

## Effectiveness Implementation of Gagne's Learning Theory with Combination Problem-Solving Approach to Ability Think Critical Student

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<b>Corresponding author:</b>	<b>Abstract</b>
Wahyuni Suryaningtyas, wahyuni.pendmat@fkip.um- surabaya.ac.id	21st century education requires students to have various abilities and skills including critical thinking. For this reason, it is necessary to apply learning theory in shaping students' thinking ability activities. This study aims to determine the effectiveness of learning mathematics through Gagne's Learning Theory with a combination of Problem Solvers at SMP Negeri 55 Surabaya. The subjects of this study were 36 students of class IX-E at SMP Negeri 55 Surabaya. The type of research used is quantitative descriptive research. Learning instruments and tools in learning used are lesson plans, worksheets, learning completeness results questions (test questions), student activity observation sheets, teacher ability observation sheets to manage learning, and student response questionnaires. The results of the study show that: (1) student activity during learning is in the active category; (2) the teacher's ability to manage abstract learning is very good; (3) Many students achieve 91% completeness with an average score of 3 for the indicator of critical thinking skills; and (4) student response to the learning process is very positive. The results of the study can be concluded that the application of Gagne's Learning theory with a combination of Problem Solving is effectively used in learning mathematics because it meets all the criteria for learning effectiveness.
<b>Keywords:</b> effectiveness; gagne's learning theory; problem- solving; critical thinking	

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### INTRODUCTION

The world of education is currently required to produce human resources who have the abilities and skills of the 21st century, namely communication skills, critical thinking skills and Problem-Solving, creativity and innovation abilities, and skills in working together. Not only do 21st Century skills help students be successful in all areas of formal school, but these skills are also necessary for a person to adapt and thrive in an ever-changing world (Stehle & Peters-Burton, 2019). For The government start planning Skills at the beginning of the 21st century and implemented them through education in the curriculum in 2013. Curriculum 13 designed government use draft Skills 21st century and also adopt two draft main that is approach scientific as well as evaluation authentic (Andrian & Rusman, 2019). Second draft This is importantly used even before education in the 21st century emerges. at this time learning 21st century already Lots of experience change, learning No only teacher-centered but participant-centered education. This is done to hone the ability of participants to educate in prowess thinking and learning in the known 21<sup>st</sup> century with the term "The 4C Skills," ie Communication, Collaboration , Critical Thinking and Problem-Solving, and Creative and Innovative (Sugiyarti et al., 2018).

21st-century capabilities component think level tall the most basic is the ability to think critically. this is in line with the opinions of Krulik and Ridnick cited in A journal state that order-level thinking started from memory, reasoning (thinking base), and think level tall (thinking critically and thinking creative (Indraswati et al., 2020). The ability to think critically is a cognitive process in analyzing in a manner systematic and specific problems encountered, distinguishing problems in a manner careful and thorough as well as identifying and studying information to use in planning a solution strategy something a problem (Firdausi et al., 2021). In finishing something problem so students demanded capable thinking critical.

Each year the National Council for Excellence in Critical Thinking (NCECT) (2017) meets to discuss critical thinking. NCECT states that critical thinking is defined as an intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action. Quote the quoted from the Journal of International Studies which is whole explain related importance ability think critically owned by student's school medium to use face hard and hopeful increased academic.

The ability to think critically must own the whole student in various fields moment this is one of them in the field of math. Mathematics is knowledge frequently basis used as an alternative to solving the problem in various field knowledge (Janna et al., 2022). So they not seldom mathematics called as king of knowledge. Mathematics can grow and develop with the thought process and critical and creative as the good ability through logic student (Arum et al., 2021). The ability to think critical student in learning mathematics is very needed to understand and solve something problem or question required math reasoning, analysis, evaluation, and interpretation thought (Zakaria et al., 2021).

Choosing the right learning approach is considered very important in playing a role in improving students' critical thinking skills in learning mathematics. Several models of learning approaches are applied by educators with the intention that students can easily understand the learning material presented (Galang et al., 2016). The learning approach that can be used is the Problem-Solving approach using Gagne's learning theory. Approach This use collaborated with the theory studied by Gagne because there is harmony in steps both are capable increase the ability to think critically student. Gagne's learning theory is a series of learning steps put forward by Robert M. Gagne called the Nine Instructional Event Gagne.

Learning is a set of processes that are internal for each individual as a result of the transformation of stimuli originating from external events in the environment of the individual concerned (conditions), order conditions external is more meaningful and should be organized in the sequence of events study (Gagne, 1985). Incident Study according to Gagne can cause learning processes and cognitive processes of students which will be used as a stimulus in bringing up various abilities as well as Skills in self student.

Incident Study according to Gagne quoted from the International Journal of Education and Research that is Gagne's events of instruction involve nine activities namely Gaining attention, informing the learner of the objective, stimulating recall of prior learning, presenting the stimulus, providing learning guidance, eliciting performance, providing feedback, assessing performance and enhancing retention and transfer (Ngussa, 2014). Other journals also described that step incident Study according to Gagne consists of (1) Paying attention; (2) Inform learning objectives and concepts; (3) Rebuilding past knowledge; (4) Serve learning as stimulation; (5) Deliver guide learning; (6) Displays performance; (7) Deliver bait back; (8) Assess performance; (9) Improve memory and knowledge transfer (Milka, 2014).

