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Senior High School Mathematics E-Module Based on STEM Orienting to Higher Order Thinking Skills Questions

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ABSTRAK

Saat ini sekolah kesulitan menyediakan bahan ajar untuk menunjang buku teks. Oleh karena itu, perlu dikembangkan bahan ajar dalam bentuk e-modul. Penelitian ini bertujuan untuk mengembangkan e-modul matematika SMA berkualitas tinggi berbasis STEM yang berorientasi pada soal HOTS. Penelitian ini menggunakan pengembangan model Plomp. Fase model yang terlibat; tahap penyelidikan awal, tahap perancangan, tahap realisasi/konstruksi, tahap pengujian, tahap evaluasi, revisi, dan pelaksanaan. Validitas e-modul dinilai oleh tiga ahli materi dan tiga ahli media dengan menggunakan lembar evaluasi dan pengujian dengan tabulasi silang Gregory. Data diperoleh melalui uji lapangan terbatas, uji lapangan luas 1 dan uji lapangan luas 2 untuk meningkatkan hasil produk e-modul melalui saran dan masukan pada kolam yang telah disiapkan. Hasil evaluasi menunjukkan dapat disimpulkan bahwa e-modul matematika SMA berbasis STEM berorientasi HOTS yang dikembangkan memenuhi aspek validitas, praktikalitas, dan efektivitas. Itu bisa digunakan dalam proses pembelajaran. Implikasi dari E-modul matematika SMA berbasis HOTS berorientasi STEM ini sangat membantu siswa untuk belajar dimana saja dan kapan saja secara mandiri.

ABSTRACT

At present schools have find difficulty providing teaching materials to support textbooks. Therefore, it is necessary to develop teaching materials in the form of e-modules. The research aimed to develop senior high school mathematics e-module high-quality based on STEM orienting to HOTS questions.. The research used the development of Plomp model. The phase of the model involved; the beginning investigation phase, design phase, realization/construction phase, test phase, evaluation, revision, and implementation phases. The validity of e-module was valued by three material experts an three media experts by using evaluation sheets and examining with Gregory cross tabulation. Data obtained through limited field tests, wide field tests 1 and wide field tests 2 to improve the results of the e-module product through suggestions and input on the prepared pond. The result of evaluation showed can be concluded that senior high school mathematics e-module based on STEM orienting to HOTS which was developed filled the aspects of validity, practicality, and effectiveness. It could be used in the learning process. The implications of the HOTS-based on STEM-orienting to high school mathematics E-module is very helpful for students to learn at anywhere and anytime independently.

1. INTRODUCTION

The essence of education is consciously planned efforts performed, which are used to realize the study environment and learning process. Students can actively develop self-potencies to have spirit, self-control, personality, intelligence, great morals, and other skills needed for themselves communities, nation, and country (Astuti et al., 2019; Mufarola & Murbowo, 2019). In the 4.0 era, the development prefers focusing on the quality of students' character. Studying is an activity or process to achieve knowledge, improve skill, improve behavior, perform good attitude, and strengthen personality. Studying is not only to remember, but it is more than that deed, namely, experience (Ahmadi et al., 2021; Maheshwari, 2021). The study result is behavioral changes instead of assignment of practice result, study activities are performed by persons who were studying, and others can observe the process.

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Learning is the whole planned activity performed by teachers to help students learn the skill and or new value in the systematical process through the design phase, performance, and evaluation learning process (Agustihana & Suparno, 2019; Kim et al., 2021). Learning and studying principles are: 1) attention and motivation, 2) the activity of learning, 3) direct involvement, 4) learning repetition, 5) stimulating and challenging the learned materials, 6) feedback giving and learning strengthening (Firdaus & Pahlevi, 2022; Staddon, 2022). The purposes of education in learning involve three aspects, namely: cognition (knowledge), practical (emotion and attitude), and psychometric (physical activity) (Ardianti et al., 2020; Elgadal & Mariod, 2021).

