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Development Module Based Search, Solve Create and Share (SSCS) to Train Critical Thinking Ability in Body Defense System Material

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Article Info	Abstract
	This research and development aiment to: 1) find out the module development products based on the SSCS model to train critical thinking skills in body defense system material, 2) find out the feasibility of developing module based on the SSCS model to train critical thinking skills in body defens system material. The research and development were carried out using procedures according to Borg and Gall which were limited to the 7 th stage of the ten stages. Data analysis techniques used qualitative and quantitatif descriptive analysis technique.. The result of the research and development showed that 1) module product based on the SSCS model were developed based on facione's critical thinking ability thinking aspects (2015) which visualized the objectives, material, activities and evalution questions. 2) module feasibility viewed from the result of validation including material expert validation got an average of 75,4 % with good quality, media experts got an average of 68,8% with good quality, evaluation experts got a men of 74,4 % with good quality, linguistists and readability got q mean of 78,37 % with good quality, validation of Biology education practitioners got an average of 96,5 % with very good qualfications and validation of students with an average of 84,7 % got very good qualifications. Based on the overall percentage it could be conclude that the module was feasible to use.

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INTRODUCTION

The development of science and technology that is increasingly rapid in the 21st century requires human resources to be able to utilize science and technology as a reference in preparing for the fulfillment of knowledge-based needs and facing competition in an increasingly tight working world. Competition that occurs in the era of globalization must be faced by preparing high-quality human resources, namely resources that have the ability to think critically logically, creatively, systematically so that they are able to face various challenges of life independently. As a solution to deal with this, all forms of change are needed, especially in the field of education. Education is expected to equip students to have life skills to deal with life challenges in the 21st century. Ministry of Education and Culture (2013) formulates that the 21st century learning paradigm emphasizes the ability of students to find out from various sources, possess critical thinking skills, master information and communication technology and collaboration and collaboration in solving problems. Friedman (2006) in Sudarisman (2015) states that entering the 21st century changes the learning paradigm towards student centered as well as the need to provide advanced thinking skills or Higher Order Thinking Skill (HOTS).

Critical thinking skills are intellectual processes in making concepts, synthesizing, analyzing, applying, and evaluating various information obtained from the results of observation, experience, reflection, where the results of this process are used as a basis for taking action (Walker & Finney, 2006). Critical thinking ability is an important thing and it is very necessary for students to face life problems that are increasingly complex in the future. Critical thinking can be categorized as high-level thinking skills, where critical thinking is a clear and directed thinking process, which is used in mental activities such as problem solving, decision making, analyzing assumptions (Johnson., 2011). With critical thinking skills, surely students can more easily think deeply about problems, especially in the basic problems of life in the globalization era. Critical thinking skills involve learning activities, such as analyzing, synthesizing, assessing, creating, and applying new knowledge to real world situations. Critical thinking skills are very important in the learning process because these skills provide opportunities for students to find new knowledge (Hakim et al., 2018). As students progress into junior and senior high school, critical thinking skills, decision-making skills, and information gathering skills need to be taught. The individual must also be skilled at evaluating the future. Students' critical thinking skills become an essential goal in education. It is related to a perceived need to deal with the information explosion in this era. However, these skills are neither inborn nor naturally acquired, yet must be trained in students (Changwong et al., (2018).

But in reality, critical thinking skills in Indonesia are still very low. The low thinking ability of students in Indonesia can be identified based on the PISA (Program for International Student Assessment) rankings held by the OECD (*Organization for Economic Co-operation and Development)* in 2009 Indonesia ranked 59, in 2012 Indonesia was ranked 64th out of 65 countries. In 2015 Indonesia experienced an increase but did not change the position of Indonesia from a low position which was ranked 62 out of 70 countries (*Organization for Economic Cooperation and Development*, 2016). The indications can also be seen from several studies on students critical thinking skills in Indonesia, such as the research of Ristiasari et al., (2012) in Temanggung Central Java N 6 Middle School, and research by Masita et al. that students critical thinking skills in Indonesia are still relatively low.

