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# The Implementation of SSCS Model By Using MATLAB on Integral Materials(A Case Study for Problem Solving and Creative Thinking)

[1]Hasby Assidiqi, [2]Muhammad Sabirin, [3]Muhammad Amin Paris,
[4]Arif Ganda Nugroho, [5]Muh. Fajaruddin Atsnan

***Abstract--****This research is intended to find out math problem solving and creative thinking ability of the students on integral materials by implementing SSCS Model with conventional learning model helped by math laboratory. The method used in this research is true experimental design with posttest only control experimental design. The samples of this research are the students of XII grade of Natural Sciencs of MAN 1, MAN 2, and MAN 3 Banjarmasin with the total number are 216 students. These samples are devided into experiment and control classes. The data in this research are analyzed by using Corhan Formula, Mean Formula, deviation standard, Z-Test, F-Test, T-Test, and Mann Whitney-Test. This research concluded that the math problem solving and creative thinking ability of the students on integral materials in experiment class are in good and very good category, while in control class the two abilities are in good category. Additionally, there is a significant different between the ability of math problem solving and creative thinking implemented by using SSCS Model with conventional learning model helped by math laboratory on the integral materials.*

***Key Words--****Problem solving ability, Creative thinking, SSCS Model, Matlab- Software.*

## I. INTRODUCTION

Integral material is one of the mathematics materials learned by the students of XII grade of *Madrasah Aliyah Negeri/MAN* (State Islamic Senior High School). This material consists of definite integral, indefinite integral, and integral application, namely deciding the area and volume of rounded objects. Integral concept is not only used to develop the mathematics itself but also widely applied to various other disciplines such as engineering, physics, chemistry, biology, medicine, technology, economics and so on. Facts on the field showed that based on the Mid-Term Test (UTS) result of the second semester students of Mathematics Education Department (PMTK) of IAIN Antasari Banjarmasin Academic Year 2014/2015 on the Integral Calculus Course taught by Ellen Davita, S.Pd., M.Pd, it is known that of the 34 students who have completed the integral questions, most students have difficulties in solving integrals. Those difficulties are: (1) the difficulty in solving indefinite integrals involving trigonometric functions; (2) the difficulty in describing graphs indefinite integral calculation results; (3) the difficulty in using substitution rules involving trigonometric functions; (4) the difficulty in manipulating algebraic function so that students experience errors in solving the definite integral.

[1]*Math Education Department of 'Antasari' State Institute for Islamic Studies, Email: hasbymath19@gmail.com*
[2]*Math Education Department of 'Antasari' State Institute for Islamic Studies.*
[3]*Math Education Department of 'Antasari' State Institute for Islamic Studies.*
[4]*UMB Banjarmasin, Indonesia*
[5]*STKIP PGRI Banjarmasin, Indonesia*

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Yasin and Enver (Gunawan, 2013:3) stated that those students' difficulties are identified because of lack of students' understanding toward the basic concept of integrals, and the students' inability to formulate a systematic problem and lack of understanding on the material algebra, geometry, and trigonometry. Kiat (Gunawan, 2013: 5) in his study grouped the kind of students' errors when solving integral questions into 3 types. The first type is conceptual error which refers to the students' mistakes due to errors in understanding concepts related to the questions. The second type is procedural error which refers to the failure of students in manipulating or algorithm the questions though the concept had been understood and owned. The third type is technical error, namely students' errors due to their lack of understanding on other concepts or materials related to the integral or error due to carelessness performed by the students.

Considering the problems mentioned above, the teacher should be able to use a variety of learning models that correspond with the content and conditions of the students. One the models of learning that can be applied to the student is Search, Solve, Create, and Share (SSCS) Model. This model consists of four phases, namely searching phase (identifying issues), solving phase (planning and carrying out problem-solving), creating phase (constructing results of problem solving) and sharing phase (communicating the results of problem solving). In addition to the model, there are things that are considered important to supporting the learning process, namely the use of media. The media that is meant here is Mathematic Laboratory (Matlab) Software. This software is expected to help the students to use their minds, develop ideas, find the solutions for a problem that they may develop themselves and express their opinions. Additionally, through the assistance of Matlab, students can save their time in calculating processes or making graphics. The time which is usually used to calculate can be used to analyze the results of computer calculations, and deepen the problems better. Therefore, by using this Matlab sofware helped by SSCS model, it is expected that students are actively involved in the teaching and learning process and can provide direct experience in the problem solving process.

Various studies about the implementation of this SSCS models have also been conducted by many researchers, they are: 1) Irwan (2011) stated that there is an increase in students' mathematical reasoning ability and activities after they are taught using problem posing approach of SSCS models. 2) Lestari (2013) in her research revealed that the application of the SSCS Model can improve mathematical disposition and student learning outcomes. 3) Warmini, et.al. (2013) stated that students who took part in the SSCS learning model aided by visual media tend to have higher scores than students who took part in the conventional learning. In addition, they also mentioned that the implementation of SSCS learning model aided by visual media influence the students' learning outcomes. 4) Rahmawati (2013) said that learning with SSCS model aided by problem-cards effectively applied to the students' mathematical problem-solving ability. 5) Periatawan, et.al. (2014) in their research revealed that there are significant differences between the mathematical problem solving abilities by using SSCS models with conventional learning models. 6) Raehanah et.al. (2014) stated that learning by using SSCS model with problem solving type in terms of critical thinking skills and mathematical abilities indicated that there is significant influence of the critical thinking skills and mathematical abilities towards the students' cognitive learning achievement. 7) Kamalia (2015) mentioned that students' mathematical creative thinking ability are taught by using SSCS learning model is higher than the students taught using conventional learning.