Ninth step study Gagne if held in a manner sequentially so will form something incident learn what can influential for both internal and external perpetrator study for reach something capability desired study. Capability Study according to Gagne divided is into five is verbal information, skills intellectual, cognitive strategies, attitudes, and skills motor. learning theory Gagne's Nine Instructional Events is a step combined learning with approach learning other. It No will affect Gagne's steps because steps can be done without seeing the order. So the theory studied by Gagne is greatly flexible combined with models, methods, and approaches other in learning.

Approach learning Problem-Solving is one of the approaches used in learning math. Problem-Solving is an approach that requires students to solve problems by using identification, exploring, looking for solving steps, and finally finding solutions (Wirnayanti et al., 2019). This approach can help improve students' ability to ask questions, identify, and answer problems, so that students are active in thinking and creative in finding a solution to a problem and concluding it. The Problem-Solving approach model is a problem-based learning model in which existing problems are given by educators to grow and develop students' critical and creative thinking skills in the Problem-Solving process.

Students will be able to become reliable and independent thinkers through Problem-Solving, where students are required to think critically in responding to and identifying a problem and solving it realistically (Ruswadi, 2013). According to Rosmiatin, the characteristics of the Problem-Solving approach are (1) there is the interaction between students and also educators and students; (2) there are mathematical dialogues and joint opportunities between students regarding concepts; (3) the teacher provides sufficient information about the problem and students clarify, interpret, and try to construct a solution; (4) the teacher accepts yes-no answers not to evaluate; (5) the teacher guides, trains, and asks insightful questions in Problem-Solving; (6) the teacher should know when to intervene and when to back off letting students use their way of solving problems (Wirnayanti et al., 2019).

Wade Wena put forward the steps of Problem-Solving quoted from a journal, namely (1) Identification of the problem; (2) Identifying problems; (3) Looking for solutions; (4) Implementing the strategy; (5) Reviewing and evaluating influence (Wartini et al., 2018). The advantages of Problem-Solving according to Shoimin in A journal namely (a) Can make participants educate more live life daily; (b) Train and get used to participant educate For face and solve a problem; (c) Develop the ability to think participant educate in a manner critical and creative ; (d) Train participant educate For designing something discovery; (e) Solve problems encountered in a manner realistic; (f) Stimulating development progress to think participant educate in finish problems encountered with appropriate (Putra et al., 2016).

Problem-Solving is not only just a method of teaching but also is something method think because in its application Problem-Solving can use methods another started for looking for data later to the interesting conclusion (Shanti & Abadi, 2015). Problem-Solving can be used in a manner effective at engaging learning groups. This is based on research conducted by Erna Ilmiati which proves that learning using effective problem-solving is used in learning groups (Ilmiati, 2020). In groups Study student trained For each other Work The same with student other in groups small. So that students can each other share knowledge and experience as well as look for information that can use to finish problem. The Problem-Solving approach used in groups will be in line with the concept of Gagne's learning theory, which theory also requires grouping students.

Learning theory Gagne is a Suite incident Study named nine instructional event Gagne that contains steps Study start from giving motivation up to the evaluation process. Whereas Problem-Solving approach is a Suite of steps to solve a problem starting from identification until find a solution. Both of them can be applied in the same learning

process, where step learning in a manner general use Suite incident Study Gagne and in the process of breaking problem use series of Problem-Solving processes. The connection between both of them each other complete deficiency and emptiness of each other for learning to become more easily understood and get reach the objective from Study That alone.

Research conducted by Dewi Sartika proves that implementing Problem-Solving learning can improve students' critical thinking skills in mathematics (Sartika, 2021). While the research conducted by Rifqiyyatush Sholihah proves that the theory Study Gagne that is Gagne's Nine Instructional Events own contribution in increase pattern think a student in A teaching (Al-Mahiroh & Suyadi, 2020). A study related to Gagne's other theory was also carried out by Ketut Bali Sastrawan Where results prove that the theory of Gagne is capable increase the ability of intellectually cognitive students (Sastrawan et al., 2020). Besides that Research conducted by Rika Wahyuni also proves that approach Problem-Solving liked effective in increasing the ability to think critically in students learning mathematics those students belong active during learning currently going on (Wahyuni et al., 2018).

Some studies on description learning to use theory studied Gagne and his approach Problem-Solving. However Still Not yet There is combined research on both, so need exists study continuation to expand insight and experience in possible learning done by educators to increase the ability to think critically student.

## RESEARCH METHOD

The type of research used is the *pre-experimental design method* using one class without a control class. This research was conducted to determine the effectiveness of learning mathematics through Gagne's learning theory with a combination of *Problem-Solving approaches* to the mathematical critical thinking skills of class IX students of SMP Negeri 55 Surabaya. The research design used in this study was a *pre-experimental design* in the form of a *one-shot case study*. *One shot case study* is a research design that involves only one experimental class which is carried out without a comparison class and a pre-test (Rukminingsih et al., 2020). The design model is as follows.

