Validity, Effectiveness, and Practicality of Learning Media

by Utiya Azizah

Validity, Effectiveness, and Practicality of Learning Media Using Advance Organizer to Increase Critical Thinking on Colloid Material of Senior High School

A Pascalia Lalian[1,*], L Yuanita[1], U Azizah[1]

Science Education, Post Graduate, State Univercity of Surabaya
*pascaliaanna@gmail.com

Abstract

The purpose of this study is to determine the validity, effectiveness, and practicality of learning tools to improve student's critical thinking skills by using an advanced organizer learning model colloidal material. The test was conducted in grade XI-5 of 7th Senior High School of Surabaya with 24 students. The learning device development model in this study uses the 4D model from Thiagarajan, but only 3 stages are applied (define, design, develop). The implementation phase of learning in the class uses one group pretest-posttest design. The assessment is carried out by using a validation sheet filled out by the validator, pretest-posttest questions based on the critical thinking skills, and an observation sheet on the implementation of the lesson plan by the observer. Based on the research conducted, it is founded that: (a) the results of the validation of learning devices in general have an average score of 3 to 4 with a reliability of 80 to 100%. (b) the average of critical thinking ability data of students is 63.12 with the categories less critical, critical and very critical. Furthermore, it is also obtained the results of the increment in each indicator of critical thinking ability, namely (i) the indicator of formulating the problem gets an increase of 31.25, (ii) the indicator of giving an argument gets an increase of 16.06, (iii) the analyzing indicator gets an increase of 6, (iv) the indicator of doing induction or concluding gets an increase of 40.62, and (v) the indicator of applying gets an increase of 39.58, and (c) the observation of the implementation of the lesson plan of three meetings obtain an average score of 3.33 to 4 with reliability of 86 to 100 %. Based on the data analysis, it can be concluded that the learning tools developed are valid, effective, and practical to improve student's critical thinking skills.

Keywords: validity, effectiveness, practicality, advance organizer, student's critical thinking skills

A. Introduction

According to the Chairman of the National Education Standard Agency, Bambang Suryadi, the procurement of High Order Thinking Skill (HOTS) questions make Indonesian education standard even higher to catch up with other countries. Therefore, this question will continue to be held, but with more preparation, namely increased learning both for students and teachers (Okezone News, 2018). Referring to the standard of National Exam questions, namely HOTS based questions, the teacher must prepare provisions for students from an early age, where the priority of a teacher as an educator is to teach students how to learn and how to think HOTS based so that when dealing with National Exam questions, students do not experience difficulties. The 2013 curriculum was developed with the completing mindset of the following: *teacher center learning* into *student centers*, one-way learning (teacher-student interaction) into interactive learning (teacher-student-community-environment-source-other media interactions), passive learning becomes a scientific learning, and individual learning becomes group learning.

The results of the pre-research test by giving questions about colloids to the 12th grade students of Science as many as 12 students at 7th Senior High School of Surabaya showed that students had difficulty learning when faced with chemical problems. Students are also lacking in critical thinking seen from the achievement of an average score that has not reached the minimum standard of the school which is 70. This is evidenced by the pre-research test scores

of 33% or as many as 4 out of 12 students who have achieved the minimum standard, while 66.67% or as many as 8 out of 12 students have not reached the minimum standard.

Students must have good critical thinking skills in order to overcome this problem. And the teacher's job is to help the students, one of it is to develop devices using an advanced organizer model.

B. Method

1. Learning Tool Validation Analysis

The data analysis which includes the device validation and assessment is done by calculating the average score of each component obtained from the validator. The average score results are described in the following table. Learning device is said to be valid for use if the average score obtained is at least 2.6.