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Based on the above description, this study is aimed to find out 1) the problem solving and creative thinking ability of the students after being taught by using Search, Solve, Create, and Share (SSCS) learning model aided by Matlab and conventional model on the integral materials. 2) the difference between mathematical problem solving ability of the students who are taught by using Search, Solve, Create And Share (SSCS) learning models aided by Matlab and those who are taught by using conventional model on Integral materials. 3) The difference between mathematical creative thinking abilities of the students those who are taught by using Search, Solve, Create, and Share (SSCS) learning model aided by matlab and those who are taught by conventional model on the integral materials.

## II. MATHEMATICAL PROBLEM SOLVING ABILITY

Talking about mathematical problem solving cannot be separated from the problem itself. According to *Kamus Besar Bahasa Indonesia* (KBBI), problem means something to be solved or resolved. A problem is called problem if it contains questions to be answered. However, not every question is a problem. In learning mathematics, generally something that is considered as a problem is not a question that is usually found by the students. Hudojo (1988: 174-175) stated that the question /questions considered as as the problem is depended on the knowledge of someone or the student. For someone, a question can be answered using a routine procedure, but for the other, answering such question requires an organizing knowledge which is acquired not through routine ways. In line with the opinion of Hudoyo, Blum and Niss (Sari, 2007: 27) said that the problem is a situation that has open questions which challenged people intellectually and cannot be easily obtained methods, procedures, direct algorithms which enough to answer questions. Additionally, Lenchner in his book "Creative Problem Solving in School Mathematics", interpreted the problem as a matter/question which the completion strategy is not immediately apparent; which the completion strategy requires some level of creativity or original comes from the problem solver (Natural Sciences IPB, 2008: 8).

From the above opinions, it can be concluded that a problem/question is considered to be a problem if the problem or question challenged to be resolved or answered and the procedures to resolve it cannot be done routinely or in another words require some level of creativity of the problem solver.

Polya (Herlambang, 2013: 15) argued that the problem is divided into two, namely problem to find and problem to prove. The purpose the problem to find a particular object is to find the unknown problem, while the purpose the problem to prove is to show the truth or falsity of a statement.

The term of problem solving is often used in various fields of science and have a different understanding. According to Kirkley, problem solving is a process used to solve/resolve problems (Widjajanti, 2009: 404). Similarly, Gagne (Mahmudi, 2010: 3) said that solving the problem is the process of synthesizing a variety of concepts, rules, and formulas to find the solution of a problem. Sukmadinata and As'ari (2006, 24) stated that the problem solving is an individual effort to use the knowledge, skills and understanding to find a solution to a problem. Furthermore, Nakin (Mahmudi, 2010: 3), defined problem as the process of problem solving using heuristics specific steps to find solutions to a problem. Regarding to the importance of learning or studying about the problem solving in mathematics, Bell (Widjajanti, 2009: 404) showed the various research results such as the problem solving strategies that are generally learned in math, certain things can be transferred

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and applied in solving problem in another situations. Problem solving can systematically facilitated students to improve their analytical power and can help them in applying the power at various situations.

According to Polya (1985: xvi-xvii) in his book "How To Solve It", to develop models, procedures or heuristic problem solving consists of some steps, namely (1) Understanding the problem; (2) Planning the problem solving (devising a plan); (3) Implement the plan of problem solving (carrying out the plan); (4) Re-examine the obtained results (looking back). Solving problems for students can mean a process. Thus, teaching how to solve problems can be considered as the activities of educators/teachers to challenge and motivate the students in order they are able to use all the knowledge and skills to formulate strategies to resolve the problem. This is consistent with the purpose of learning mathematics recommended by the National Council of Teachers of Mathematics (NCTM, 2000: 334), namely: (1) Adopting and adapting various approaches and strategies to resolve the problem, (2) Resolving problems that arise in mathematics or in another context that involve mathematics, (3) Building new mathematical knowledge through problem solving, and (4) Monitoring and reflecting on the process of mathematical problem solving.

Based on the explanation above, thus this research measure the mathematical problem-solving ability by using problem-solving stages/step by Polya, namely understanding the problem, planning the problem-solving, carrying out the problem-solving, and rechecking the obtained results.

## III. MATHEMATICAL CREATIVE-THINKING ABILITY

Etymologically, thinking comes from the word think. According to *Kamus Besar Bahasa Indonesia* (2007: 872), *Berpikir berarti akal budi, ingatan, angan-angan, pendapat atau pertimbangan* (Thinking means intellectual, memory, imagination, opinions or considerations). Thinking means using reasons to consider and decide something. Ruggiero (Johnson, 2010: 185) defines thinking as any mental activity that helps to formulate the problem or solve problems, make decisions, or fulfilling a desire to understand; thinking is a search for an answer and a meaning attainment. This opinion confirms that when someone formulating a problem, solving problem, or understanding something, then s/he is doing thinking activities. These thinking activities are surely aimed to find an answer and the achievement of meaning of what are being thought.