Table 1. Pre-experimental Design Model for One Shot Case Study

Group	Pre-test	Treatment	Post-test
Experiment	-	X	Q

Information:

- X : Treatment, namely learning mathematics by applying Gagne's learning theory with a combination of Problem-Solving
- T : Final test or evaluation after treatment

This research was conducted in the odd semester of the 2022/2023 school year at SMP Negeri 55 Surabaya which is located on Jalan Pegesangan 4 Mulia, Jambangan District, Surabaya City. A population is an object or subject that has certain qualities and characteristics as a whole in a study. The population in this study were all Class IX-E students at SMP Negeri 55 Surabaya for the 2022/2023 academic year. While the sample is part of a population that has certain characteristics. The sample in this study was Class IX - E SMP Negeri 55 Surabaya with details of 17 male students and 19 female students. Samples were taken using a random sampling technique where each element used as a sample was taken randomly.

### Data Collection Techniques and Instruments

Data collection techniques are the methods used to obtain research data. This descriptive quantitative research uses data collection techniques, namely observation, questionnaires, and tests. While the data collection instrument is a procedure used to determine the success rate of the learning process. Data collection instruments used in this study are.

1. Observation Sheet Activity Student in the Learning Process Mathematics  
These instruments are used to get data about the activity student during the learning process going on. Observation sheet This is used for net activity students during they study on lessons applied mathematics theory study Gagne with combination approach purposeful Problem-Solving for get activity data student during learning going on.
2. Observation Sheet Master's ability to Manage Learning  
Observation sheet teacher's ability to manage to learn used to obtain teacher ability data as well as see teacher success in managing learning that applies Gagne's Learning Theory with Combination *Problem-Solving* along with the RPP that has been made by researchers. Observation sheet filled with give sign check in the appropriate column with assessed aspects.
3. Test Ability Think Critical Mathematical Student  
Testability thinks critical mathematical student form description of as many as 10 questions, which aims to measure the ability to think critical mathematical after student carry out the learning process. According to Facione (1994) in A journal state that there are six indicators of the ability to think critically that is interpretation, analysis, evaluation, inference, explanation, and regulation of self (Rani et al., 2018). But in this research, the researcher only uses indicators to think critically that is interpretation, analysis, evaluation, and inference. For obtaining ability data think critically about students, and do scoring to answer students for each grain question. Criteria scoring used is score modified rubric from Facione (1994), Ismaimuza (2013), and Karim (2015).

Table 2. Guidelines for Scoring Critical Thinking Skills

Indicator	Information	Score
Interpretation	Do not write down what is known and what is asked	0
	Write down what is known and what is asked with No appropriate	1
	Write down what is known just with appropriate or being asked just with appropriate	2
	Write known from the question with appropriate but not enough complete	3
	Write down what is known and asked from the question with precise and complete	4
Analysis	Not creating a mathematical model date question given _	0
	Create a mathematical model from the question given but no appropriate	1
	Create a mathematical model from the question given with appropriate without giving the explanation	2
	Create a mathematical model from the question given appropriately but There is an error in the explanation	3
	Create a mathematical model from damn given with right and deliver the correct and complete explanation	4
Evaluation	Not using deep strategy finish question	0
	Use a strategy that doesn't right and does not complete the finished question	1



	Using the right strategy in the finish question, however not complete or using an indifferent strategy appropriate but complete in the finish question	2
	Using the right strategy in the finish question, complete but do errors in calculation or explanation	3
	Using the right strategy in the finish questions, complete and correct in doing calculation or explanation	4
Inference	Not create conclusion	0
	Make no conclusion right and no in accordance with to context question	1
	Make no conclusion appropriate although customized with context question	2
	Make a conclusion with the right, appropriate context but not complete	3
	Make a conclusion with the right, appropriate context question and complete	4

As for the way calculation mark results Study with percentage as following :

$$Percentage = \frac{Gain\ Score}{Maximal\ score} \times 100\%$$

Percentage value ability thinks critical already obtained from results Study students will categorize by table following (Normaya, 2015).

Table 3. Category Percentage of Critical Thinking Ability

Interpretation (%)	Category
$81,25 < X \leq 100$	Very high
$71,5 < X \leq 81,25$	Tall
$62,5 < X \leq 71,5$	Currently
$43,75 < X \leq 62,5$	Low
$0 < X \leq 43,75$	Very low

#### 4. Questionnaire Response Student to Learning Mathematics

Questionnaire response student used for answer question about response student to learning math uses theory study Gagne with combination approach *Problem-Solving*. Good learning model what we can be certain of is can give a response positive for the student after following activity learning. Aspect response student in study This concerns the atmosphere of the class, interest in learning, the way the teacher teaches, and suggestions. The technique used to get response data is to share the questionnaire with the student after ending the meeting and finally for filled in by instructions given. In research, the questionnaire used form questionnaire closed for know response students to learning mathematics use theory study Gagne with combination approach *Problem-Solving*. Response answer consists of 2 categories that are negative and positive.