The above problems also occur in the SMAN 2 Palembang. Students critical thinking skills in these schools are classified as low, this is indicated by the results of the initial needs analysis conducted by researchers by giving a test of critical thinking skills developed by Prayitno (2014) which refers to Facione (2015) critical thinking ability indicators. The results of the percentage obtained from the critical thinking ability tests obtained aspects of interpretation 74.7% with high categories, analysis aspects 30.8% with very low categories, evaluation aspects 28% with very low categories, conclusions aspects 19.6% with very categories low, explanatory aspects 0.9% with very low categories, and self-regulation aspects 60.7% with low categories.

Based on the needs analysis carried out at the Palembang State High School 2 through the results of a questionnaire analysis and interviews of teachers and students, the use of teaching materials used so far is limited to the textbooks provided by the school and has not fully empowered critical thinking skills, this is

shown from analysis of teaching materials in the form of books on the body defense system material written by Yusa (2016) used in Palembang State High School 2 by using aspects of critical thinking with aspects of interpretation obtained 56.6% with low categories, 40.6% analysis aspects with categories very low, 28.6% evaluation aspects with very low categories, 62.5% conclusions with moderate categories, 44.4% explanatory aspects with low categories, and 50% self-regulation with low categories, while based on the results of book analysis on material the body defense system used in other schools by Pujiyanto & Ferniah (2002) shows that a interpretation specs 75.4% with medium category, analysis aspect 68.7% with moderate category, 42.8% evaluation with low category, 62.5% conclusion with moderate category, 69.4% explanation with moderate category, and self regulation 56.33% with a low category. The low level of thinking ability of students is also due to the fact that when the learning process is very rarely trained to solve a problem and the evaluation questions given by the teacher have not led to high-level thinking skills.

The low ability of students' thinking is also due to the fact that during the learning process they are rarely trained to solve a problem and the evaluation questions provided by the teacher have not led to higher-order thinking skills. This happened in almost every subject matter explained by the teacher at SMAN 2 Palembang. One of them is on the body's defense system material. Through the results of interview students show that the body's defense system material is material that is quite difficult to understand. This is also supported by the analysis of the national exam (UN) scores in the 2015/2016 academic year of SMA Negeri 2 Palembang students who showed low mastery of the body's defense system material, with an average grade level of the School which was 39.58%, at the Regency / city level 52.55%, the Provincial level is 48.29%, and 56.33% for the National level (Puspendik, 2016).

The body's defense system material is contained in the curriculum 2013 on basic competencies 3.14 Analyzing the role of the immune system and immunization against physiological processes in the body, as well as basic competencies 4.14 Conducting campaigns the importance of various programs and types of immunizations and abnormalities in the immune system in various forms of information media. The material of the body's defense system is very closely related to daily life, such as being able to know various causes of disease and prevention early through an immunization program. This material is very difficult to understand because the material is abstract, making students less able to understand. The learning process given by the teacher to students is simply reading and completing a training assignment in a printed book given by the teacher without any more detailed explanation of this material. Students are only fixated on books. In addition, teachers also do not use teaching materials or media as a support and attraction for student learning. The result is that students are less active and will affect their thought processes.

In order to overcome these problems, one of the efforts that teachers can do is to use modules as teaching material used to train student self-study. Module is one of the teaching materials that is packaged systematically and designed to achieve specific learning objectives, besides that the advantage of the module is that it can provide feedback to students (Sesya & Lisdiana, 2014).

Modules can train learning activities are modules based on learning models, learning models will construct student knowledge so that students get a more meaningful learning experience. In the selection of learning models in the teacher module should be able to apply learning models that involve students directly in learning activities so that students will understand about meaningful learning concepts and can process and develop student creativity. Munawaroh, et al., (2018) states that the learning model used is very important and influential in the learning process to support critical thinking skills in model selection based on problem solvers is one model that can be applied. As for research based on Permana et al., (2019) Students who can think critically must often train themselves to analyze a problem. One of them is the Search, Solve, Create, and Share (SSCS) model.

