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Profile of SETS Approach to Improve Student's Critical Thinking Skills During 2015 to 2022

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ABSTRACT

Critical thinking skills are one of the skills needed by students in the 21st century. The research aims to describe and analyze the application of the SETS approach in improving students' critical thinking skills in Indonesia. The method used in this study is a qualitative method of secondary data in the form of a literature study based on the results of previous research. The sample in this study was 20 published scientific articles. Based on the analysis of 20 articles analyzed, it can be seen that the SETS approach can improve students' critical thinking skills which include increasing the N-gain value, positive student responses during learning, and student activity. Further research should integrate other innovative learning models with the SETS approach so that they can be used to develop other 21st-century skills.

INTRODUCTION

The 21st century is marked by very rapid developments in various fields, both in the field of technology and in the field of education as well. Education certainly cannot be separated from efforts in developing quality human resources. The characteristics of quality human resources are being able to manage, use, and develop thinking skills (Nuraini, 2017). Critical thinking skills are one of the skills that are the demands of the 21st century that must be possessed by students (Redhana, 2019). Critical thinking skills are needed in life to analyze and find solutions to problems that exist in the present and future. Critical thinking skills are basic abilities in problem-solving. John Dewey argues that critical thinking is essentially an active process of someone thinking deeply, asking various questions, and finding relevant information rather than just waiting for information (Ariyana et al., 2018). Critical thinking according to Muglia is described as a process of using higher-order thinking skills possessed by students to understand problems, analyze, synthesize and evaluate ideas logically (Tumanggor, 2021).

Critical thinking skills can be trained through learning, a set of teaching materials, and assessment instruments that reflect critical thinking skills. However, the facts on the ground show that students' critical thinking skills are still low, according to the 2018 PISA survey, the value of the science ability of Indonesian students is 396, ranking 71st below the rankings of Thailand and Malaysia (Schleicher, 2019). The score shows that the science ability of students in Indonesia is low due to the lack of optimal problem-solving and reasoning abilities (Lestari & Annizar, 2020). Students' low critical thinking skills are due to a lack of reasoning ability in responding to problems that arise. Based on research of Suratno & Kurniati (2017) the lack of students' reasoning ability is due to a lack of interest in proving principles or concepts, investigations, and generalizations of problems are lacking. One of the causes of the lack of student interest is that the

methods, models, and learning approaches used are not appropriate so students are less actively involved in learning (Hamdani et al., 2019).

Students' critical thinking skills can be trained by applying the *Science, Environment, Technology, And Society* (SETS) approach in the learning process. SETS can be interpreted as science, environment, technology, and society which are one unit and have a reciprocal relationship to study the benefits and losses generated (Wijayama, 2019). According to Binadja, the SETS approach is intended to help students know about science, its development, and how scientific developments can affect the environment, technology, and society. The goal of using the SETS approach is a way to improve student's critical thinking by integrating science, environment, technology, and society (Hilda, 2021). The SETS approach will provide an atmosphere related to real life with the hope that students can develop their knowledge through technological innovation to solve problems in the environment. Several studies have examined the implementation of the SETS approach which can improve critical thinking skills. Therefore, this study aims to describe and analyze the application of the SETS approach to improving students' critical thinking skills in Indonesia through a literature study.

RESEARCH METHOD

The method used in this study is an analytical method with a literature review. According to Sutrisno, the literature review is research because the data used comes from the literature, both books, dictionaries, journals, encyclopedias, and other documents relevant to the research conducted (Izza et al., 2020). This research is descriptive qualitative, this method is used to describe how the implementation of the SETS approach and its effect on the critical thinking skills of students in Indonesia. The subject of this research is the author himself who will analyze previous studies related to the implementation of the SETS approach and its effect on the critical thinking skills of students in Indonesia.

This study uses secondary data analysis, which analyzes as many as 20 journals related to the implementation of the SETS approach and its effect on students' critical thinking skills in Indonesia. The purpose of using this literature review method is to gain new knowledge and introduce new studies on the topic of implementing the SETS approach and its effect on students' critical thinking skills so that it is useful for other researchers in applying the same topic. The steps taken in the literature review were adapted from Ramdhani et al., (2014) including: 1) choosing a topic to be reviewed, 2) finding and selecting articles that match the topic, 3) analyzing and synthesizing literature from selected articles, 4) organize or present the results of the study found clearly and consistently, 5) draw conclusions. These steps are presented in Figure 1.