The low study result was suspected that the students had difficulty understanding mathematics concepts. The phenomenon was caused by a lack of student activities in the learning process. In addition, the teachers did not have exciting materials transferred to the students. The teachers transfer the study as if they gave the talk. Therefore, the students felt bored studying mathematics. Handbook was viewed to have a significant factor in leading the success of the 2013 curriculum performance (Fuad et al., 2020; Poerwanti & Tribudhiarto, 2020). As the curriculum was applied, the government published 2013 curriculum handbooks used for the students and teachers. One of which was mathematics books. The previous study done by previous study concluded that the students' learning using the handbook did not show the optimal result (Christenson et al., 2012; Susanto et al., 2021). In addition, the result of the interview and observation performed in SMA N 7 Denpasar showed that there was the same result; namely, the students still had problems understanding the handbook. There were not many modules developed to support the study process performed in the class. The students were viewed as complicated functional in the odd semester in X grade of Senior High School. The students were still confused with differing functions, relation and algebra operational in the function, composition function, and inversion function, especially in story questions in daily life (Alam, 2020; Bollen et al., 2016). Based on that explanation above, the researcher feels interested in developing an e-module that could ease the students to understand the materials by 2013 curriculum expectationIndexing and abstracting services depend on the accuracy of the title, extracting from it keywords useful in cross-referencing and computer searching. An improperly titled paper may never reach the audience for which it was intended, so be specific.

In the 2013 curriculum, the learning process uses a scientific approach: observing, questioning, collecting information, associating, and promoting, often called the STEM approach. STEM approach in the learning process can train the students either in cognition skill or effectiveness (Sobri et al., 2019; Yuanita & Kurnia, 2019). The students are taught theories, but they are also trained how to practice, so they directly experience the learning process. The e-module learning development was viewed to be very effective in managing the problems experienced by the students in the learning process (Mulyasari & Sholikhah, 2021; Ningtyas & Jati, 2018). The module was designed based on the exciting concept and STEM approach involving mini lab, project activities, IT exploration, and completed with illustrations such as pictures which can ease the students to comprehend the materials.

To increase the students' interest by giving practice how to answer the challenging questions, which are expected to show the ability of high-grade thought (HOTS) ability by developing communication in the class by discussing and performing mathematics activities. The ability of high-grade thought is a process of thought occurring in high-grade cognition. The basic principle in learning the ability to apply high-grade thought is the assignment requiring knowledge and skill in the new situation (Krüger & Bodemer, 2022; Widana, 2020). Because of this, more optimal students' learning results must be improved because the learning period is performed by combining evaluation based on STEM and HOTS questions (Anwar et al., 2020; Khasanah et al., 2021).

In managing the low students' results in Senior High School, a mathematics e-module based on STEM orienting HOTS questions must be developed. The phenomenon follows the research performed by previous study that showed that the STEM application (Science, Technology, Engineering, and Mathematics) was one of the learning approaches viewed to be suitable to prepare the students' skill and consciousness in the 4.0 era in which it goes very fast (Meishanti & Maknun, 2021). STEM purposes of increasing critical thought ability, which prepare the students to become an innovator in the world. Therefore, they can answer the challenge to manage the 4.0 industry revolution such as big data (Khaeruddin & Bancong, 2022; Widayanti et al., 2019). Previous study also did research entitled E-Module Development Based on PBL Integrated STEM Assisted by Social Media To Improve Critical Thinking Skill: A Preliminary Study E-Module Development Based on PBL Integrated STEM Assisted by Social Media to Improve Critical Thinking Skill: A Preliminary Study (Milaturrahmah et al., 2017). The result of the research showed that the data of need analysis result done by the researcher could be identified that the development of e-module based on STEM integrated to PBL was very much needed. The finding in the field showed that most of the used study sources were texts from school. In addition, most of the teachers stated that they did not use the module yet, which

stimulated the students to think critically. Because of that, the developed e-module focused on stimulating the students' critical thinking ability.

Having managed the disadvantaged product output was e-module development. The disadvantage of the previous research was that e-module development was not found yet, so the resulting product could not access the study based on the time required by the students (Ananda et al., 2022). The E-module which should be developed was by observation research and interview with Senior High School mathematics teachers. The material study viewed as the complex study by the students was functional material in X grade in the odd semester. The students found difficulty comprehending functional concepts associated with story questions in daily life in functional material (Genc & Erbas, 2019; Irawati & Setyadi, 2021).