The SSCS model is a model that can be actually applied in learning the 2013 curriculum and is seen as an appropriate model for optimizing critical thinking skills. The characteristics of this model are involving students in investigating and solving a problem so that it will directly support participation and stimulate thinking skills. This is reflected in each phase. As explained by Chen (2013), that the SSCS learning model consists of four stages, namely 1) the Search phase aims to identify the problem, 2) the Solve phase which

aims to carry out the problem solving plan obtained from the search stage, 3) the stage Create that aims to produce solutions and evaluate the processes and solutions that have been obtained in a product, 4) Share phase aims to socialize problem solving through presentation activities. In this learning model students are required to think actively in solving given problems, find solutions by working together in groups and then be able to deduce logically to problems. Thus, this model is a learning model that involves students' problem solving thinking skills (Kurniawati & Fatimah, 2014). In addition, based on research Diani, et al., (2019) learning activities using the SSCS learning model puts students as the center of activity (student-centered learning) while the teacher only acts as a facilitator of class activities.

Based on this background, the researcher conducted a study entitled "Development of Seacrh, Solve, Create, and Share (SSCS) Model-Based Modules to Train Students' Critical Thinking Abilities in the Material of the Human Body Defense System".

RESEARCH METHOD

This research is a type of research and development called R & D research. The development model refers to the model of Borg and Gall (2003) which was modified to the seventh stage (Sugiono, 2016).

The procedures for research and development that are carried out are: 1) the research and information collecting stages which are the needs analysis phase including literature studies and field studies. 2) Stage of planning (planning) to design modules / products based on a matrix arranged. 3) The stage of developing the initial product design (develop preliminary form of product) is to make the module in accordance with the plan. 4) The initial product validation stage (preliminary field testing) is carried out by expert validators including material expert validators, media expert validators, evacuation expert validators and linguist validators and readability. 5) Product revision stage as a result of design validation (main product revision) as the first product revision. 6) Limited field testing stage (main field testing) is carried out by education practitioners and students as small groups. 7) Second product revision phase after operational product revision.

The data analysis technique used in this research and development is a qualitative descriptive data analysis technique that is processing data in the form of suggestions derived from expert validation and quantitative data analysis is used to systematically compile an assessment score on the perception of responses regarding the feasibility of the module.

RESULTS AND DISCUSSION

Module Product Based on the SSCS Model on Body Defense System Material

Body Defense Module System Product Development based on the Search, Solve, Create And Share model to train critical thinking skills developed based on the development procedures of Borg and Gall (2003) which were modified into seven stages, namely until the product revision stage.The development of module teaching materials was selected based on the initial needs analysis conducted at Palembang N 2 High School. The initial needs were carried out through literature studies and field studies. Based on preliminary data, it is found that in Palembang National High School 2, teaching materials are needed that can support the learning process and empower critical thinking skills. The teaching material is a module based on the SSCS learning model.

Based on the results of the library study module is a teaching material that can be used independently by students, making it easier for students to develop the results of their thinking in the module, in addition modules equipped with learning models can train learning activities so that student learning activities are more directed. Literature study on learning models conducted by researchers found that learning models that can support students' critical thinking skills are models with problem-solving characteristics, one of the problem-solving models is the SSCS learning model. According to Chen (2013) SSCS learning model is a model that uses a problem-solving approach that emphasizes the use of scientific methods or think systematically, logically, regularly and thoroughly. The aim is to acquire cognitive abilities and abilities, to solve rational, straightforward and complete problems.

SSCS learning model involves students in investigating new situations that are designed with four stages, namely Search, Solve, Create and Share. Each learning phase is specifically designed to arouse students' interest in asking questions and will make students actively involved to gain understanding of science by conducting investigations and finding solutions to existing problems. Another advantage of the SSCS learning model according to Pizzini (1998) in Rahmatika & Alimah (2014) is gaining direct experience in the problem-solving process, providing opportunities to learn and solidify concepts in a more meaningful way, process information, use higher-order thinking skills, provide opportunities for students to be responsible for the learning process, and practice collaboration with others. According to Nastiti et al., (2018) the SSCS model is a problem-solving based model with student-centered learning characteristics, training students to solve problems with stages or steps to solve independently, teachers no longer become the center of the learning process but as a facilitator guides the learning process in the classroom so that it trains students to think logically.