Table 1 DataValidation Analysis

Interval	Category	Explanation
$1,0 \leq$ to $\leq 1,5$	Invalid	Cannot be used yet, consultation is needed
$1,6 \leq$ to $\leq 2,5$	Less Valid	Can be used with a lot of revisions
$2,6 \leq$ to $\leq 3,5$	Valid	Can be used with a little revisions
$3.6 \leq$ to $\leq 4,0$	Very Valid	Can be used without revisions

(adapted from Ratumanan & Laurens, 2011)

The reliability of the instrument is determined based on the assessment data from the validator. The level of reliability can be calculated by using the formula below:

$$R = (1 - \frac{A-B}{A+B}) \text{ x } 100\%$$

(adapted from Borich, 1994)

Explanation:

R = Percentage of instrument reliability

A = Higher average score than the validator

B = Average number of scores lower than the validator

The instrument is said to be reliable if it has a reliability value $\geq 75\%$ (Borich, 1994).

2. The learning tool effectiveness analysis

a. Analysis The ability to think critically

The analysis of student's critical thinking skill is carried out to determine the increase in student's critical thinking skill through *pretest* and *posttest*. Critical thinking ability data is analyzed through the critical thinking rubric.

Critical thinking skill rubric used in this study is a multilevel scale, which is a question followed by columns that indicate the level of scoring with a scaling scale in accordance with predetermined criteria as in Table 2.

Table 2 Categories ofStudent's Critical Thinking Ability

No.	Criteria	Score
1.	Very Correct	4
2.	Correct	3
3.	Correct Enough	2
4.	Less Correct	1
5.	Is not done	0

(adapted from Purwanto, 2008)

The data that has been obtained is analyzed to determine the increase in critical thinking skills.

$$\text{Level of critical thinking} = \frac{Score\ obtained\ by\ students}{Total\ score} \times 100$$

After obtaining the results of student's critical thinking skill, researchers adjust to the category of student's critical thinking abilities. The categories of critical thinking skill can be seen in Table 3.

Tabel 3 The Guidelines for Critical Thinking Categories

No.	Obtained Scale	Category
1.	> 81,25 to ≤ 100	Very Critical
2.	> 62,50 to ≤ 81,25	Critical
3.	> 43,75 to ≤ 62,50	Less Critical
4.	≤ 25,00 to 43,75	Very Less Critical

(Source: Setyowati et al, 2010)

3. Student Response Questionnaire Analysis

The results of the student response questionnaire will be obtained, are analyzed by using the following formula:

$$\text{Percentage} = \frac{Number\ of\ students\ answering\ items}{number\ of\ respondents} \times 100\%$$

The percentage criteria for student responses are presented in the following table:

Table 4 The Criteria for Percentage of Student Responses

No.	Scale Obtained	Category
1.	0 – 20 %	Very Less
2.	21 – 40%	Less
3.	41 – 60%	Enough
4.	61 – 80%	Good
5.	81 – 100%	Very Good

4. Learning Device Practical Analysis

The value of the implementation of learning conducted by observers who have understood the observation sheet correctly, then, the data is processed by calculating using the following equation:

$$P = \frac{Number\ of\ learning\ stages\ carried\ out}{total\ number\ of\ learning\ stages} \times 100\%$$

The implementation of lesson plan is analyzed descriptive qualitatively, by comparing the average rating scale given by the two observers with the following evaluation criteria.

Table 5 The Analysis of the Implementation of Lesson Plan

No	Interval Score	Category
1.	$3,60 \leq score \leq 4,00$	Very Good
2.	$2,60 \leq score \leq 3,59$	Good
3.	$1,60 \leq score\ 2,59$	Less Good
4.	$1,00 \leq score\ 1,59$	Is not Good

(Ratumanan & Laurens, 2011)

The level of data reliability between the two observers was calculated by using an *interobserver agreement* by using statistical analysis of *percentage of agreement* (R). The reliability level is calculated by using the following formula.

$$R = (1\ \frac{A-B}{A+B}) \times 100\%$$

Explanation:

R = Percentage of instrument reliability

A = Higher average score than the observer

B = Lower average score than the observer

The instrument is said to be reliable if it has a reliability value $\geq 75\%$ (Borich, 1994).

C. The Result of Research and Discussion

1. Learning Tool Validation Result

The tool developed to be validated are the syllabus, lesson plans, student teaching materials, student worksheets, and pretest and posttest questions based on the critical thinking skills, and student response questionnaires. The following summarizes the results of the validation of learning tool developed using the advanced organizer learning model as presented in Table 6.