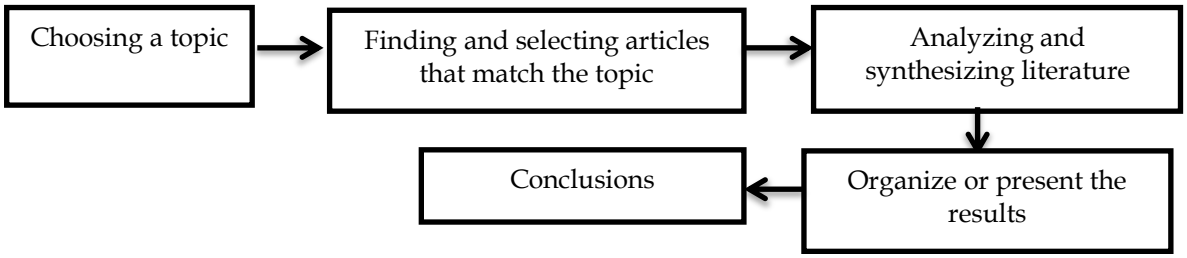

Figure 1. Research flowchart about the profile of the SETS approach to improve students' critical thinking skills.

RESULT AND DISCUSSION

Profile of the SETS approach to improve students' critical thinking skills from 2015 to 2022 detailed in Table 1 (attachment). The Science, Environment, Technology, and Society (SETS) approach is a learning approach that seeks to train students' abilities to view things in an integrated manner by focusing on real-life problems. The SETS approach is student-centered so that students are trained to be able to think globally and solve problems by applying concepts they have from various related sciences. According to Binadja in Wisudawati (2014) stated that Learning SETS is a learning approach that connects science with other elements, namely technology, the environment, and society. The SETS approach is a development of the Science, Technology, and Society (STS) approach. The STS approach is a learning approach that links science learning with technological advances and community development (Jailani et al., 2018). The material development process in the STS approach is inseparable from the characteristics of science which are process and product-oriented, but also oriented to existing technology and needed by the community (Septiana & Rohmadi, 2013). While in the SETS approach, there is a message or vision that is carried in the learning process, namely to use science (as the main focus) to form technology in meeting the needs of the community, it is also necessary to think about various impacts on the environment both physically and mentally (Khasanah, 2015). So, the SETS approach is learning that integrates four elements, namely the concept of science as the main element by utilizing technology for the benefit of the community without having to damage the environment.

According to Yager, the characteristics of SETS learning are: 1) identification of local problems that exist in everyday life and have importance and impact, 2) active involvement of students in collecting information used to solve problems in everyday life, 3) emphasizing process skills as an effort to solve the problems encountered, 4) providing opportunities for students to play a role as a community in participating in solving problems that have been identified (Simatupang & Purnama, 2019). In essence, the SETS vision is a way of looking ahead that directs the understanding that everything in life contains aspects of science, environment, technology, and society as a single unit that influences each other reciprocally. Meanwhile, as an approach, SETS is an integration learning method that links the four elements. In creating learning that meets the characteristics of SETS, careful planning is needed, so that in the learning process both teachers and students become accustomed and do not feel difficult (Nugraheni et al., 2013).

The aims of the SETS approach according to Poedjiaji are: 1) increasing motivation and learning achievement in addition to broadening students' horizons, 2) solving problems faced by students as well as environmental and social problems, 3) increasing creativity, 4) increasing critical thinking skills, 5) increasing environmental awareness. , 6) as well as increasing student responsiveness to technological developments both critically assessing the positive and negative impacts of existing technological advances (Habibati, 2017). The steps in implementing the SETS approach according to the National Science Teachers Association are: 1) Invitation stage: the teacher raises actual issues/problems that are developing in the surrounding community and can be observed or understood so that it will stimulate students to provide solutions to overcome, 2) Exploration stage: students go through their own activities to understand new situations or problems at hand. The process of understanding the problem can be done through reading books, magazines, newspapers, listening to the news on the

radio, watching TV, discussions with friends or interviews with the community or direct observation, 3) Solution phase: the results of exploration obtained by students are then analyzed further about the occurrence phenomena and discuss how to solve the problem. Students will build new concepts according to local conditions. Next, the teacher provides feedback on the concepts obtained by students, 4) Application Stage: students get the opportunity to use the concepts that have been obtained. Then students will take concrete actions in overcoming environmental problems that arise at the invitation stage (Rini, 2017).