The results of the national exam (UN) analysis in the 2015/2016 academic year of SMA Negeri 2 Palembang students showed the low mastery of the body's defense system material, with an average grade level of School which was 39.58%, District / city level which was 52.55%, the Provincial level is 48.29%, and 56.33% for the National level (Puspendik, 2016). The low national exam scores become a reference for the selection of material in the module.

SSCS model based module products are developed based on basic competencies basic competencies 3.14 Analyzing the role of the immune system and immunization against physiological processes in the body and basic competencies 4.14 Conducting campaigns the importance of various programs and types of immunizations and abnormalities in the immune system in various forms of information media. Modules based on the SSCS model developed by researchers have advantages over ordinary modules. The module is compiled based on indicators of critical thinking ability according to Facione (2015) which consists of six aspects including interpretation, analysis, conclusions, evaluation, explanation and self-regulation. Indicators of critical thinking skills have been accommodated in each activity both in the material, learning activities, and evaluation questions. So that the module based on the SSCS model can be used effectively as teaching material that optimizes critical thinking skills, especially in the body's defense system material. A series of student activities in the module are designed based on the syntax of the SSCS learning model. The student activity is placed at the front of the module before giving a description of the material. It is intended that students become more active and effective in constructing their knowledge. The final part is given exercises that have been arranged based on indicators of critical thinking skills and based on the objectives that must be mastered by students. The exercise aims to measure the level of mastery of the material by students as a whole. The following is a module cover based on the SSCS model to improve critical thinking skills.
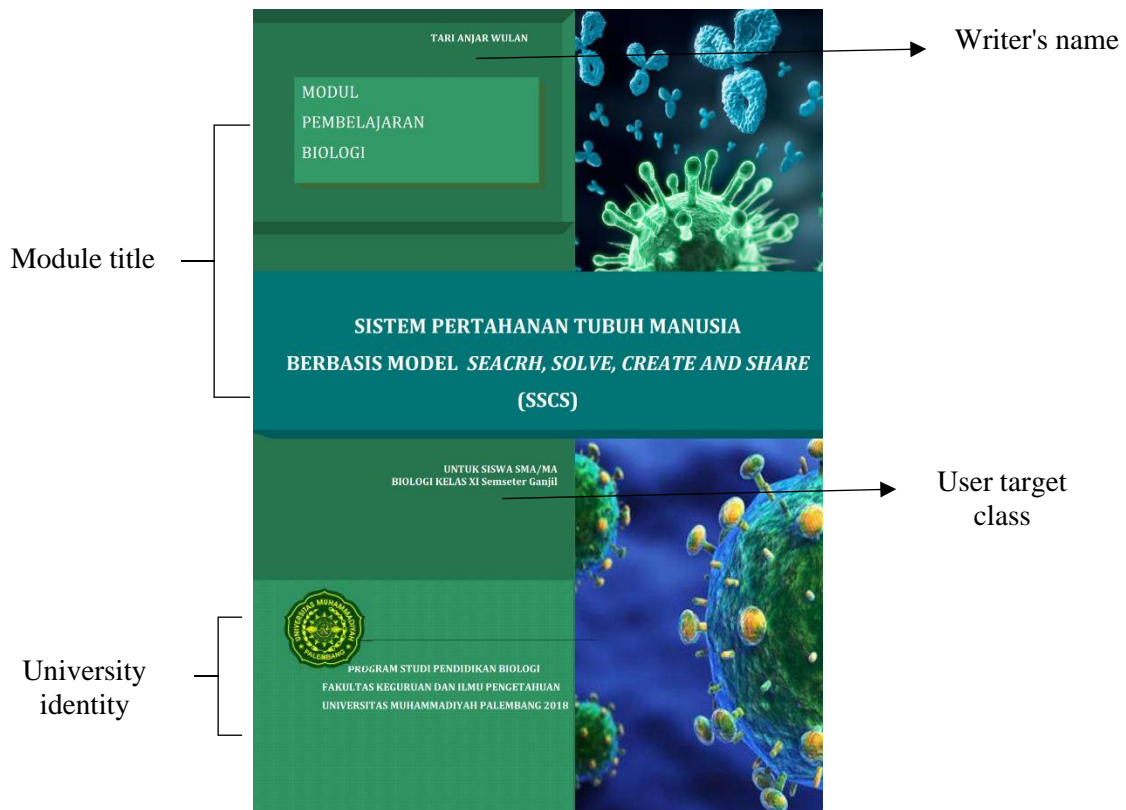
Figure 1 The front cover of the module based on the SSCS model