The study based on STEM in Senior High School is related to science, technology, and mathematics. With the study based on STEM, the learning process will be more significant, so the result of students' mathematics study can be improved (Ardianti et al., 2020; Yusuf & Widyaningsih, 2018). The study based on STEM can develop the students' skills to integrate science and technology discuss the daily situation by involving science and technology. In addition, it involves the activity and criticism in science and technology discourse. According to previous study the aim of the study based on STEM is that the students know science and technology when they are in communities (Gustiani et al., 2017). They can develop the owned competencies used as preparation for daily life problems related to science and knowledge.

The development of the e-module is performed systematically based on the related phases to result in helpful study material. Mathematics e-module development based on STEM, the analysis, the design, the development, the evaluation, and the revision must be developed (Khaeruddin & Bancong, 2022; Meishanti & Maknun, 2021; Sukendra et al., 2022). It is related to the ability to answer the questions in high critical thinking. The HOTS questions will be realized in the e-module. E-module is the development from a printed module into a digital module, most adopted from printed modules (Suryawirawati et al., 2018; Tobing et al., 2021). The advantages of e-module compared with the printed module are interactive, which is easy to navigate, enables to show a picture, audio, video, animation, and question practice, which automatically enables feedback. Meanwhile, the advantages of e-module are: 1) A media which makes the students study independently so e-module is more efficient and more effective. 2) It can appear on computer or smartphone screens. 3) It is more practical and more flexible to bring anywhere because it does not need a large room which will be used to save it. 4) The text can be constructed in linear or non-linear. It is also completed with audio and video in one presentation package (Saraswati & Agustika, 2020; Wijayanto & Zuhri, 2014). Based on the explanation above, the purposes of the research were to find out the characteristics of Senior High School mathematics e-module based on STEM orienting to HOTS questions. 2) To determine the quality of Senior High School mathematics e-module based on STEM orienting to HOTS questions. 3) To find out the study characteristics of Senior High School mathematics e-module based on STEM orienting to HOTS questions.

2. METHOD

This research developed a mathematics e-module based on STEM orienting to HOTS questions for the students and the teachers teaching in X grade of Senior High School in functional material. The research subject was the students studying in the X grade of Senior High school of SMA N 7 Denpasar in 2020/2021 and the teachers teaching mathematics in SMA N 7 Denpasar. The research was suited with the research phases, and the data collection used purposive sampling. It was done because the research focused on finding out the disadvantages of the application of e-module. Because of these, the research presented the suggestion to get e-module improvement. The research was performed at SMA N 7 Denpasar. This research is the development research with the Plomp's model. The Plomp model is involving the early investigating phase (Preliminary investigation), design phase, realization/construction phase, test, evaluation phase, revision phase, and implementation phase (Hartini et al., 2020; Misrom et al., 2020). It is described as show in Figure 1.

To result products and to examine the effectiveness of this research hires descriptive and evaluative methods. Descriptive method is used in initial research to collect data about existing conditions involving 1) existing product conditions as comparison material or basic materials (embryos) for products which will be developed, 2) conditions of the part of users, such as: schools, teachers, principals, students, and other users, 3) the conditions of the supporting and inhibiting factors for the development and use of the product which will be produced involve the human element, infrastructure, costs, management, and the environment. While the evaluative method is used to evaluate the trial process of developing a product. The product is developed through a series of trials, and each trial activity is evaluated, both result evaluation and process evaluation. Based on the findings of the trial results, improvements were done (Ananda et al., 2022; Artisa Indariani, Surya Amami Pramuditya, 2018).