### Data analysis technique

#### 1. Activity Data Analysis Student

Activity data analysis students can obtain direct with doing observation of the ongoing learning process. Activity data students analyzed with method look for percentage activity student use formula as follows.

$$Percentage\ activity\ student = \frac{\sum f_i}{\sum f} \times 100\%$$

Description:

$f_i$ : the number of activity categories of the students

$f$ : the sum of the frequencies of all student activities

Furthermore calculating the average percentage of activity student activities during the learning process mathematics uses Gagne's Learning Theory with Combination *Problem-Solving*. To determine category activity student active demanded criteria presented in table 4.

Table 4. Student Activity Category

No.	Percentage Activity Student	Category
1.	$0\% \leq \text{active student activity} < 65\%$	Off_
2.	$65\% \leq \text{active student activity} < 80\%$	Less active
3.	$80\% \leq \text{active student activity} < 95\%$	Active
4.	$95\% \leq \text{active student activity} < 100\%$	Very active

(Arikunto, 2016)

## 2. Data Analysis of Teacher Ability to Manage Learning

Data on the ability of teachers to manage to learn obtained from activity observations made at the time apply Gane's Learning Theory with combination *Problem-Solving*. To know the teacher's ability to manage to learn every meeting, used the formula as follows.

$$\text{Score} = \frac{\text{the total score obtained by the teacher}}{\text{Total meetings}}$$

Learning mathematics said effective If the teacher's ability to achieve the criteria. As for the criteria, the teacher's ability to manage to learn is as follows (Arikunto, 2016).

Table 5. Teacher Activity (TA) Category

No.	Mark	Criteria
1.	$0,0 < TA \leq 1,0$	Very not good
2.	$1,0 < TA \leq 2,0$	Not good
3.	$2,0 < TA \leq 3,0$	Good
4.	$3,0 < TA \leq 4,0$	Very good

## 3. Data Analysis of Test Questions Mastery Learning Outcomes

For count completeness results Study students that is with see results score knowledge to test them. The formula for the count percentage completeness Study is as follows.

$$\text{Achievement percentage} = \frac{\text{many students complete}}{\text{Total students}} \times 100\%$$

Whereas formula for count the average value is as following.

$$\bar{x} = \frac{\sum x}{\sum n}$$

Description:

$\bar{x}$  : average value

$\sum x$  : the sum of all student scores

$\sum n$  : the number of students

The calculation percentage must be by criteria completeness studied at SMP Negeri 55 Surabaya, students said complete if mark competence his knowledge get  $KKM \leq 78$  value. Class completeness is achieved if there is  $\leq 85\%$  have completed this class.

## 4. Response Data Analysis Student

Response data analysis student counted use presentation. Response student said effective If percentage response students who answered "agree or happy" is by 70% or more. Percentage of every response student analyzed with formula.

$$P = \frac{A}{B} \times 100\%$$

Description:

Q : percentage response student

A : a lot students who choose

B : amount student

Furthermore results percentage the categorized as based on criteria following:

Table 6. Criteria for Student Response to Learning

Percentage Response Student	Category
$0\% \leq R < 20\%$	Not Effective
$20\% \leq R < 40\%$	Less Effective
$40\% \leq R < 60\%$	Enough Effective
$60\% \leq R < 80\%$	Effective
$80\% \leq R < 100\%$	Very Effective

(Arikunto, 2016)

## RESULTS AND DISCUSSION

In part, this serves as a discussion of the results of research that has processed the data. Presentation results and discussion research uses tables and graphs as means to explain results research and documentation activity research. Research results by the problems posed, so an explanation in section This can explain through sub-sections as follows.

### 1. Activity Student

The study held two meetings at one class on November 8, 2022 and November 10, 2022 with the material subject of "Congruence and Congruence". Activity data students obtained after the following learning using Gagne's Learning Theory with Combination Approach *Problem-Solving*. The liveliness of students in learning graded mathematics including (1) Paying attention and listening to explanations from the teacher; (2) Review material that has then; (3) Discussing and asking the teacher if there is trouble; (4) Engagement and liveliness student in discuss group; (5) Conveying ideas or opinion; (6) Finding solution For every given problem; (7) Show self/do question/displays performance; (8) Join give *feedback* to a friend already follow show self; and (9) Activities No relevant with KBM.

Activity student rated during the learning process teaches currently going on. The observation sheet is shared with the assigned observer in a few corner classes, so evaluation can be done with easy. Then the data from the results observation activity student from meeting first and meeting second analyzed with method count How many big percentage activity students during the learning process. So that will produce mark activity students during follow learning at meetings first and meeting second as well as average activity students during follow the second meeting. Activity results from students are shown in the table under this.