Student activities in the module include 4 stages of activities namely *Search, Solve, Create* and *Share.* The first activity is *Search* (identifying problems) This stage is the initial activity of the SSCS learning model. At this stage students are directed to identify problems based on the phenomena presented in the module by expressing ideas or ideas through a list of questions created. through these questions it is expected to provide simple explanations and build students' basic abilities (Saregar, et al., 2018). The aspects of thinking ability that will emerge at this stage are aspects of interpretation and aspects of analysis that will be used by students in exploring students' initial knowledge concepts. This is in line with the opinion of Rustaman (2009) in Faizah et al., (2017) organized and systematic questions that enable students to engage in activities that help them to gain a deep understanding.
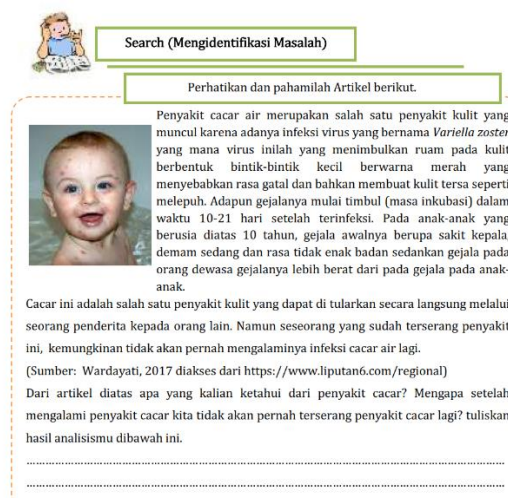
Figure 2 Display Stage *Search* (identify problems)

The second activity is *Solve* (planning problem solving) At this stage students are directed to actively make designs in solving problems in the form of hypotheses that are presented through ideas or ideas based on the results of analysis from various sources of the problems presented in the module. Activities at this stage can lead to aspects of critical thinking, namely the analysis phase as well as aspects of further explanation of the problem and include the right reasons. Through problem-solving activities it is hoped that students will get a more meaningful learning experience. As revealed by Yusnaeni et al., (2017) the opportunity for students to acquire skills in problem solving will realize the ability to think, In addition to this activity students will work together with a group of friends in solving problems in the module. Collaboration and discussion in groups makes students dare to express opinions and interact (Suciati, 2013). Mulyono & Dewi, (2016) State SSC learning with a contextual approach encourages students to build their own knowledge, and encourages students to work together. Provide contextual problems that make learning more meaningful and make students' thinking processes more developed.

(a)   (b)

Figure 3 Display of the *Solve* Stage (solving problems)

The third activity is *Create* (creating a product). This stage students are directed to create something new product in order to provide further explanation of the ideas and ideas that have been understood in the previous stage. Hatari, et al., (2016) revealed in his research that student activities at this stage can train students' critical thinking skills on indicators to provide further explanation, infer, and implement strategies and tactics. Conclusion skills can be observed from students' activities in making correct conclusions, logical statements, and making general statements.