The advantages of implementing the SETS approach in learning according to (Hermita, 2021) are: 1) Students have the ability to look at things in an integrated manner by paying attention to the four elements of SETS, so they will better understand the knowledge they already have; 2) Train students to be sensitive to problems that develop in everyday life; 3) Students have a concern for the surrounding environment by knowing science, how the development of science can affect the environment, and technology and society reciprocally; 4) Students become more active and creative in learning. The drawback of the SETS approach according to Sutarno is that students have difficulty associating the elements of SETS which consist of science, environment, technology, and society (Maryani et al., 2017). In addition, in the aspect of students if they are not active, then the application of the SETS approach is not effective. Teachers who use the SETS approach must be broad-minded, have high creativity, and have reliable methodological skills. The SETS approach can only be applied to certain materials because the learning atmosphere tends to prioritize one field of study (Simatupang & Purnama, 2019). It is also supported by research results (Ghofur & Raharjo, 2018) that the implementation of SETS-based learning requires a long time because the SETS approach requires applicative learning.

SETS is a unity between science, environment, technology, and society which is implemented so that students have higher-order thinking skills. According to (Ansari & Abdullah, 2020) higher-order thinking skills are thinking activities that involve a cognitive level with a high hierarchy from Bloom's Taxonomy, namely analysis (C4), evaluation (C5), and creation (C6). The effect of higher-order thinking accompaniment from the SETS approach is to improve critical thinking skills and solve problems encountered by students (Wisudawati & Sulistiyowati, 2014). Higher-order thinking skills are the ability to use and process thinking processes on facts. A person is said to have higher-order thinking skills not only knowing the facts but also being able to use the knowledge they have to develop their own knowledge (Lie et al., 2020). Higher-order thinking skills can be trained by teachers to students.

In the literature review, the researcher focuses on one of the higher-order thinking skills, namely critical thinking skills. According to Gholami, critical thinking is self-regulation in deciding a problem, resulting in interpretation, analysis, evaluation, and inference as well as exposure using the basis for decision making through evidence and concepts, methodologies, criteria, or contextual considerations (Tumanggor, 2021). According to Gunawan, critical thinking is the ability to think at a complex level and uses an analysis and evaluation process so that it involves the ability to think inductively and think deductively (Warti, 2019). Critical thinking ability is influenced by two factors, namely internal factors, and external factors. The internal factors that influence students' critical thinking skills are student characteristics, experience, learning styles, and self-efficacy. While external factors that affect students' critical thinking skills are learning methods, learning strategies, learning models, and learning

approaches applied in the learning process (Tumanggor, 2021). However, based on TIMSS (Trends in Mathematics and Social Study) data in 2015 Indonesian students have low critical thinking skills. Therefore, the study conducted by researchers focused on one approach, namely SETS which could be an alternative to overcome the low critical thinking ability of students.

The SETS approach is widely used to conduct research, whether it is needed in the development of a learning product or applied directly in the learning process. Research conducted by (Mualifah & Rusmini, 2021) developed a module with a SETS approach on acid-base material to improve students' critical thinking skills. The results of the research show that the module with the SETS approach that has been developed can improve students' critical thinking skills. In line with research conducted by (Amanda et al., 2018) which combines a problem-based learning model with the SETS approach, increasing students' critical thinking skills.

Based on the literature review, it is stated that the SETS approach can improve students' critical thinking skills. The SETS approach can also be applied to various levels of education. As in the review of 20 articles that have been carried out, including 4 articles on the SETS approach applied at the elementary level, 6 articles applied at the junior high school level, 9 articles applied at the high school level, and 1 article applied at the university level. The suggestions given in developing the SETS approach in other research are integrating the SETS approach with a learning model that is following the material to be taught. For example, the SETS approach is an integrated project-based learning model (PjBL) to improve students' critical thinking skills on environmental pollution material. In addition, suggestions for using the SETS approach were developed in other, more innovative learning media. For example, the development of educational games with SETS vision to improve students' critical thinking skills on optics and light.