Dewey (Kowiyah, 2012: 175) says that thinking begins when someone faces a problem and deals with something that requires a way out. The situation that requires the way out invites the one to utilize the knowledge, understanding, or skill that already acquired. A certain process happens in his brain so that he was able to find a right thing and appropriate tobe used in finding a solution to the problems faced. Thus, the person doing a process process called thinking.

Guilford (Izzati, 2009: 49-60) classifies the ability to think into two main groups, namely; memory ability and thinking ability. The thinking ability is differentiated into three categories, namely; cognitive, productive, and evaluative. Productive capability consists of two types, namely; convergent and divergent. Convergent thinking leads to conventional or prescribed answers. Conversely, divergent thinking moves into different directions, not the answers given. Convergent thinking focuses on the correct solution, while divergent thinking results varied solutions. Creative thinking is the kind of divergent thinking. In line with the above opinion, Rich in Izzati (2009) added that there are three kinds of realistic thinking, namely deductive, inductive, and evaluative. Deductive reasoning is to infer from the general to the particular statement. Inductive thinking

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on the contrary initiated special things then taking a general conclusion, while evaluative thinking is thinking to judge good or bad, right or wrong about an idea. From some statements of the experts about the definition of thinking above, it can be synthesized that thinking is a mental activity to acquire knowledge, understanding and skills in order to be able to understand, formulate and evaluate the problem solving productively and evaluatively in accordance with the mentioned stages/steps.

Talking about creative thinking actually cannot be separated from what is called creativity. Barron (Asrori, 2011: 60) defined that creativity is the ability to create something new. Something new here is not meant to be entirely new, but it can also be a combination of elements that have been there before. Guilford (Asrori, 2011: 60) stated that creativity refers to the ability to mark the characteristics of a creative person. Furthermore, Guilford suggested two ways of thinking, convergent and divergent ways of thinking. Convergent thinking is a way of thinking about something individual in taking the view that there is only one correct answer. While divergent thinking is the ability of individuals to seek alternative answers to a variety of issues. In conjunction with the creativity, Guilford emphasized that creative people have more the divergent ways of thinking than the convergent.

Noticing the characteristics of creative thinking, it is understood that creative thinking is part of life skills that need to be developed in the era of information and increasing condition of competitive atmosphere. Creative thinking needs to be trained because it makes children fluent and flexible in thinking, make them able to look at problems from different perspectives, and able to generate lot of ideas. Creative people have great possibility and chance to improve the quality of life. In this globalization era there is no doubt that the prosperity and the success of society and country depended on creative contribution, in the form of new ideas, new inventions and new technologies from the member of communities.

Munandar (Sumarmo, 2014: 7) detailed the characteristics of creative thinking into four indicators as following: (1) Fluency which includes: generate many ideas, many answers, a lot of problem solving, has many questions smoothly, creating a lot of ways of doing things, and think about more than one answer. (2) Flexibility which consists of: generating ideas, answers, or varied questions, look at things from a different angle, seeking many alternatives or different ways; changing the approach or way of thinking. (3) Originality which includes: generating new or unique means or phrase, compile unusual way, create unusual combinations of parts or elements. (4) Elaboration which includes: developing an idea or product; specifies the details of an object, idea, or situation so that it becomes more attractive. Based on the above explanation, the mathematical creative-thinking ability in this resarch is meausred based on fluency, flexibility and originality, and its elaboration.

## IV. SEARCH, SOLVE, CREATE AND SHARE (SSCS) MODEL

Search, Solve, Create, and Share (SSCS) Model is learning model that uses problem-solving approach and is designed to develop thinking skills in problem solving. This model was first developed by Pizzini in 1988 for natural sciences subjects. Furthermore Pizzini, Abel and Shepardson (1988) and Pizzini and Shepardson (1990) developed this model and said that this model is not only applicable to science education, but also suitable for mathematics education (Irwan, 2011: 4). This model refers to the four phases, namely the phase of investigating the problem (Search), plan and implement problem solving (Solve), constructing the problem-

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solving (Create), and the latter is to communicate the results obtained solving (share). The complete four phases can be seen in Table 1 below.

**Table 1.** SSCS Model Phases

| Phase | Activities Performed |
|---|---|
| Search | Understanding the problem/question or condition that is given to students, which consist of what is known, what is unknown, what is being asked.<br>Observing and investigating the condition.<br>Creating tiny questions.<br>Analyzing existing information to form a set of ideas. |
| Solve | Producing and implementing the plan to find solutions<br>Developing critical thinking and creative skills, forming hypotheses in this case hypothetical answer.<br>Choosing a method to solve the problem.<br>Collecting the data and analyze. |
| Create | Creating a product in the form of solutions to problems based on allegations that have been selected in the previous phase.<br>Examining the allegations made whether right or wrong.<br>Showing the results creatively as possible and if necessary the student can use graphics, poster or model. |
| Share | Communicating with teachers and other groups of friends on the findings, the problem solution. Students can use the recording media, video, posters, and reports.<br>Articulating their ideas, getting feedback and evaluate the solutions. |

(Source: Pizzini, Abel dan Shepardson (1988)

## V. THE IMPLEMENTATION OF SSCS MODEL AIDED BY MATLAB ON INTEGRAL MATERIALS

The following is a given example related to the implementation of SSCS model aided by matlab on integral material as seen from the students' mathematical problem solving and creative thinking.