Instruments in the Preliminary Study are in the form of questionnaires to reveal learning that is currently happening including: the use of STEM-based e-modules in learning, the used learning models, knowledge of learning outcomes, the linkage of the used teaching materials based on STEM oriented to HOTS questions (Maziyah & Hidayati, 2022; Mulyasari & Sholikhah, 2021). Expert and practitioner validation test instruments consist of content suitability validation instruments and construction validation instruments. The practical test instruments consist of observation sheets on the implementation of learning, teachers' ability observation sheets in managing learning, and student perception instruments. In the instrument, there is a suggestion column so that students can write suggestions for product improvement (Irawati & Setyadi, 2021; Sari & Sutihat, 2022; Susiaty & Oktaviana, 2021). Instruments for product effectiveness test consist of the used test instruments involving pretest and posttest. Unstructured Interview Instrument.

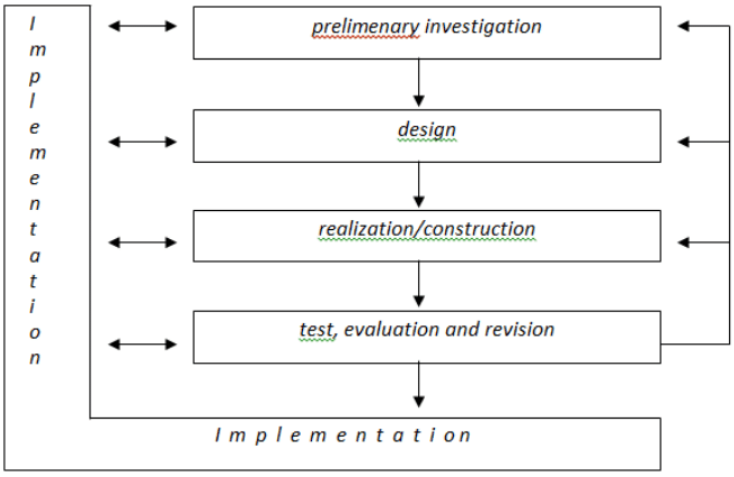

Figure 1. Plomp Development Model

3. RESULT AND DISCUSSION

Result

Analysis Phase

The need analysis for the students was performed by using questioners containing the e-module required by the students. The result shows that 71.25% of the students liked the e-module related to their chosen HOTS questions. 85% of the students chose to study by e-module rather than a handout. Besides that, the result of the field research showed that the Senior High School students thought of mathematics as difficult study material. Therefore, the student's interest in mathematics was low. The phenomenon could be seen from the questioners distributed to the students. It showed that the students prefer studying studies that do not involve counting to studying mathematics. The students' examination results showed that the mathematics average was lower than other study result averages. To manage that phenomenon, e-module related to HOTS questions needs improvement.

Then curriculum analysis was performed by focusing on the curriculum character applied in schools. The purposes of the curriculum at SMA N 7 Denpasar involved four competence aspects, namely; (1) spiritual attitude, (2) social attitude, (3) knowledge, and (4) skill. Those aspects were achieved through an extracurricular, co-curricular, and extracurricular learning process. The main competence (Kl 3 knowledge) in mathematics learning was: to comprehend, to apply, to analyze, and to evaluate factual knowledge, conceptual, procedural, metacognition based on mathematics field and analysis in the level of technique, specification, detail, and complexity, relation with knowledge, technology, art, culture, humanism in the context of self-potency development as part of family, school, work field, social community, regional, and international. The main competency (K1 4 skills) in mathematics learning was to perform a specific task by using tools, information, and the work procedure that was commonly performed and to solve the problem based on mathematics analysis. Showing skill perceives, imitating, preparing, attuning, and making skillful motion realized nature motion concretely related to the study developed in schools. In addition, it can perform specific work under direct control Mathematics e-module based on STEM orienting to HOTS questions must be developed.

The Students' Character Analysis. The result of performed observation showed that only some students were active, dominated by students with high intelligence. Some students only accepted and

waited for the result to be discussed. The other students ignored did not respect themselves, others, and the environment during the learning process. They thought that the topic discussed was not useful for them. In addition, some students gave up easily when they found the problems given by the teachers.