CONCLUSIONS

Based on the literature review, it can be concluded that the SETS approach can be applied in learning and able to improve students' critical thinking skills. The SETS approach aims to improve critical thinking skills through the integration of four elements, namely science, environment, technology, and society with solving problems that exist in life around them. So the SETS approach is expected to be a solution to improving students' critical thinking skills. Future research needs to apply the SETS approach to enhance other skills needed in the 21st century such as creativity, problem-solving skills, communication skills, and collaboration skills.

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Attachment

Table 1. Profile of the SETS approach to improve students' critical thinking skills from 2015 to 2022.

Author/Year	Sample Characteristics	Research design	Finding
(Budi et al., 2015)	The research subjects were 64 students of junior high school 2 Jatisrono. A total of 32 students of class VII-C as the control class and 32 students of class VII-D as the experimental class.	The type of research is Research and Development (R&D) in the science module with a SETS approach to ecosystem materials. The development model used is Four-D (4D) which includes define, design, development, and disseminate. The experimental design method used in this research is the Pre-test and Post-test of the control group.	The developed module is validated before being distributed. The results of the validation got an average score of 95.31 % included in the very feasible category. Furthermore, the developed module was tested in learning to determine the effect of the developed SETS approach module to improving students' critical thinking skills. After the research, it was found that critical thinking skills in the experimental class had increased in the post-test of 84.11.
(Oktaviani et al., 2019)	The research subjects were 24 8th grade students of junior high school 7 Tegal in the 2016/2017 academic year in each control class and experimental class which was taken using the cluster random sampling technique.	The research conducted is a research and development (Research and Development) which aims to develop learning tools and science learning media with an insight into the SETS PBL model on Newton's Law material. The product development model is Borg and Gall. The research trial design used Two-Group Pretest-Posttest Design.	The developed media obtained validation results of 88.33 % and 79.37% with proper categories. The use of the developed media is very effective in learning as evidenced by the increased motivation and ease of students in understanding the theory. Furthermore, to find out the improvement of students' critical thinking skills, a test was carried out so that a comparison of pre-test and post-test scores was obtained. The N-gain value in the experimental class was 0.59 in the medium category, which means that students' critical thinking skills have increased.
(Mualifah & Rusmini, 2021)	The research subjects were 12 students of class XI senior high school 1 Dongko Trenggalek.	The research carried out includes research on the development of an acid-base module with the SETS approach using the Borg and Gall development model which consists of 10 stages. However, this research was only carried out until the fourth stage, namely a limited trial.	Based on a literature study and analysis of student potential problems, it is known that there are still many students who have difficulty understanding acid-base material because they are not encouraged to understand the material but are only limited to memorizing. Therefore, this module has been compiled to address this problem. The developed module is declared valid and feasible to use both in terms of content,

Author/Year	Sample Characteristics	Research design	Finding
			presentation, and linguistic aspects. Furthermore, the module was tested on a limited basis so that the N-gain value of 0.79 was obtained. Acid-base module with SETS approach can improve students' critical thinking skills.
(Amanda et al., 2018)	The research subjects were students of class VII-A as the control class and students of class VII-B as the experimental class at junior high school 1 Socah, Socah District, Bangkalan Regency.	The research method used is Quasi-Experimental Design. The research design used is the Nonequivalent Control Group Design.	Critical thinking skills can be improved with a problem-based learning model accompanied by the SETS approach because it is oriented to problems in the students' daily environment. Therefore, the results of students' critical thinking skills on each indicator completeness got a good category with an N-gain value of 0.36 with a medium category.
(Maimunah, 2016)	The research subjects used were 62 students of class XI at senior high school 1 Leuwimunding, Majalengka consisting of 31 students in the experimental class and 31 students in the control class.	This study uses a quasi-experimental method. The research design used the Pretest-Posttest Nonequivalent Control Group Design, which means the sample consisted of a control group and an experimental group who were given a pre-test and a post-test with different treatments.	The difference in students' critical thinking skills between the control class and the experimental class is known to have N-gain values of 28% and 42%, respectively. The difference in critical thinking skills is due to the implementation of the SETS stages which are full of thinking, arguing, and discussing activities so that they can train students' critical thinking skills.
(Rasenior high schoolwan, 2020)	The research subjects are 30 first-year students who have studied acid-base material.	This research uses Research and development of acid-base teaching materials using the SETS approach. The development model chosen is the Borg and Gall model which is modified into 5 stages, namely the preliminary study stage, the product draft preparation stage, the validation and revision stage, the readability test stage, and the final revision.	The development of the design of student teaching materials with the SETS approach is based on learning only limited to mastery of concepts so it hinders the mastery of critical thinking skills. Therefore, SETS acid-base teaching materials were developed which obtained validation results with the appropriate category, positive student responses after being tested on a limited basis. The conclusion is that SETS teaching materials can be used as a reference in the teaching and learning process to practice critical thinking skills.
(Firdaus et al., 2020)	The research subjects used were 20 fourth-	The research method used is research and	The purpose of this research is to develop interactive