Example: Given function $f(x) = \sin x \, cos^2 x$

Determine:

a. The integral result of the f (x) function
b. Another way to get the integral result of the f (x) function
c. The integral result of the f (x) function with matlab program
d. The graph of the f (x) function with matlab program
e. The graph of the integral result of the f (x) function with matlab program

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**Searching Phase (Understanding the problem/question)**

Known : $f(x) = \sin x \, cos^2 x$

Questioned

a. $\int \sin x \, cos^2 x \; dx = \cdots$?

b. Another ways to find out $\int \sin x \, cos^2 x \; dx = \cdots$?

c. Integral result of the $f(x)$ function with Matlab program?

d. Graph of the $f(x)$ function with Matlab program?

e. Graph of the ntegral result of the $f(x)$ function with Matlab program?

**Solve Phase (Planning and Implementing the Problem Solving)**

a. $$\int \sin x \,.\, \cos^2 x \, \mathrm{dx} = \int \sin \mathrm{x} \left(1 - \sin^2 x\right) \mathrm{dx} = \int \left(sin \, \mathrm{x} - \sin^3 x\right) \mathrm{dx}$$

$$= \int \sin \mathrm{x} \, \mathrm{dx} - \int sin^3 \, x \, \mathrm{dx}$$

$$= -\cos \mathrm{x} - \int sin x \; - \sin^2 \mathrm{x} \, \mathrm{dx}$$

$$= -\cos \mathrm{x} - \int sin x \; \left(1 - \cos^2 x\right) \mathrm{dx}$$

$$= -\cos \mathrm{x} - (\int sin x \, \mathrm{dx} - \int \sin \mathrm{x}. \cos^2 x \; \mathrm{dx}$$

$$= -\cos \mathrm{x} - \left( - \cos \mathrm{x} + \frac{1}{3} cos^3 \, x \right) + c$$

$$= -\cos \mathrm{x} + cos \, \mathrm{x} - \frac{1}{3} cos^3 \, x + c$$

$$= -\frac{1}{3} cos^3 \, x + c$$

Thus, $\int \sin x \,.\, \cos^2 x \, \mathrm{dx} = -\frac{1}{3} cos^3 \, x + c$ , where *c* is any constanta.

**Create Phase**

In this phase, the students are asked to use the matlab program to find out the integral result of the given problem/question. In addition, in this phase, the students are also asked to describe the graph of the function and the unknown integral results. More than that, in this phase the students are asked to solve various related problems as creative as possible. The result are shown in the table result of processing by using Matlab.

b. Second Alternative Solution

Suppose that u = cos x $\Rightarrow$ du = - sin x dx $\Rightarrow$ -du = sin x dx

$$\int \sin x \,.\, \cos^2 x \, \mathrm{dx} = -\int u^2 du = -\frac{1}{3} u^3 + c = -\frac{1}{3} cos^3 \, x + c$$

Thus, $\int \sin x \,.\, \cos^2 x \, \mathrm{dx} = -\frac{1}{3} cos^3 \, x + c$ , where *c* is any constanta.

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Third Alternative Solution:

Suppose that $u = \cos^2 x \Rightarrow du = 2 \cos x (-\sin x)\, dx$

$\Rightarrow - du = 2 \cos x . \sin x\, dx$

$\Rightarrow dv = \sin x\, dx \Rightarrow v = - \cos x$

Use the formula: $\int u\, dv = u . v - \int v\, dv$

$$\int \sin x . \cos^2 x\, dx = -\cos x . \cos^2 x - \int 2 \cos x . \cos x . \sin x\, dx$$

$$\Leftrightarrow \int \sin x . \cos^2 x\, dx + \int 2 \sin x . \cos^2 x\, dx = -\cos^3 x + c$$

$$\Leftrightarrow 3\int \sin x \cos^2 x\, dx = -\cos^3 x + c$$

$$\Leftrightarrow \int \sin x . \cos^2 x\, dx = -\frac{1}{3}\cos^3 x + c$$

Thus, $\int \sin x . \cos^2 x\, dx = -\frac{1}{3}\cos^3 x + c$, where $c$ is any constanta.

c. Integral result by using Matlab program

```
>> syms x
>> f=sin(x)*(cos(x))^2
>>int (f)
```

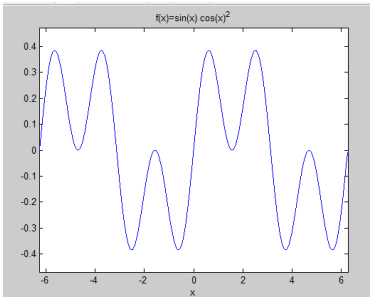
The obtained result :

```
-1/3*cos(x)^3
```

d. Graph result by using Matlab program

```
>> syms x
>> f=sin(x)*(cos(x))^2
>>ezplot (f)
```