Tabel 6 Learning Tool Validation Result

No.	Tool's Name	Score Obtained	Category	Reliability
1.	Syllabus	3,33 – 4	V, VV	86 – 100%
2.	Lesson Plan	2,67 – 4	V, VV	80 – 100%
3.	Student Teaching Material	2,67 – 4	V, VV	80 – 100%
4.	Student Worksheet	2,67 – 4	V, VV	80 – 100%
4.	*Pretest* Question	3,33 – 4	V, VV	86 – 100%
6.	*Posttest* Question	3,33 – 4	V, VV	86 – 100%
7.	Student Response Questionnaire	3,33 – 4	V, VV	86 – 100%

Explanation: V: Valid; VV: Very Valid

Based on the Table 6, it is known that all devices get an average score that ranges from 2.67 to 4 with a valid category and is very valid. In addition, each device also has reliability ranging from 80-100%, it means that the devices developed using the advanced organizer model are appropriate for use in improving critical thinking skills on colloidal material. Thus, all devices developed can be used in the process of learning colloidal material because it has met the criteria for proper use, namely valid and appropriate.

2. Learning Tool Effectiveness Result

a. Critical Thinking Ability Assessment Result

The data of student's critical thinking skill before learning was obtained based on the pretest scores carried out before the first meeting, while the student's critical thinking skill after learning was obtained based on the posttest scores after the third meeting. The indicators of student's critical thinking skill is assessed namely formulating the problem, giving arguments, analyzing, inducing or concluding, and applying those assessed by using the rubric of critical thinking with a range of 0-4. The results of the student's critical thinking skill are presented in Table 7.

Table 7 The Score of Student's Critical Thinking Skill

Code	Pretest		Posttest	
	Score	Category	Score	Category
S1	45	LK	62,5	LC
S2	57,5	C	70	C
S3	62,5	C	72,5	C
S4	42.5	VLC	60	LC
S5	57,5	LC	75	C
S6	40	VLC	60	LC
S7	42,5	VLC	60	LC
S8	42,5	VLC	67,5	C
S9	42,5	VLC	60	LC
S10	42,5	VLC	72,5	C
S11	40	VLC	60	LC
S12	35	VLC	47,5	LC
S13	52,5	LC	67,5	C
S14	45	LC	72,5	C
S15	30	VLC	55	LC

Code	Pretest		Posttest	
	Score	**Category**	**Score**	**Category**
S 16	45	LC	75	C
S 17	65	C	80	C
S 18	57,5	LC	75	C
S 19	60	LC	80	C
S 20	52,5	LC	77,5	C
S 21	47,5	LC	67,5	C
S 22	40	VLC	65	C
S 23	45	LC	67,5	C
S 24	60	LC	85	VC
Average	47,71	LC	63,12	C

Explanation: VLC = Very Less Critical; LC = Less Critical; C = Critical, VC = Very Critical

Based on Table 7, it is known that before the learning activities there are 3 critical students and 21 less critical students with grades ranging from 30 – 62,5. After learning the student's grades have increased, there are still 8 less critical students, 15 critical students, and 1 very critical student with grades ranging from 47.5 – 85.

Furthermore, the analysis of each indicator of critical thinking skill that are formulating the problem, providing arguments, analyzing, inducing or concluding, and applying can be seen in Table 8.

Table 8 The Analysis of Each Indicator of Critical Thinking Skill

No.	Indicator	Average Score			
		Pretest	**Explanation**	**Posttest**	**Explanation**
1.	Formulating the problem	25	VLC	56,25	LC
1.	Providing arguments	44,87	LC	60,93	LC
2.	Analyzing	77,07	C	83,07	VC
3.	Inducing or concluding	16,67	VLC	57,29	LC
4.	Applying	17,18	VLC	56,76	LC

Explanation: VLC : Very Less Critical; LC : Less Critical; C : Critical; VC : Very Critical

Based on Table 8, it is known that there is an increase in the five indicators of critical thinking skills after learning by using an advanced organizer model. The indicator of formulating the problem gets an increase of 31,25, the indicator of giving an argument gets an increase of 16,06, the analyzing indicator gets an increase of 6, the indicator of inducing or concluding gets an increase of 40,62, and the indicator of applying gets an increase of 39,58.