Table 7. Average Student Activity

No.	Syntax Learning Gagne's Learning Theory with Combination Problem-Solving	Activity Student	Meeting to		Aspect average	Information
			1	2		
1.	Learning Steps are Gagne's Nine	Watch and listen teacher's explanation	83,30%	79,02%	81,16%	Active



No.	Syntax Learning Gagne's Learning Theory with Combination Problem-Solving Instructional Events	Activity Student	Meeting to		Aspect average	Information
			1	2		
		Involvement of students in a group	88,70%	91,50%	90,1%	Active
		Discuss or ask the teacher when There is difficulty	85,45%	90,50%	87,97%	Active
		Read and understand the given LKPD	65,97%	64,44%	65,20%	Less Active
		Submit an idea or opinion	82,57%	80,50%	81,53	Active
		Show self or do questions in front of	60,66%	70,55%	65,60	Less Active
2.	PS-1: Formulate Problem	Knowing and formulating problems that exist in LKPD	73,52%	88,70%	81,11%	Active
3.	PS-2: Analyze hypothesis	Discussion students in A group for responding to problems in LKPD	75,97%	88,70%	82,33%	Active
4.	PS-3: Formulate hypothesis	Make formula hypothesis settlement problem from results discussion	81,11%	82,02%	81,56%	Active
5.	PS-4: Collecting and Categorizing Data	Group data from problem, write is known in problem	81,11%	82,02%	82,01%	Active
6.	PS-5: Testing hypothesis	Finish problems in LKPD with assisted by existing data	85,20%	92,40%	88,8%	Active
7.	PS-6: Formulate Recommendation Solving Problem	Make conclusion in the process of completion problem	79,50%	75,60%	77,55%	Less Active
Total Average			78,58%	82,57%	80,41%	Active

Description: PS-n (Problem-Solving step to -n), n=1,2,...,6

Based on the criteria activity student during learning show that activity students at the 1st meeting 78,58% and at the 2nd meeting 82,57%. The liveliness student overall average is obtained during two meetings is 80,41% which included in the criteria active.



Figure 1. Students work on the blackboard the post-test



Figure 2. Students do

Frequent activity done by students in learning is “involvement and activeness student in discussion group”. This is because the enthusiastic student sees and understands the questions in the LKPD. Students in a manner group with each other to discuss for finding solutions and solving problems that exist in LKPD. Start with formulating a problem, analyzing the problem, formulating a hypothesis, collecting data, testing the hypothesis, and the last process that is solving the problem, this by steps approach *Problem-Solving*. Besides that liveliness students are also visible when “Show self/do question/displays performance”. Students in a manner alternate show result performance group with presence in front of friends class. Activity this to implement theory study Gagne. This can be seen from the change Act in demand participants previously taught passively and after given stimulus materials and LKPD change become active.

Because that, in the whole activity students in learning going on with using Gagne's Learning Theory with a Combination *Problem-Solving* on the material congruence and congruence in Class IX-E of SMP Negeri 55 Surabaya in criteria active because the average percentage activity student in a manner whole of 80,41%.

## 2. Master 's ability in Manage Learning

During the research learning process led by a math teacher class IX-E SMP Negeri 55 Surabaya used teaching materials that have been prepared researcher with discussion by the eye teacher of the lesson concerned. Plan Implementation Learning (RPP) using RPP type one sheet containing 3 components main that are objective learning, activities learning, and assessment. The curriculum used is curriculum 2013. Furthermore, RPP is made researcher in activity learning already there are learning process steps according to Gagne and also steps for settlement problems based on the *Problem-Solving* process. The researcher also made observation sheets on the teacher's ability to manage learning, questionnaires, and critical thinking skills rubrics. Observation sheets and critical thinking skills assessment instruments are expected to be used optimally in the process of Implementation of Gagne's Learning Theory with a combination *Problem-Solving*.

Observation of teacher's ability to manage to learn rated based on guidelines that have been made and customized with the RPP that has been there. Observation conducted by researchers with math teacher subject class IX-E SMP Negeri 55 Surabaya in doing activity learning that applies Gagne's Learning Theory with a combination approach *Problem-Solving*. Evaluation is done during two meetings. Data from second meeting the Then will be recapitulated so that will produce an average value for each aspect of both meetings. Recapitulation results from observation teacher's ability to manage to learn as seen in table 8.

Table 8. Recapitulation of Observation Results of Teachers' Ability to Manage Learning

No.	Syntax Learning Gagne's Learning Theory with Combination Problem-Solving	Teacher Activity	Meeting to		Aspect average	Information	
			1	2			
1.	Gaining Attention (Giving Attention) Gagne's Learning Theory	a. control learning with regards	Introduction		4	Very good	
			b. Ask news and check presence student	4	3	3,5	Very good
			c. Give motivation	3	3	3	Good
			d. Check ability beginning student	3	3	3	Good
			Stimulating the recall of prerequisite learning (building return past knowledge)				
	Gagne's Learning Theory	e. Convey objective learning	3	3	3	Good	
	Informing the learner of the objective or concept to be learned (telling goals and concepts learning)						
	Gagne's Learning Theory						
	Average (1)		3,4	3,2	3,3	Very good	
2.	Presenting the stimulus material or concept to be learned (presenting learning as stimulation) Gagne's Learning Theory	a. Convey material	Core		4	Very good	
			b. Organize student into the groups	4	4	4	Very good
			c. Share and give something problem in LKPD to student in accordance group	4	4	4	Very good
			d. Observe and guide student in identify problem	4	4	4	Very good
			e. Guide student in formulate solving problem	4	4	4	Very good
			f. Guide student in the process of grouping problem data	3	3	3	Good
			g. Observe and guide student in finish problem	4	4	4	Very good
	Formulate and analyze problem						
	Problem-Solving						
	Formulate hypothesis						
	Problem-Solving						
	Collect and classify data						
	Problem-Solving						
	Testing Hypothesis and Formulate						