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	grade students at elementary school Klakahrejo 1/578, Surabaya.	development. The development model used is 4D developed by Thiagarajan. The research trial design used One Group Pretest-Posttest Design.	multimedia based on the SETS approach which obtained a decent validity result with a percentage of 93.88 %. The implementation of learning activities using the SETS approach is also very good so that it gets a positive response from students. After being tested, the increase in critical thinking skills is seen in the N-gain value ranging from 0.7 to 1 with the high category.
(Azkiyah et al., 2020)	The research subjects were 75 students in 3 class VIII at *MTs* Nurul Huda.	This research was conducted to develop learning tools using the SETS-oriented guided inquiry model which was developed using the Dick and Carey model. In the implementation phase, a trial was conducted with a one-group pre-test post-test experimental design.	Students' thinking skills on each indicator have increased after the application of learning with the SETS-oriented guided inquiry model. However, there are 6 students with low scores due to the possibility that students in the class do not support certain learning activities, the intrinsic motivation of each student is different, and some students need longer study time. However, the learning tools developed got a positive response from students.
(Amilyana et al., 2021)	The research subjects used were 92 5th grade students of elementary school Manukan Kulon, Tandes sub-district, Surabaya City for the 2020/2021 academic year.	The type of research carried out is development research to produce products in the form of SETS-based science teaching materials The research development design uses a 4-D model.	The SETS-based science teaching materials developed are very feasible to use. Supported with proper lesson plans and syllabus. The product trial developed was carried out through a digital platform and got a student active response of 95% and received a positive response among students. The SETS teaching materials developed were able to improve student's critical thinking skills with an N-gain value of 0.77 in the high category.
(Wijaya et al., 2018)	The research subjects used were 37 students of science class XI at senior high school Negeri Tangerang Selatan City in the odd semester of the 2016/2017 academic year.	The research method used is quasi-experimental. The research design used was the Nonequivalent Control Group Design with certain treatments in the experimental group.	The implementation of the PBL model with the SETS approach was able to improve student's critical thinking skills with an average post-test score of 81.8. The achievement of critical thinking indicators using the PBL model with the SETS approach is 82.7% in the high category.
(Maulidati et al., 2018)	The research subjects used were 61 fifth-	The research method used is Quasi	Students' critical thinking skills after applying SETS-oriented

Author/Year	Sample Characteristics	Research design	Finding
	grade students at elementary school Lelateng.	Experiment with a Single Factor Independent Group Design research design. This design is also called the between-subject design because a comparison is made between different treatment conditions between two groups of subjects.	scientific learning are in the high category. The average score of student learning outcomes who take SETS-oriented scientific learning has a high category.
(Sylviana et al., 2019)	The research subjects were grade VII junior high school 8 Pekalongan in the 2018/2019 academic year.	The research design was pretest-posttest. Data collection method using a multiple-choice test.	One of the solutions to improve students' critical thinking skills is using the SETS learning model based on probing prompting. The results of the analysis of students' critical thinking skills after the implementation of the probing-prompting- based SETS learning model increased by 10.4%, with a pretest of 72.5% and a post-test of 82.9%.
(Destini et al., 2022)	The research subjects used were 59 5th grade students at elementary school 5 Metro Pusat Kota Metro.	This type of research is experimental research with non-equivalent control group design research.	The implementation of the SETS approach can train students' critical thinking skills with an average post-test score of 74.03. The results of the analysis of the average N-gain is 0.53 in the medium category.
(Fitriani, 2017)	The research subjects were students of class X *MA* Darul Muhsin NW Tanjung in the 2016/2017 academic year.	The research method used is Research and Development (R&D) concerning the 4D development model by Thiagarajan. The product development carried out is a Physics module that is based on SETS.	The SETS-based module was developed to help students to apply simple experiments independently to train critical thinking skills. The modules compiled have appropriate criteria by getting a score of 81% by material experts, 72% by media experts, and 88% by linguists. The response shown by students to the use of the module was positive. Aspects of critical thinking that get a high score percentage after applying the module are provide simple explanations and follow-up explanations.
(Asmuri et al., 2019)	The research subjects used were 36 students of class VIII junior high school 1 Donorajo.	The research method used is research and development (R&D) with the adaptation of the 4D development model (four-D model) by Thiagarajan.	One of the ways to improve students' critical thinking skills is the SETS-based integrated science module with the theme of food and body health. The results of the module validation carried out by material expert