(a)   (b)

Figure 4 Display *Stage* Create (create)

The fourth activity is *Share* (communicating). In this activity students are directed to communicate the results of discussions and products that have been made in the previous stage with confidence. The aspects of critical thinking skills that will emerge are aspects of explanation, aspects of evaluation or testing the truth of the results of the discussion and aspects of concluding the results of the discussion. The ability to evaluate performance in a group is also expressed by (Mustofa, et al., 2015). Through the stages in SSCS, students will go through a process where they solve problems systematically so that they not only understand how to solve problems but can also share them with other friends (Wijayanti, et al., 2019). According to Yusnaeni & Corebima, (2017) states that using the SSCS model especially at the Share stage will motivate students to be more confident in expressing their opinions responding to solutions, and evaluating the solutions obtained. In addition to a sense of responsibility and cooperation, the application of the SSCS learning model at the Share stage can also help students develop mutual respect for opinions and receive opinions from others (Febriyanti et al., 2014).

Figure 5 Display Stage *Share* (communicate).

Feasibility of Module Based on SSCS Model

The feasibility of the module based on the SSCS model on body defense system material was tested through expert validation stages, practitioner assessment, and students as a small group of field users. The results of expert validation indicate that the module is in accordance with the objectives developed because it is qualified according to material experts, design experts or presenters, linguists or legibility, and evaluation experts, but requires some improvements according to the advice of each expert through the first phase revision module. The results of the validation assessment of module products based on the SSCS model can be seen in the following table.

Table 1 Recapitulation of Module Validation By Validators

No	Aspect	Percentage of Score (%)	Qualification
1	Material Expert	75,4 %	Good
2	Media Expert	68,8 %	Good
3	Evaluation Expert	74,4 %	Good
4	Linguist	78,3%	Good
	Average	74,22 %	Good

Percentage of assessment of expert validation results in table 2.1 shows that feasible module products are continued in limited field tests, this can be addressed from the validation results by several expert validations such as material expert validation obtained by an average of 75.4%, media expert validation obtained average 68.8%, expert evaluation validation obtained an average of 74.4% and linguistic validation and readability obtained an average of 78.3%. From the four results of the validation obtained an average of 74.22% with good qualifications.

Even though it is said to be feasible by the validator there are several things that need to be improved. As for the revisions suggested by the material expert validator, namely improving the writing of the source, the writing system of the numbering should follow the EYD writing system and there is an image caption in a foreign language. The steps taken by the researcher were improving the writing of the source, improving the writing of numbers correctly and translating foreign language captions into Indonesian. This is very important in order to make it easier for students to understand the material well. The revision of the media expert is to improve the color selection on the module background that is too striking, to improve the similarity in font size and to move the glossary at the end of the module. Revision of evaluation experts is to improve evaluation questions on the analysis aspect and questions with the interpretation aspect. Revision of linguists and legibility, namely improving the writing of prepositions and correcting words that are less lettered.

After repairing the module based on suggestions from experts, the next step is a limited field test involving validation of education practitioners, namely the Biology teacher and student validation as a small group test conducted by 30 students of class XII MIPA. The results of the validation by teachers and students can be seen in the following table.

Table 2 Result of Limited Fielt Test

No	Aspect	Percentage of Score (%)	Qualification
1	Educational practitioner (teacher)	96,5 %	Very good
2	Students	84, 7%	Very good
	Average	90,6 %	Very good

Based on the results obtained by the limited field test is that the module is feasible to use because it is in accordance with the objectives and is very good qualified. The details of the validation of education practitioners obtained 96.5% and student ratings obtained 84, 7%. However, there are some suggestions given by the teacher, namely regarding words that are less lettered and the material in the module should be linked

to daily life so that it makes it easier for students to understand them. In addition, suggestions from students, namely the evaluation section should use easy-to-understand sentences and add foreign terms to the glossary. The steps taken by the researcher were perfecting the module product based on suggestions from education practitioners and students so that the module was really suitable for use.

CONCLUSION

Based on the results of the presentation of research and module development, it can be concluded that the module product developed consists of four stages, namely *Search* (identifying problems), *Solve* (planning problem solvers), *Create* (developing a product) and *Share* (communicating) to practice critical thinking skills. Validation results show that module products based on Search, Solve, Create, and Share (SSCS) models to train critical thinking skills can be said to be feasible because they are well qualified in terms of material validation, media experts, evaluation experts, linguists and readability of, Biology education practitioners and small group validation.

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