The indicator that experienced the highest increase is the indicator of inducing or concluding a value of 40,62, while the indicator that experienced the lowest increase is analyzing with a value of 6.

b. The Analysis Result of Student Response Questionnaire

The result of the student questionnaire responses to the learning activities that have been carried out and the learning tools that have been developed by using the advanced organizer learning model presented in Table 9.

Table 9 The Result of Student Response Questionnaire

Goal	Declaration	Respond Percentage		Category
		Yes	**No**	
Interest	The design of LKS andcoloid student's material are interesting	100	-	Very Good

	This design of LKS andcoloid student's material make me more enthusiasm in learning chemistry	100	-	Very Good
	By using the design of LKS andcoloid student's material make learning chemistry fun	83,33	16,67	Very Good
	The explanation of student material relates with the daily life	95,8	4,16	Very Good
Material	The material in the student's book can be easily understood	95,8	4,16	Very Good
	The material in the student's book make student doing discussion with their friends	66,67	33,33	Good
	The steps of practice in the student's book(LKS) are easily understood	79,16	20,83	Good
Language	Sentences and paragraphs that have used in the student's book are easily to understood	83,33	16,67	Very Good
	The language that has used in the student's book is simple and easily to understood	79,16	20,83	Good

Based on Table 9, it is known that the device with an advanced organizer learning model gets a positive response from students. This is shown by the interest in student worksheets and teaching materials ranging from 83.33-100%, it means that most students are interested in the worksheets and teaching materials developed. The percentage of the content of the material ranges from 66.67 to 95.8%, it means that from the aspect of the content of the material, students can understand the student worksheet and teaching material developed. While from the aspect of language, it gets a percentage ranging from 79.16 to 83.33%, it means that the aspects of the language used in the worksheets and student teaching materials are easy to understand and do not cause multiple meanings.

Based on the description above, it can be concluded that student's responses to learning devices by using the advanced organizer model, students give positive responses, which means students can follow the learning activities carried out by the teacher using learning devices by using the advanced organizer model.

c. Learning Device Practical Result

The learning device practical result is reviewed from the result of the trial of the learning device by using an advanced organizer learning model conducted with three meetings observed by 3 observers. The following are the

practicalities of the learning tools obtained based on trials in 1 class for 3 meetings. The results of observing the implementation of learning observed by 3 observers while conducting the trial are presented in Table 10.

Table 10 The Observation Result of Lesson Plan Implementation

Steps	First Meeting			Second Meeting			Third Meeting		
	Average	Category	R (%)	Average	Category	R (%)	Average	Category	R (%)
First Activity									
Teacher gives greeting	3,33	G	86	3,67	VG	86	3,67	VG	86
Teacher asks one of the student to lead the pray	4	VG	100	3,33	G	86	3,67	VG	86
Teacher explains the *advance organizer*learning model	3,33	VG	86	4	VG	100	4	VG	100
Main Activity									
Phase 1 : the presentation of *advance organizer*									
a. **Explain the goal of learning** Teacher explains the goal of the learning and indicator	3,33	G	86	3,33	G	86	3,67	VG	86
b. **The presentation of*advance organizer*** 1. Teacher gives student's worksheet	3,67	VG	86						
2. Teacher	3,33	G	86	3,33	G	86	4	VG	100

Steps	First Meeting			Second Meeting			Third Meeting		
	Average	Category	R (%)	Average	Category	R (%)	Average	Category	R (%)
gives an example to the student									
3. Teacher asks the student to give question(**stating the problem**) (asking)	3,33	G	86	3,67	VG	86	3,67	VG	86
4. Teacher asks one of the student to answer **(giving argument)**	3,33	G	86	3,67	VG	86	3,67	VG	86
5. Teacher explains	3,67	VG	86	4	VG	100	3,67	VG	86
6. Teacher explains the technical term (giving attention)	4	VG	100	3,67	VG	86	3,33	G	86
c. **Reminding the knowledge or relevant experience** Teacher asks to the student the material that they have learnt before	3	G	100	3,67	VG	86	3,33	G	86
Phase 2 : Learning material									