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			validators, media, and Integrated Science teachers were declared suitable for use. The implementation of the module received a very good response from students. The use of the SETS-based Integrated Science module can improve students' critical thinking skills by getting an N-gain score of 0.6 in the medium category.
(Shafarina et al., 2018)	The research subjects used were 35 students of Science class XI-2 senior high school 3 Banjarmasin.	The research design is Classroom Action Research (CAR) as much as 2 cycles using the SETS-vision Guided Inquiry learning model. The classroom action research model used is Kemmis and Taggart.	There was an increase in students' critical thinking skills in each cycle after the SETS vision-guided inquiry learning model was applied. In cycle 1 with a value of 60.04 the critical enough category increased in cycle 2 to 83.61 in the critical category. An indicator that is quite critical is deciding on an action which means that students have not been able to provide problem-solving solutions with clear evidence and reasons. Students responded positively with a score of 34.49 and student activities became more active, enthusiastic in group discussions, and confident in their opinions so that they increased from cycle 1 to cycle 2 with a value of 52% to 80%.
(Afrinis et al., 2017)	The research subjects used were students of Science class XI-1 and XI IPA 3 at senior high school 1 Kampar.	The research method used is Research and Development (R&D).	The improvement of critical thinking skills before and after learning using the guided inquiry method with SETS vision has increased in 5 indicators of students' critical thinking skills. Affective assessment of critical thinking abilities of students in Science class XI-1 got a good category with an average score of 60, while Science class XI-3 got a good category with an average score of 67. While the assessment of psychomotor aspects in Science class XI-1 and Science class XI-3 got a good category with an average score of 50 and 51.
(Lamsihar et al., 2020).	The research subjects used were 24 students of Science class XI-1	The research design used was Classroom Action Research	After doing research with 3 cycles, it was found that in cycle 3 the SETS approach can train

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	from senior high school 5 Dumai, Riau.	(CAR) for 3 cycles using qualitative data collection. The classroom action research model used is Kemmis and Mc Taggart.	students' critical thinking skills. The average value obtained by 24 students of Science class XI-1 at the end of the cycle (cycle 3) is 94 so it can be said that students can develop critical thinking skills.
(Suriawati et al., 2019)	The research subjects used were 55 students consisting of 27 students of class X Natural History 7 as the experimental class and 28 students of class X Natural History 4 as the control class.	The research method used is Research and Development (R&D) with the Borg and Gall development model.	Audiovisual media based on the SETS approach can be used as a solution to improve students' critical thinking skills. The developed product has met the eligibility criteria. The result of observing student activity at meeting 1 was 75% and at meeting 2 was 85%, which showed positive activity. The results of the statistical test of the product developed showed differences in critical thinking skills between students in the experimental class and the control class.
(Putri & Rusmini, 2021)	The research subjects were 1-3 students of senior high school 10 Surabaya to determine the effectiveness of the media and 10-15 students of gread XII senior high schooln 10 Surabaya for a limited trial.	The research method used is Research and Development (R&D). The development model used is Borg and Gall which is limited to a limited trial stage. The product trial design used One Group Pretest-Posttest.	The module that has been developed is a module with a SETS approach to practice critical thinking skills on hydrocarbons and petroleum materials. The product developed got an average validation score of 87% with a very valid category. The practicality score of the module is 94% in the very practical category. The improvement of students' critical thinking skills can be seen in the average N-gain value of 0.8 in the high category.