Thus, the obtained graph result if if it is done by using Matlab program:




e. Graph of integral result of the *f* (x) function with Matlab program

In order to be able to describe the graph of the integral result of the *f* (x) function, the following steps/stages should be done:

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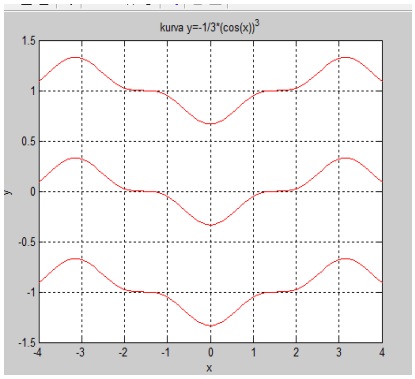
```
clc;
clear all;
for c=-5:1:5;
    x=-5:0.1:5
    y=(-1/3)*(cos(x)).^3+c;
    plot(x,y,'r','linewidth',1)
    axis([-4,4,-1.5,1.5])
    xlabel('x')
    ylabel('y')
    title('kurva y=-1/3*(cos(x))^3')
    hold on
    grid on
end
```




**Share Phase**

In this phase, each group discusses to other groups and teachers on the findings obtained of the above mentioned problems/questions. In this phase, students can use a variety of media such as microsoft power point, recordings, posters and reports. The results of the discussion can be used as feedback for both students and teachers towards the obtained findings/results.

## VI. RESEARCH METHODOLOGY

This research was conducted on XII graders of Natural Sciences Class at three State Islamic Senior High Schools or *Madrasah Aliyah Negeri (MAN)*, namely MAN 1, MAN 2 and MAN 3 Banjarmasin with the total sample numbers are 216 students. Each class was divided into two classes, the experimental and control classes. The division was using cluster random sampling (Sugiono, 2010). The method used in this research is true experimental design with post-test only control experimental design. The reseach instrument used in this research was the problem solving and creative thinking abilities tests with the following details:

The mathematical problem solving and creative thinking tests in this research was in the form of essay questions. The delailed indicators for every aspect can be seen on the following table:

**Table 2.** The Indicators of Mathematical Problem Solving and Creative Thinking

| Aspect | Measured Indicators |
|---|---|
| Problem Solving | Understanding the problem which involves the ability to identify the adequacy of the data and ability to create a mathematical model of a situation or everyday problem<br>Planning and resolving the problem solving, including the ability to select and implement strategies to solve model or given problems<br>Responding to the problem, including the ability to explain or interpret the results in accordance with the given problem, and write / verify the the validity of the results or answers |
| Creative Thinking | Ability to create something new, unusual, different clever ideas which are gotten through uncomon ways, able to create combinations from uncommon parts or elements |

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| | |
|---|---|
| | Ability to generate many ideas, many answers, many problem-solving<br>Generating ideas, answers, or varied questions, ablity to view problems from different point of views.<br>Elaborate or specifying the details of an object in detail and more attractive |

To obtain data on the students' mathematical problem solving and creative thinking, scoring is done on each items of the students' answers. The scoring guideline is briefly discussed as the following:

a) Scoring Guideline for Problem Solving Ability

The scoring creteria for the problem solving ability which was used in this research is the modification of scoring rubric from analytical scale for problem solving (Szetela, Walter, and Nicol, 1992), and presented on the table 3, as following:

**Table 3.** Scoring Rubric for Problem Solving Ability

| **Measured Aspects** | **Students' Response toward the questions or problems** | **Score** |
|---|---|---|
| Understanding the Problem/Question | Students do not write anything about what is known and being asked from the question | 0 |
| | Students are able to write the answer (what is known or being asked) of the problem/question but false all | 1 |
| | Students are able to write the answer (what is known or being asked) of the problem/question correctly but incomplete | 2 |
| | Students are able to write the answer (what is known or being asked) of the problem/question correctly and completely | 3 |
| Planning and Implementing Problem Solving | Students do not give any answer at all | 0 |
| | Students are able to identify problems/questions, together with the ways of problem solving (the use of formulas and characteristics of the integral, substitution techniques, techniques of partial integration) but did not lead to the right answer or false/wrong all. | 1 |
| | Students are able to identify problems/questions, together with the ways of problem solving (the use of formulas and characteristics of the integral, substitution techniques, techniques of partial integration), and lead to the right answer, but the calculation processes are incomplete. | 2 |
| | Students are able to identify problems/questions, together with the ways of problem solving (the use of formulas and characteristics of the integral, substitution techniques, | 3 |

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| | | |
|---|---|---|
| | techniques of partial integration), and result the right answer and the obtained answers are complete. | |
| Verying the truth of the problem solving result | Students cannot write the conclusion or write the conclusion but wrong and incomplete | 0 |
| | Students write the conclusion correctly and completely | 1 |

b) Scoring Guideline for Creative Thinking Ability

The scoring creteria that is used for the creative thingking ability was modified from Bosch (1997), and presented in the table 4, as following:

**Table 4.** Scoring Guideline for Creative Thinking Ability

| **Measured Aspects** | **Students' Responses towards the problems/questions** | **Score** |
|---|---|---|
| (Elaboration) Elaborasi | Not answer the questions or Providing/giving the wrong answer | 0 |
| | Providing and giving answers that lead to the correct one, but there is an error/errors in problem solving without clear details | 1 |
| | Providing/giving the right answer, but there is an error /errors in solving the problems/questions accompanied by unclear and incomplete details. | 2 |
| | Providing/giving the right answer, but there is an error /errors in solving the problems/questions accompanied by clear and complete details. | 3 |
| | Providing/giving the right answer, and there is no error /errors in solving the problems/questions accompanied by clear and complete details. | 4 |
| Fluency | Not answer the questions at all or Providing/giving the wrong answer | 0 |
| | Providing one or more ways / ideas which relevant to the problem solving, but the revelation is unclear or incomplete | 1 |
| | Providing one or more ways / ideas which relevant to the problem solving, with clear and complete revelation | 2 |
| | Providing more ways/ideas wich relevant to the problem solving and accompanied by unclear revelation. | 3 |
| | Providing more ways/ideas wich relevant to the problem solving and accompanied by clear and complete | 4 |

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| | | |
|---|---|---|
| | revelation. | |
| Flexibility | Not answer or giving answer with one or more ways out but wrong/false | 0 |
| | Providing or giving answer with one or more ways, but the process of completion is wrong and does not lead to the right/correct answer | 1 |
| | Providing or giving answer with one other way, the process of completion is right/correct, leads to the right/correct answer but incomplete | 2 |
| | Providing or giving answer with more than one ways, the completion process is right/correct, but incomplete | 3 |
| | Providing or giving answer with more than one ways, the completion process is right/correct, the answer is right/correct and complete | 4 |
| Originality | Not answer at all or not providing/giving the completion/solution by him/herself | 0 |
| | Providing/giving the answer, doing it by him/herself, but the answer cannot be understood | 1 |
| | Providing/giving the answer, doing it by him/herself, but the answer is understandable but incomplete | 2 |
| | Providing/giving the answer, doing it by him/herself, the answer is understandable but incomplete and the result is wrong/false | 3 |
| | Providing/giving the answer, doing it by him/herself, the answer is understandable, complete, and the result/answer is right/correct. | 4 |

Drafting or Preparing the test or questions of the students' mathematical problem solving and creative thinking skills is based on the mathematics syllaby of SMA/MA curriculum and adjusted with the purpose of research. Before the above test/questions are used, they are previously validated by experts to see the content validity and face validity of the test/questions and processed using Cohran formula. After the instrument for the students' mathematical problem solving and creative thinking skills is stated to meet the the content and face validity, then the questions or items were tried out to see the validity and reliability by using product Moment correlation and Cronbach-Alpha formulas. The data of this research are analyzed by using the average formula (mean), deviation standard (DS), the normality test, homogeneity test, Student's t test or Mann-Whitney (U).

## VII. RESEARCH RESULTS/FINDINGS

Reaserach findings which is meant in this research is the description of problem solving and creative thinking ability of the XII graders of Natural Sciences Class of Islamic State Senior High Schools/*Madrasah Aliyah Nigeria* (MAN), especially on experimental class and control class, together with testing the hypothesis.

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1) Data Description on Problem Solving Ability

The data from tests of mathematical problem solving ability of the XII garders of each MAN in Banjarmasin obtained from the experimental class and control class is presented in the table 5 below.

**Table 5**

| No | Centralization and dessimination of the Data | Mathematical Problem Solving Ability of the XII Graders of Natural Sciences Class | | | | | | The Average Score (Mean) | |
|---|---|---|---|---|---|---|---|---|---|
| | | MAN 1 | | MAN 2 | | MAN 3 | | | |
| | | E | K | E | K | E | K | E | K |
| 1 | Mean | 79.42 | 70.63 | 80.55 | 69.82 | 77.94 | 67.12 | 79.30 | 69.19 |
| 2 | Deviation Standard | 22.64 | 23.28 | 21.84 | 25.38 | 22.45 | 25.81 | 22.31 | 24.82 |
| 3 | Minimum Score | 44.44 | 22.22 | 44.44 | 22.22 | 44.44 | 16.67 | 44.44 | 20.37 |
| 4 | Maksimum Score | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

Note: E = Experimental Class; K = Control Class

Based on table 5 above, it is seen that the overall mathematical problem solving of the XII graders of Natural Sciences after they were given treatment at each school by using SSCS and Conventional Model on Integral Material, such as the average problem-solving abilities of the XII graders of Natural Sciences Class by using SSCS and conventional models aided by Matlab on indefinite integrals material are 79.30 (good category) in the experimental class and 69.19 (good category) in the control class.

