musriadi, Rubiah, & Jailani. (2016). *THE DEVELOPMENT OF FUNGI CONCEPT MODUL USING BASED PROBLEM LEARNING AS A GUIDE FOR TEACHERS AND STUDENTS*. Semantic Scholar.
- [21] Nalarita, Y., & Listiawan, T. (2018). Pengembangan E-Modul Kontekstual Interaktif Berbasis Web pada Mata Pelajaran Kimia Senyawa Hidrokarbon. *MULTITEK INDONESIA*, 12(2), 85–94.
- [22] Nengrum, T. A., Pettasolong, N., & Nuriman, M. (2021). Kelebihan dan Kekurangan Pembelajaran Luring dan Daring dalam Pencapaian Kompetensi Dasar Kurikulum Bahasa Arab di Madrasah Ibtidaiyah 2 Kabupaten Gorontalo. *JURNAL PENDIDIKAN*, 30(1), 1–12. <https://doi.org/10.32585/jp.v30i1.1190>
- [23] Oliver, M. (2000). Evaluating online teaching and learning. *Information Services and Use*, 20(2,3), 83–94.
- [24] Standar Proses Pendidikan Dasar dan Menengah, Pub. L. No. 22 (2016). <http://repositori.kemdikbud.go.id/4790/>
- [25] Layanan Informasi Publik di Lingkungan Kementerian Pendidikan dan Kebudayaan [JDIH BPK RI], Pub. L. No. 16 (2017). <https://peraturan.bpk.go.id/Home/Details/163828/permendikbud-no-16-tahun-2017>
- [26] Pramana, M. W. A., Jampel, I. N., & Pudjawan, K. (2020). Meningkatkan Hasil Belajar Biologi Melalui E-Modul Berbasis Problem Based Learning. *Jurnal Edutech Undiksha*, 8(2), 17–32. <https://doi.org/10.23887/jeu.v8i2.28921>
- [27] Prastowo, A. (2013). *Panduan kreatif membuat bahan ajar inovatif: Menciptakan metode pembelajaran yang menarik dan menyenangkan*. Diva Press.
- [28] Ramadhana, A., Malik, A., & Denya, R. (2020). Studi Literatur Pada Model Pembelajaran ICARE Terhadap Keterampilan Berpikir Kreatif Peserta Didik Pada Materi Momentum&Impuls. *COMPTON: Jurnal Ilmiah Pendidikan Fisika*, 7(1), 27–34. <https://doi.org/10.30738/cjipf.v7i1.6390>
- [29] Stoffova, V. (2016). *The Importance of Didactic Computer Games in the Acquisition of New Knowledge*. 676–688. <https://doi.org/10.15405/epsbs.2016.11.70>
- [30] Sugihartini, N., & Jayanta, N. L. (2017). PENGEMBANGAN E-MODUL MATA KULIAH STRATEGI PEMBELAJARAN. *Jurnal Pendidikan Teknologi Dan Kejuruan*, 14(2), Article 2. <https://doi.org/10.23887/jptk-undiksha.v14i2.11830>
- [31] Syahrial, Asrial, Kurniawan, D. A., & Piyana, S. O. (2019). E-Modul Etnokonstruktivisme: Implementasi Pada Kelas V Sekolah Dasar Ditinjau Dari Persepsi, Minat Dan Motivasi. *JTP - Jurnal Teknologi Pendidikan*, 21(2), 165–177. <https://doi.org/10.21009/jtp.v21i2.11030>
- [32] Tsai, M.-J. (2009). The Model of Strategic e-Learning: Understanding and Evaluating Student e-Learning from Metacognitive Perspectives. *Journal of Educational Technology & Society*, 12(1), 34–48.
- [33] Voithofer, R. (2005). *Designing New Media Education Research: The Materiality of Data, Representation, and Dissemination*. SAGE Publishing Company. [https://www.researchgate.net/publication/242479139\\_Designing\\_New\\_Media\\_Education\\_Research\\_The\\_Materiality\\_of\\_Data\\_Representation\\_and\\_Dissemination](https://www.researchgate.net/publication/242479139_Designing_New_Media_Education_Research_The_Materiality_of_Data_Representation_and_Dissemination)
- [34] Wiley, D. A., & Agency for Instructional Technology (Eds.). (2002). *The instructional use of learning objects* (1st ed). Agency for Instructional Technology : Association for Educational Communications & Technology.
- [35] Winne, P. H., & Jamieson-Noel, D. (2002). Exploring students' calibration of self reports about study tactics and achievement. *Contemporary Educational Psychology*, 27(4), 551–572. [https://doi.org/10.1016/S0361-476X\(02\)00006-1](https://doi.org/10.1016/S0361-476X(02)00006-1)