Based on the data and facts occurring in the field, the conclusion was that Senior High School mathematics learning contained a collection of mathematics in general, lack of activity in learning, lack of focus of the material study required to support students' skill competence. In addition, mathematics learning was not yet based on STEM in the learning process. It was also in e-module development orienting to HOTS questions. The questions examined the high thought ability in which the students were required to analyze, evaluate, and create the solution to the existing problems. The questions did not end in the ability of thinking, comprehension, and application. However, it also required the students to analyze, evaluate, and create a model/conclusion and provide information. The average validation result of media experts was at 0.82, so the evaluation of e-module from media experts was in the score scale > 0.7 following Gilford guidance. Because of this, e-module development was categorized as valid from a media expert point of view.

Design Phase

The characteristics of the Senior High School mathematics e-module based on STEM orienting to the developed HOTS questions were: 1) Picture, question examples and the discussion material based on the students' needs. 2) The sound could be ended when getting disturbance. 3) To evaluate and check the ability that could be done in-network or out network. 4) To obligate the students to focus in-network or out network before the summative test. 5) The answer key of the formative test is in video form.

The characteristics the mathematics learning based on STEM orienting to HOTS questions were: 1) To guide the students to start the study from mathematics based on STEM for the students at the beginning of the study. 2) To guide the students to develop a vertical instrument (Chart, Model, Scheme) discussed in a group. 3) To guide the students to use the students' work results. 4) Discussion questions could cause interactivities in-network or out network. 5) There was a linkage between functional material and mathematics material or with the study material. All symbols that have been used in the equations should be defined in the following text. E-module cover page is show in Figure 2.

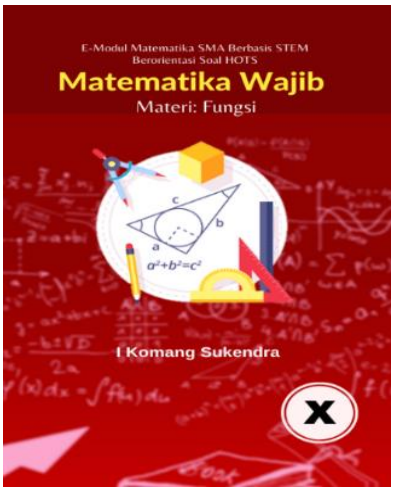

Figure 2. E-Module Cover Page

Base on Figure 2, prototype 1 evaluation used LORI (Learning Object Review Instrument). The evaluation instrument analysis from material experts based on LORI was as big as 4.40 on the scale of $4.20 \leq \dot{x} \leq 5.00$, so the developed e-module was very good in learning. The result of the evaluation instrument from media experts based on LORI was as big as 4.00 on the scale of $3.40 \leq \dot{x} \leq 4.20$, so the developed e-module was good in the learning.

Test, Evaluation, and Revision Phases

Limited Trial. The limited trial performed on September 14th, 2020, involved six X grade SMA N 7 Denpasar students with e-module components based on STEM orienting to HOTS questions. It was good in the learning with revision. The revision of the mathematics e-module was associated with the presentation of module components. Results of student and teacher perception questionnaires on field test 1 is show in Table 1.

Table 1. Results of Student and Teacher Perception Questionnaires on Field Test 1

Aspect	Average Student	Average Teacher
Appearance	0.87	0.89
Material Presentation	0.84	0.85
Benefit	0.86	0.873
Total Average	**0.857**	**0.873**

Base on Table 1, the average mathematics e-module evaluation result based on STEM orienting to HOTS questions and based on students' perception questioner was 0.857. The teachers' perception questionnaire was at 0.873. That score was converted based on the Guilford evaluation aspect. Therefore, the average of the teachers' scores was in the range $\dot{x} > 0.80$. The phenomenon showed that the applied e-module in the trial was categorized as good and practical in the learning process. The average of mathematics e-module based on STEM orienting to HOTS questions and observation was 0.830. That score was converted based on the Guilford evaluation aspect, so the observation average was in the range $\dot{x} > 0.80$. The phenomenon showed that the applied e-module in site trial one was classified as good and practical in the learning. Of 37 students involved in trial 1, only three did not fill the KKM value. The percentage of classical completeness was at 91.89% in the range $p > 80\%$ with very good classification. Based on the conversion table based on Guilford guidance, the e-module applied in site trial one was very effective in learning. It showed that the students' value was complete. Results of student and teacher perception questionnaires on field test 2 is show in Table 2.