No.	Syntax Learning Gagne's Learning Theory with Combination Problem-Solving	Teacher Activity	Meeting to		Aspect average	Information
			1	2		
	Recommendation Solving Problem <b>Problem-Solving</b>	h. Discuss or ask answer with student	4	4	4	Very good
	Eliciting the performance (showing performance) <b>Gagne's Learning Theory</b>	i. Guide student For brave For self in present results discussion group	4	4	4	Very good
	Providing feedback about the performance (giving bait back) <b>Gagne's Learning Theory</b>	j. Respond and deliver appreciation on results discussion group	3	3	3	Good
	Assessing the performance (judging performance) <b>Gagne's Learning Theory</b>	k. Evaluate performance student	4	4	4	Very good
	Enhancing the retention and transfer (increase memory and knowledge transfer) <b>Gagne's Learning Theory</b>	l. Guide student For conclude material that has studied	4	4	4	Very good
	<b>Average (2)</b>		<b>3,8</b>	<b>3,8</b>	<b>3,8</b>	<b>Very good</b>
<b>3.</b>	<b>Prepare learning to be come</b>		<b>Closing</b>			
		a. Convey the title of the sub material to be delivered at the meeting furthermore	3	3	3	Good
		b. End of lesson	4	4	4	Very good
		<b>Average (3)</b>	<b>3,5</b>	<b>3,5</b>	<b>3,5</b>	<b>Very good</b>
<b>4.</b>	<b>Time management learning using Gagne's Learning Theory with Combination Problem-Solving</b>	<b>Managing Time</b>	3	3	3	Good
		<b>Average (4)</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>Good</b>
<b>5.</b>	<b>The ability of the teacher in Manage atmosphere class moment learning using Gagne's Learning Theory with</b>		<b>Class Atmosphere</b>			
		a. Student centered	4	4	4	Very good
		b. Enthusiastic student	4	4	4	Very good
		c. Teacher enthusiasm	4	4	4	Very good

No.	Syntax Learning Gagne's Learning Theory with Combination Problem-Solving Combination Problem-Solving	Teacher Activity	Meeting to		Aspect average	Information
			1	2		
		Average (5)	4	4	4	Very good
		Average observed aspect ( 1, 2, 3, 4, 5)	3,74	3, 7	3,72	Very good

Based on the table shows that the average of two meeting teachers' ability the engage in learning on stage introduction is 3,3 which is included in the category very ok. This is due to one teacher meeting not carrying out all aspects of the part introduction. The core stage is 3,8 which is included in the category very ok. This is because, at the time of learning, there is a number of students who don't attentive and are busy with their world alone. But in the process of organizing students into the group got to the stage of guiding students in concluding very teacher material skilled in coordinating two meetings. The closing stage is 3,5 which is included in the category as very good because every aspect is already implemented by the teacher right. Management stage time is 3 included in the good category because the time used still deviated from the existing RPP made. Atmosphere stage class is 4 which is included very well because learning is already student-centered with involves students in a manner directly in the process of investigation problem come to a resolution problem.

Based on the description above, shows that the teacher's ability to manage learning during two meetings is very good with an average of 3,72. With thereby can be concluded that the teacher's ability to manage to learn that applies Gagne's Learning Theory with a combination Approach *Problem-Solving* on the material Congruence and Congruence class IX-E SMP Negeri 55 Surabaya is very ok.

### 3. Mastery Learning Outcomes Students and Abilities Think Critical Mathematical Student

After executing learning mathematics using Gagne's Learning Theory with a combination Approach to Problem-Solving and the participant educate has finished do *post-test* given, then will be done calculation by guidelines the scoring has made. This is done to know the completeness results of the study participant education on material that has been taught. Then the value data will be analyzed with method count percentage achievement results study participants educate in a manner classic.

Completeness results Study student rated from results *post-test* conducted at the 2nd meeting, after carrying out the learning process. Form test description with amount question 4 items with 40 minutes. Recapitulation completeness results Study student class IX-E at SMP Negeri 55 Surabaya is as follows.

Table 9. Completeness of Student Learning Outcomes

Criteria	Post-test Value		Average value
	$\Sigma$ Student	%	
complete ( $\geq 78$ )	33	91%	87,72
Not Completed ( $< 78$ )	3	9%	

Guidelines researcher's assessment used by guidelines scoring on indicators of ability thinks critically in table 2, where student considered already own ability to think critically. The test questions given shaped the test ability to think critically consisting of 4 questions.