Furthermore, the students' mathematical problem solving ability which is based on the indicators adopted in this study, namely understanding the problem, planing and implementing the problem solving, verifying the true results of problem solving for each respective MAN 1, MAN 2 and MAN 3 Banjarmasin can be seen in Figure 1 below:

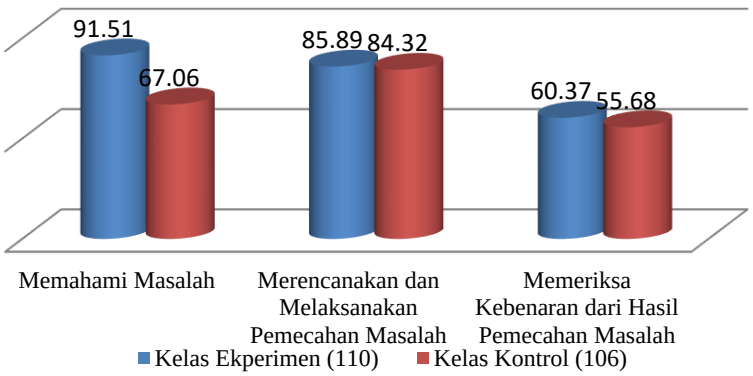


**Figure 1.** Scoring Percentage of the Problem Solving Ability of the XII garders of Natural Sciences Class in MAN Banjarmasin

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The Figure 1 above showed that XII graders of Natural Sceices Class of MAN in Banjarmasin who took part in learning by using SSCS learningg Model assisted Matlab (Experimental class) from a total of 110 students obtained the average percentage score of mathematical problem-solving ability which consist of understanding the problem, planning and implementing the problem solving, verifying the true results of the problem solving, got respectively for 91.51%, 85.89% and 60.37%. While in control class which applied conventional learning model assisted by Matlab from a total of 106 students, it is obtained the average percentage score respectively for 67.06%, 84.32% and 55.68%.

2) Data Description on Students' Mathematical Creative Thinking

The data of the mathematical creative thinking ability of the XII graders of Natural Sciences Class of each MAN in Banjarmasin on the Experimental and Control Class is presented in the following table 6:

**Table 6**

| **No** | **Centralization and Dessimination of the Data** | **Mathematical Creative Thinking Ability of the XII Graders of Natural Sciences Class** | | | | | | **The Average Score (Mean)** | |
|---|---|---|---|---|---|---|---|---|---|
| | | **MAN 1** | | **MAN 2** | | **MAN 3** | | | |
| | | **E** | **K** | **E** | **K** | **E** | **K** | **E** | **K** |
| 1 | Mean | 80.66 | 71.79 | 79.61 | 72.79 | 80.27 | 73.96 | 80.18 | 72.85 |
| 2 | Deviation Standard | 17.95 | 17.85 | 17.52 | 15.13 | 17.85 | 16.07 | 17.77 | 16.35 |
| 3 | Minimum Score | 56.25 | 50.00 | 50.00 | 50.00 | 50.00 | 46.88 | 52.08 | 48.96 |
| 4 | Maksimum Score | 100 | 100 | 100 | 93.75 | 100 | 100 | 100.00 | 97.92 |

Note: E = Experimental Class; K = Control Class

Based on table 6 above, it is known that the overal ability of mathematical creative thinking of the XII graders of Natural Sciences of MAN in Banjarmasin who are treated in learning by using SSCS and Conventional Model assisted by Matlab program on integral materials is 80.18 (very good category) in experimental class, and 72.85 (good category) in control class.

Furthermore, the mathematical creative thinking ability of students in this study are based on provided indicators, namely originality, fluency, flexibility and elaboration for each school, namely MAN 1, MAN 2 and MAN 3 Banjarmasin whichcan be seen in Figure 2 below.

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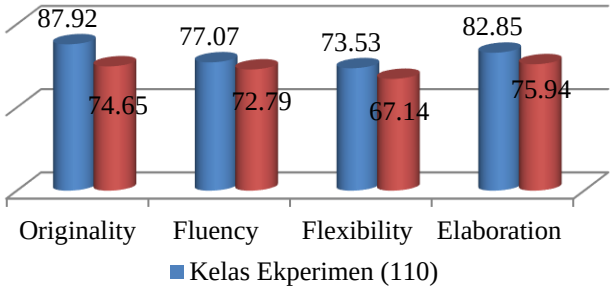


**Figure 2.** Scoring Percentage of Mathematical Creative Thinking Ability of the XII Graders of Natural Sciences Class of MAN in Banjarmasin

The figure 2 above showed that XII graders of Natural Sciences Class of MAN in Banjarmasin who took part in learning by using SSCS learning Model assisted by Matlab progra (Class Experiment) with a total of 110 students obtained an average score percentage of mathematical creative thinking ability which involves originality, fluency, flexibility, and elaboration got respectively for 87.92%, 77.07%, 73.53 and 82.85%. While in control class which applied conventional learning Model assited by Matlab program with a total of 106 students, obtained an average percentage score respectively for 74.65%, 72.79%, 67.14% and 75.94%.

3) Hypothesis test for the data of the students' mathematical problem solving and creative thinking test on the both samples

Since both samples of this research for the data of the students' mathematical problem solving, and creative thinking ability are not normally distributed, thus, to test the hypothesis Mann-Whitney test or U-test is used. By utilizing the SPSS 17, the U-test results can be seen in table 7 below.