Table 2. Results of Student and Teacher Perception Questionnaires on Field Test 2

Aspect	Average Student	Average Teacher
Appearance	0.9	0.933
Material Presentation	0.867	0.85
Benefit	0.9	0.9
Total Average	**0.889**	**0.894**

Base on Table 2 show the average mathematics e-module based on STEM orienting to HOTS questions and based on the students' questioner was 0.889, and the teachers' perception questioner was 0.894. That score was converted based on the Guilford value aspect. Therefore, the teachers' perception questionnaire was in the range $\dot{x} > 0.80$. The phenomenon indicated that the e-module applied in the limited trial was classified as very good and practical in the learning process. Of the 38 students involved in site trial 2, only two did not fill the KKM value. The percentage of classical completeness was as big as 94.73% in the range $p > 80$ with very good classification. Based on the conversion table following Guilford evaluation. Therefore, the students' value was complete.

Implementation Phase

The definition phase aimed to identify and define the needed requirements in the learning by analyzing the aim and the material scope. This activity was set first as a foundation used to step to the following development steps. In the steps, e-module was used in schools following the instruction of MGMP of Denpasar.

Discussion

The average validation result from a material expert was 0.80. It was in the range > 0.7, so the developed e-module was categorized as valid. The validity result from media experts was at 0.813. It was valid. It means that the research result shows that high school mathematics e-module based on STEM orienting to HOTS which was developed filled the aspects of validity, practicality, and effectiveness (Firdaus & Pahlevi, 2022; Sofiyan et al., 2020). Therefore, it could be used in the learning process at school. The learning result by the use of this E-module can improve the students' score in the learning process of Mathematics at school. The research of high school mathematics e-module based on STEM orienting to HOTS is a new research which has not been discussed by other researchers previously. The use of this E-module can help students to understand the mathematics concept easier, so the students' leaning result can be improved (Arianatasari & Haqim, 2018; Chuseri et al., 2021). This research resulted Senior High School Math Module orienting to HOTS questions on valid, practical, effective, and worth functional materials. While other studies have not discussed math e-module based on STEM orienting to HOTS matters. The relevant researches only discuss STEM or HOTS matters in math studies (Arnila et al., 2021; Wulandari & Hamdi, 2021).

E-Module Practicality Analysis

The measurement of mathematics e-module based on STEM orienting to the developed HOTS questions was valued from the performance in the site. The data relating to the developed e-module was obtained from the observation of learning, the teachers' and the students' perception questioners at every end of the trials. Based on the survey result, the average of the limited trial was 0.75. The Guilford value aspect converted the score, so the observation average was in the range $0.60 < \dot{x} \leq 0.80$. This phenomenon indicated that the e-module applied in the limited trial was classified as good and practical in the process of learning (Abdullah, Syahbanur Ramadhan, 2021; Siti et al., 2021). During the limited trial, the teachers did have problems applying mathematics e-learning based on STEM orienting to HOTS questions. Inside trial 1, the average of observation results got increased. The average of mathematics e-module based on STEM orienting to HOTS questions based on the observation was 0.83. The Guilford value aspect converted the score, so the observation average was in the range $\dot{x} > 0.80$. The e-module applied inside trial one was very good and practical in the learning process. While in the side trial 2, there was an increase for mathematics e-module based on STEM orienting to HOTS questions, it was at 0.89. The Guilford value aspect converted the score. Therefore, the observation average was in the range $\dot{x} > 0.80$. This phenomenon indicated that the e-module applied inside trial two was classified as very good and practical in the learning process (de Graaf et al., 2019; Yuanita & Kurnia, 2019).