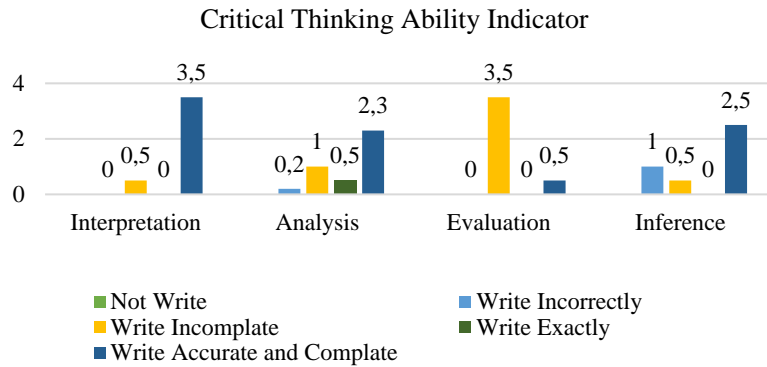


Figure 3. Value of Critical Thinking Ability based on Indicators

Table 9 above shows that completed students get marks of 91% and students who did not complete 9%. Meanwhile, from Figure 1 the diagram above shows that students' critical thinking skills are included in the high category d in every aspect. So from the second result, it can be said that ability to think critically students included in the category very tall that is with interpretation 91% for completeness results studied and an average of 3 for indicator ability to think critically.

Complete students actively follow a series of learning processes that apply Gagne's Learning Theory with a combination Approach to Problem-Solving. 33 students pass in class IX- E whereas students don't complete there are 3 students. Students who don't complete experience difficulty answering question tests that do not include analysis problems or conclusions as should be listed in indicator ability to think critically.

So, it can be concluded that the learning completeness and critical thinking skills of class IX-E students at SMP Negeri 55 Surabaya are classically achieved because students who complete their learning outcomes are  $\geq 85\%$  of the number of students or to be exact 33 students out of 36 students and their thinking skills reach an average 3.

#### 4. Response Student

Charging questionnaire response student done after doing activity learning using Gagne's Learning Theory with a combination *Problem-Solving* and *post-test*. The questionnaire was given with media *google form* which is more make it easy for participant educate in the charging process. Questionnaire response student This is used for knowing interest participants educate on the learning process using Gagne's Learning Theory with a combination *Problem-Solving* that has done. In practice Alone responds to students in a manner No direct Already seen from expression face and behavior. However to find valid data then will present questionnaire data that has been spread researcher. Data that has been obtained Then will be recapitulated in every aspect so that data can be grouped into positive and negative categories, response data students obtained after the following learning using Gagne's Learning Theory with combination *Problem-Solving* is as follows.

Table 10. Student Responses to Learning Mathematics

Questionnaire	Response Student	
	Positive	Negative
Learning Mathematics by using Gagne's Learning Theory with Combination Problem-Solving	91,84%	8,15%

Based on the table obtained that students choose a response category positive by 91,84% and choose a response negative 8,15%. Thereby response students to Gagne's



Learning Theory with a combination *Problem-Solving* including criteria positive and appreciated very effectively used.

## CONCLUSION

Based on the results of research data management and general discussion, it can be concluded that the mastery of learning outcomes and critical thinking skills for class IX-E students of SMP Negeri 55 Surabaya using Gagne's Learning Theory with a combination of Problem-Solving is said to be effective. Therefore it can be concluded that

1. Student activities during the learning process using Gagne's Learning Theory with a combination of Problem-Solving are included in the active category. The average aspect of 80.41% shows the effectiveness of student activities in the implementation of Gagne's Learning Theory with a combination Problem-Solving.
2. The ability of the teacher to manage to learn using Gagne's Learning Theory with a combination Problem-Solving in the first and second meetings is a very good category.
3. Test results student class IX-E SMP Negeri 55 Surabaya after following learning using Gagne's Learning Theory with combination Problem-Solving show that completeness results in learning and the ability to think critically student in a manner classic reached.
4. Response students after the learning process using Gagne's Learning Theory with combination Problem-Solving in class IX-E SMP Negeri 55 Surabaya is very positive.

## REFERENCES

- Al-Mahiroh, R. S., & Suyadi. (2020). Kontribusi Teori Kognitif Robert M. Gagne dalam Pembelajaran Pendidikan Agama Islam. *Jurnal Pendidikan, Sosial, Dan Agama*, 12, 117–126.
- Andrian, Y., & Rusman, R. (2019). Implementasi pembelajaran abad 21 dalam kurikulum 2013. *Jurnal Penelitian Ilmu Pendidikan*, 12(1), 14–23. <https://doi.org/10.21831/jpipfip.v12i1.20116>
- Arikunto, S. (2016). *Prosedur Penelitian: Suatu Pendekatan Parktik*. Rineka Cipta.
- Arum, D. M. M., Suryaningtyas, W., & Soemantri, S. (2021). Efektifitas Komik Digital Sebagai Media Pembelajaran Online Pada Materi Sistem Persamaan Linear Dua Variabel. *Journal of Education and Teaching (JET)*, 3(1), 24–36. <https://doi.org/10.51454/jet.v3i1.127>
- Firdausi, B. W., Warsono, & Yermiandhoko, Y. (2021). Meningkatkan Kemampuan Berpikir Kritis pada Siswa Sekolah Dasar. *Jurnal MUDARRISUNA: Media Kajian Pendidikan Agama Islam*, 11, 229–243.
- Gagne, R. M. (1985). *The Conditions of learning and theory of instruction*. Rinehart and Winston Holt Saunders Japan.
- Galang, A., Suryaningtyas, W., & Kristanti, F. (2016). Penggunaan Model Pembelajaran Blended Learning Terhadap Hasil Belajar MAatematika Kelas VIII di SMPN 38 Surabaya. *MUST: Journal of Mathematics Education, Science and Technology*, 1, 10–20.
- Ilmiati, E. (2020). Penggunaan Teknik Pemecahan Masalah dalam Bimbingan Kelompok untuk Mengurangi Kesulitan Belajar Siswa SMP. *Prosiding Seminar & Workshop Bimbingan Dan Konseling Nasional*, 53–58.
- Indraswati, D., Marhayani, D. A., Sutisna, D., Widodo, A., & Mulyda, M. A. (2020). Berpikir Kritis dan Pemecahan Masalah dalam Pembelajaran IPS untuk Menjawab Tantangan Abad 21. *HORIZON SOSIAL: Jurnal Pendidikan Sosial*, 7, 12–28.
- Janna, A. M., Shoffa, S., & Suryaningtyas, W. (2022). Pengaruh Penggunaan Metode Active Knowledge Sharing Terhadap Kemampuan Komunikasi Matematika Siswa SMP. *PEDAGOGY Jurnal Pendidikan Matematika*, 7, 126–145.