Steps	First Meeting			Second Meeting			Third Meeting		
	Average	Category	R (%)	Average	Category	R (%)	Average	Category	R (%)
presentation									
a. Give material 1. Teacher asks the students to make a group	3,33	G	86	4	VG	100	3,67	VG	100
2. Teacher gives LKS	3	G	100	3,33	G	86	3	G	100
3. Teacher gives instruction to the student to do LKS	4	VG	100	3,33	G	86	4	VG	100
4. Students do the question from the teacher **(stating problem), (giving argument), (analyzing), (inducting or concluding), (applying)** (observing, asking, trying, thinking, communicating)	3,33	G	86	3,67	VG	86	3,67	VG	86
5. Teacher supervises the discussion	3,67	SB	86	3,67	B	86	3,67	SB	86
6. Teacher asks one group to do	3	G	100	3,67	VG	86	3,33	G	86

Steps	First Meeting			Second Meeting			Third Meeting		
	Average	Category	R (%)	Average	Category	R (%)	Average	Category	R (%)
presentation about the discussion result and asks another group to give attention									
7. Another student give responses and questions	3,33	G	86	3,33	G	86	3,67	VG	86
8. Teacher checks student's understanding	3,67	VG	86	3,33	G	86	3,33	G	86
Phase 3 : strength cognitive organization									
a. Using integrative reconciliation principal 1. Teacher reminds the students about the main idea of the material	3,67	VG	86	3	G	100	3,67	VG	86
2. Teacher asks the student to re-state the definition of term**(giving argument)**	3,67	VG	86	3,67	VG	86	3,33	G	86
3. Teacher asks	3,67	VG	86	3,67	VG	86	4	VG	100

Steps	First Meeting			Second Meeting			Third Meeting		
	Average	Category	R (%)	Average	Category	R (%)	Average	Category	R (%)
the students to summary what they have learned									
4. Teacher gives student the assignment for writing the differenceof each concept that has served (thinking)	3,33	G	86	3,67	VG	86	3,33	G	86
b. Suggest active reception learning Teacher asks the student to write another examples (thinking)	3,67	VG	86	3,67	VG	86	3,33	G	86
c. Build the critical approach to the learning material Teacher asks the student to explain again the main idea of the material **(giving argument)**	3,33	G	86	3,33	G	86	3,67	VG	86

Steps	First Meeting			Second Meeting			Third Meeting		
	Average	Category	R (%)	Average	Category	R (%)	Average	Category	R (%)
d. Clarification Teacher asks the student in every group to ask question(**statin g problem**) (asking)	4	VG	100	3,33	G	86	3,67	VG	86
Closing									
1. Teacher gives homework	3,33	G	86	3	G	100	3,67	VG	86
2. Teacher closes the lesson by praying and greeting	3	G	100	3,67	VG	86	3,67	VG	86
Class Condition									
1. Teacher's enthusiasm	3,33	G	86	3,67	VG	86	4	VG	100
2. Student's enthusiasm	4	VG	100	3,67	VG	86	3,33	G	86
3. Time management	3,67	VG	100	3	G	100	3,67	VG	86

Explanation: G: Good; VG: Very Good

Based on Table 10, it is known that the implementation of each aspect in the lesson plan of meetings I, II, III gets an average score of 3.33 to 4. These results indicate that overall the stages of learning, namely the initial, main, and closing activities have been carried out with both good and very good categories. In addition, each stage has reliability ranging from 86 to 100%, it means that all stages in the three meetings are appropriately carried out in accordance with the stages in the lesson plan.

D. Conclusion

Based on the results of the development and the data collection that is heldat 7th Senior High School of Surabaya towards 24 students, it can be concluded that the learning device by using the advanced organizer model has fulfilled the validity, practicality, and effectiveness requirements so that it is appropriate to be used in the learning process to improve student's critical thinking skills, especially at indicators of formulating the problems, analyzing, providing arguments, inducting or concluding, and applying.

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