The average mathematics e-module based on STEM orienting to HOTS questions based on the teachers' perception questioner was 0.733. The score was converted according to the Guilford value aspect, so the average of the teachers' perception was in the range $0.60 < \dot{x} \leq 0.80$. This phenomenon indicated that the e-module applied in the limited trial was classified as good and practical in the learning process (Chen & Kurniawan, 2022; Tytler & Prain, 2022). Inside trial 1, there was an increase in the average. Evaluation result for mathematics e-module based on STEM orienting to HOTS questions based on the teachers' perception was at 0.873. The average of the teachers' perception was in the range $\dot{x} > 0.80$. The phenomenon indicated that the e-module applied in the limited trial was very good and practical in the learning process. There was also an increase in the site trial 2 for the evaluation result average of mathematics e-module based on STEM orienting to HOTS questioners based on the teachers' perception was 0.894 (Frydenberg & Andone, 2011; Granić & Marangunić, 2019). The score was converted by Guilford evaluation aspect, so the teachers' perception was in the range $\dot{x} > 0.80$. The phenomenon indicated that the e-module applied in site trial two was classified as very good and practical in the learning process. Based on the teachers' perception, the applied e-module was practical in the learning process.

E-Module Effectiveness Analysis

Of six students involved in the limited trial, only one student did not fill KKM. The classical completeness percentage was at 83%, and it was in the range $p > 80$ with very good classification. Based on the conversion table, which was stipulated, the e-module applied in the limited trial was used effectively in the learning. Therefore, the students' value became complete. The observation value based on the STEM approach during the learning was at 83.33%, which was not filled yet where the ability to map the problems and the ability to perceive the problems. The cause of the two indicators was caused by the lack of the student's readiness to use e-module (Rahmawati et al., 2021; Sujanem et al., 2020).

Site trial 1 involved 37 students, only three students did not fill the KKM value. The classical completeness percentage was at 91.89%, with a very good classification range $p > 80$. Based on the conversion table stipulated, the e-module applied in site trial two was used effectively in the learning process, so the students' value becomes complete. Site trial 2 involved 38 students, and only two students did not fill the KKM value. The classical completeness percentage was 94.73%, with a very good classification range $p > 80$. Based on the conversational table, which was stipulated, the e-module applied in site trial two was used effectively in the learning process. Therefore, the students' value became complete (Taufan, 2022; Tytler & Prain, 2022).

The study result increased: 1) Before studying, the students were active in solving problems given in the e-module. 2). The student could study at any time and anywhere. 3) The students could study in the network or out network. This students' value made the student study at any time and anywhere. 4) The STEM problems given at the beginning of the learning made the students feel convenient to study the provided materials in the e-module. 5) The studied functional material was related to HOTS questions in daily life.

The Revised Product Analysis

Senior High School mathematics e-module product based on STEM orienting to HOTS questions which were revised were: 1) the teachers' guidance, 2) the students' e-module, the revised e-module competencies were : a) the specific learning goal, b) the content of learning material c) picture, d) the

students' worksheet, e) conclusion, f) self-assessment, and g) formative test. The result of the revision could clarify the guidance book and could ease the teachers to apply Senior High School mathematics e-module based on STEM orienting to HOTS questions. The competence assessment indicators were: 1) To determine the result of a total operation in the function. 2) To find out the result of the subtraction in the function. 3) To define the result of multiplication and division in the function. 4) To find out the result of composition operation in the function. 5) To find out the inversion in the function. 6) To analyze the functional linkage of inversion function in the composition functional. 7) To solve contextual problems related to composition function. 8) To search question examples related to composition and operation of inversion function and how to solve them.

4. CONCLUSION

This research successfully developed a Senior High School mathematics e-module based on STEM orienting to HOTS questions for the students and the teachers of qualified X grade Senior High School students. The characteristics of Senior High School mathematics e-module based on STEM orienting to the developed HOTS questions were: a) Picture, question examples, and discussion materials by the students' problems related to daily life. b) The sound could turn off when getting disturbed. c) Evaluating and checking the ability could be done in the network or out network. d) obligating the students to discuss in the network or out network before a formative test. e) The answer keys of the formative test were oral and video. The developed Senior High School mathematics e-module filled aspect of content validity and construction validity because it was by the applied curriculum and the applied theories as to the foundation in the development of the mathematics e-module. The use of this E-module can help students to understand the mathematics concept easier, so the students' leaning result can be improved.

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