- Ngussa, B. M. (2014). Gagne's Nine Events of Instruction in Teaching-Learning Transaction: Evaluation of Teachers by High School Students in Musoma- Tanzania. *International Journal of Education and Research*, 2, 189–206.
- Normaya, K. (2015). Kemampuan Berpikir Kritis Siswa dalam Pembelajaran Matematika dengan Menggunakan Model Jucama di Sekolah Menengah Pertama. *EDU-MAT: Jurnal Pendidikan Matematika*, 3, 92–104.
- Putra, A. S., Suropto, & Salimi, Moh. (2016). Penerapan Model Pembelajaran Problem Solving untuk Meningkatkan Kemampuan Problem Solving Cerita Tentang Problem Solving pada Siswa Kelas V SDN 1 KRAKAL Tahun Pelajaran 2015/2016. *KALAM CENDEKIA*, 4, 719–723.
- Rani, F. N., Napitupulu, E., & Siregar, H. (2018). Analisis Kemampuan Berpikir Kritis Matematis Siswa Melalui Pendekatan Pendidikan Matematika Realistik di SMP Negeri 3 Stabat. *PARADIGMA: Jurnal Pendidikan Matematika*, 11, 1–7.
- Rukminingsih, Adnan, G., & Latief, M. A. (2020). *Metode Penelitian Pendidikan* (E. Munastiwi, Ed.). Erhaka Utama.
- Ruswadi. (2013). *Psikologi Pembelajaran*. CV. Cipta Pesona Sejati.
- Sartika, D. (2021). Pembelajaran Problem Solving dalam Meningkatkan Keterampilan Berpikir Kritis Matematika Siswa SMP. *Jurnal Pendidikan Dan Pembelajaran*, 1, 30–38.
- Sastrawan, K. B., Suardipa, P., Tinggi, S., Hindu, A., Mpu, N., & Singaraja, K. (2020). *Quality Learning Based on Nine Instructional Events Gagne's Learning Theory*. 1(2).
- Shanti, W. N., & Abadi, A. M. (2015). Efektifitas Pendekatan Problem Solving dan Problem Posing dengan Setting Kooperatif dalam Pembelajaran Matematika. *Jurnal Penelitian Pendidikan Matematika*, 2(1), 121–134. <https://doi.org/10.21831/jrpm.v2i1.7155>
- Stehle, S. M., & Peters-Burton, E. E. (2019). Developing student 21st Century skills in selected exemplary inclusive STEM high schools. *International Journal of STEM Education*, 6(1), 39. <https://doi.org/10.1186/s40594-019-0192-1>
- Sugiyarti, L., Arif, A., & Mursalin. (2018). Pembelajaran Abad 21 di Sekolah Dasar. *Prosiding Seminar Dan Diskusi Pendidikan Dasar Nasional*.
- Wahyuni, R., Mariyam, M., & Sartika, D. (2018). Keefektifan Model Pembelajaran Creative Problem Solving (CPS) Dalam Meningkatkan Kemampuan Berpikir Kritis Matematis Siswa Pada Persamaan Garis Lurus. *JPMI (Jurnal Pendidikan Matematika Indonesia)*, 3(1), 26. <https://doi.org/10.26737/jpmi.v3i1.520>
- Wirnayanti, Sukmawati, & Satriani, S. (2019). Perbandingan Hasil Belajar Matematika Melalui Pendekatan Problem Solving dan Problem Posing pada Siswa Kelas VIII SMP Muhammadiyah 1 Makassar. *SIGMA (Gaya Matematika Suara Intelektual)*, 11, 78–87.
- Zakaria, P., Nurman, & Silalahi, F. D. (2021). Deskripsi Kemampuan Berpikir Kritis Siswa Melalui Pembelajaran Daring Segi Empat. *Jurnal Ilmiah Matematika, Sanis Dan Teknologi*, 9, 32–39.