**Table 7.** Mann-Whitney Test/U-Test

| | **Problem Solving** | **Creative Thinking** |
|---|---|---|
| Mann-Whitney U | 4406.500 | 4142.000 |
| Wilcoxon W | 10077.500 | 9813.000 |
| Z | -3.205 | -3.690 |
| Asymp. Sig. (2-tailed) | .001 | .000 |

Based on table 7 above, the statistic value of z-test for the problem solving is greater than the value of table Z that is 3, 205> 1.96. Thus, the decision is that Ho is rejected. In other words, that there are significant differences between the data of mathematical problem solving ability of students in the experimental class and in the control class of the XII graders of Natural Sciences class of MAN in Banjarmasin. In addition, for the statistic value of z-test on creative thinking ability is greater than the value of table Z, ie 3.690> 1.96, Thus, based on the hypothesis, Ho is rejected. In other words, that there are significant differences between the data on the students' ability to think creatively on the experimental class and in the control class.

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## VIII. DISCUSSION

Based on the research results described above, the students' mathematical problem solving and creative thinking ability in the experimental class which were taught by using the SSCS learning model assisted by Matlab program on indefinite integral material obtained the value, respectively for 79.30 (Good category) and 80.18 (Very good category). While in control class which were taught using Conventional learning model assisted by Matlab program on indefinite integral material gain value, respectively for 69.19 (Good category) and 72.85 (Good Category). Furthermore, by testing the samples for both classes using the Mann-Whitney or U-Test, it was concluded that there are significant differences between students' mathematical problem solving ability and their mathematical creative thinking ability.

The difference of high and low achievement of the students in the experimental class and the control class indicated that the application of the SSCS learning Model assisted by Matlab program is better than conventional learning model assisted by matlab program, epecially on indefinite integral material for the XII graders of Natural Sciences of MAN in Banjarmasin. This is because the SSCS learning model focuses on students-centered learning. In addition to that, the SSCS learning may train the students to solve problems with the stages or steps of the completion systematically and independently. Teachers are no longer as the center of the learning and teaching process but more to be a facilitator who guides the teaching and learning process in classroom to train the students to have mathematical problem solving and creative thinking skills. Whereas in conventional learning, the teacher as the source of the teaching and learning process. The Students tend to be passive, or in other words, they are in this case just listening to the teacher's explanation that the mathematical problem solving and creative thinking cannot be developed.

The Search, Solve, Create And Share (SSCS) learning model in this study consists of four stages of learning, namely: to identify the problem (Search), planning and implementing the completion of the given problems (solve), state the results which relate to the given problem based solutions from the previous stage (create), communicate the results of the completion or the solved problem (Share). In the process of learning, the students were given students' worksheet (LKS) and completed it in groups. The LKS in the experimental class was different from the one in the control class. In the experimental class, the LKS given was completed with the stages or steps of learning using the SSCS Model assisted by matlab program. In the control class, the LKS did not present such steps of SSCS learning model, but written in the form of materials, sample questions, simulations and exercises Matlab program. In the process of conventional learning, the teacher explains the material and then give examples of problems, provide a simulation of program matlab, do FAQs, providing question and answer practice on the board, the students do exercises and discuss in groups with other groups, the students are given the opportunity to write down the results of the works on the board and the teacher assess and evaluate the works and then discuss it. The final or post-test were given to the students were the same to both experimental and control class. The difference was only in the learning model used in class. This test was given to measure the students' mathematical problem solving and creative thinking. Based on the results of the students' work at the final or post-test, the students' mathematical problem solving and creative thinking ability on experimental class is higher than the students' ability in control class.

Based on the above explanation, it is concluded that that the mathematical problem solving and creative thinking ability of the XII graders of Natural Sciences Classes of Islamic State Senior High

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Schools/*Madrasah Aliyah Nigeria (MAN)* in Banjarmasin that was treated or taught by using SSCS learning model assisted by matlab program on indefinite integral materials is better than those who were treated or taught by using Conventional learning model assisted by matlab program.

## IX. CONCLUSION

1. The ability of the mathematical problem solving of the students on integral material by using SSCS and Conventional learning Models assisted by Matlab Program are both in good category.
2. The ability of the mathematical creative thinking of the students on itegral material by using SSCS and Conventional learning Models assisted by Matlab Program are in very good category and good category respectively.
3. There are significant differences between mathematical problem solving ability on indefinite integral materials of the students who were treated or taught by using SSCS Learning Model assisted by Matlab Program and those who were treated or taught by using Conventional Learning Model assisted by matlab program.
4. There are significant differences between mathematical creative thinking ability on indefinite integral materials of the students who were treated or taught by using SSCS Learning Model assisted by Matlab Program and those who were treated or taught by using Conventional Learning Model assisted by matlab program.

## X. SUGGESTIONS AND RECOMENDATIONS

1. As a good contrubution and information for educational analists that SSCS Learning Model assisted by Matlab Program can be used as an alternative learning model in order to improve students' mathematical problem solving and creative thinking ability.
2. For other researchers, considering the existing limitations in this research, it is suggested to conduct similar further advanced research on the different spots and characteristics, as well as wider subject on the other mathematical concepts. In addition to that, the research facilities and supporting infrastructure such as Laptop or Personal Computer need to be considered.

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