

Computer-Based Learning with Metacognitive Strategy: Improve Students' Learning Outcomes In Indonesian Food Processing Lesson

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Abstract—This study aimed to determine feasibility of computer-based learning with metacognitive strategy, learning implementation, learning outcomes, and students' responses. Method used was development of 4-D model with intact-group comparison research design on students in Vocational High School in Surabaya, Indonesia. Results showed that computer-based learning with metacognitive strategy was feasible, learning implementation using computer based learning with metacognitive strategy was in good category, learning outcomes was increased by using computer-based learning with metacognitive strategy. Students' responses to computer-based learning with metacognitive strategy was very good. Based on results of research, it was found that computer-based learning with metacognitive strategy significantly improved students' learning outcomes in subject of Indonesian food processing. For future research, it is suggested that there is a need of a measurement of students' learning motivation. The use of computer-based learning with metacognitive strategies can improve students' learning outcomes as well as offer attractive and practical media.

Keywords—*computer-based learning; metacognitive strategy, learning outcomes; Indonesian food processing.*

I. INTRODUCTION

Learning process in Indonesian food processing subject emphasizes on activities which lead to real problems that make students learn to construct knowledge and analyze problems which may occur in Indonesian food processing. In an attempt to achieve above goals, it is necessary to have lesson plans with exercises so that students can analyze the problems which may occur in Indonesian food processing. Exercise in analyzing problems on Indonesian food processing subject can be planned by teachers using problem-based learning model.

To achieve learning objectives in Indonesian food processing subject and support problem-based learning model, supporting media and strategies which support learning objectives are required. Selection of relevant learning media and attracting students' attention to Indonesian food processing learning will create fun learning atmosphere that make students can learn optimally, develop spiritual and social

attitudes, curiosity, creativity, cooperation with intellectual and psychomotor abilities.

Computer-based learning puts computer as an individual learning system tool where students can interact directly with computer systems deliberately designed and utilized by teacher. Systems within computer can interact individually and directly with students as it is expressed that "computer systems can deliver instruction by allowing them to interact with lesson programmed into system; referred to computer-based instruction". There are several advantages of computer-based learning, they are: (1) creating an effective learning climate for slow students (slow learner); but also spurring effectiveness of learning for fast students (fast learner); (2) providing feedback on student learning outcomes and can examine as well as provide scores of learning results automatically; (3) providing prescriptions or suggestions for students to perform in certain learning activities which can be used for individual learning; (4) integrating components of color, music and animated graphics to convey information and knowledge with a high level of realism.[2]. Computer can be directly used by students in the content of lesson being delivered, may give practice and test progress of students in learning so that students know the firsthand results of their learning.[2]

Computer-based learning equipped with learning strategies which support media content make learning objectives can be delivered. In this study, metacognitive learning strategy is chosen because this strategy is a strategy that can construct knowledge and help process of analyzing and solving problems which may occur in Indonesian food processing. It is hope that students can achieve optimal learning outcomes. Metacognitive strategy help students to solve problems through effective design, by involving the process of recognizing problems, understanding problems which need to solve and understanding effective strategies to solve them. [3]

Learning Indonesian food processing using metacognitive strategy help students to solve problems encountered through following stages: process of knowing problem, finding solutions, and understanding effective strategies for dealing

with problems. Cognition focuses on solving problem, metacognition focuses on processes of problem solving. [4]

Metacognitive focuses on problem-solving process of Indonesian food processing so that students can construct their own knowledge while cognitive focuses on helping students to achieve optimal learning outcomes. Media and learning strategies are monotonous and less interactive can be the causes of failure in achieving optimal learning outcomes. Computer-based learning media with metacognitive strategy help students to learn by their own as well as find their way of learning to understand material, skill and good learning result. The statement is in line with the research which states that computer-based learning media in culinary classes significantly improve culinary skills, knowledge and test scores.[5]

II. METHODS

This development research was a study of development of computer-based learning media with metacognitive strategy in Indonesian food processing subject. Techniques of data collection of this research were observation, validation, test administration, and questionnaire.

A. Assessment of Media Validity

Assessment of media validity was carried out by three experts consisting of one media expert, one educational expert, and one material expert.

TABLE 1. LIKERT SCALE [6]

Assessment Criteria	Scale
Very valid	5
Valid	4
Valid enough	3
Invalid	2
Very invalid	1

After validation results obtained, they were analyzed by the assessment made by the validator. The analysis was performed by calculating average of each indicator and then converted into value interval form.

$$\text{Score's Interval} = \frac{\text{highest score} - \text{lowest score}}{\text{total class}}$$

$$= \frac{5-1}{5} = \frac{4}{5} = 0,8 [7]$$

- 1,0 s/d 1,8 : very invalid.
- > 1,8 s/d 2,6 : invalid.
- > 2,6 s/d 3,4 : valid enough.
- > 3,4 s/d 4,2 : valid.
- > 4,2 s/d 5,0 : very valid.

B. Analysis of learning implementation.

Observation in learning implementation was done by two observers who had been trained to provide an assessment.

TABLE.2 LIKERT SCALE[6]

Assessment Criteria	Scale
Good (done, precise and systematic)	4
Good enough (done, but not quite right)	3
Less good (done but not finished)	2
Not good (not done at all)	1

Results of observer's rating was then summed and averaged by matching the interval as follows:

$$\text{Interval Score} = \frac{\text{highest score} - \text{lowest score}}{\text{total classes}}$$

$$= \frac{4-1}{4} = \frac{3}{4} = 0,75$$

- 1,00 s/d 1,75 : Bad
- > 1,75 s/d 2,50 : Not Good
- > 2,50 s/d 3,25 : Pretty Good
- > 3,25 s/d 4,00 : Good

C. Analysis of learning outcomes.

Analysis of learning outcomes conducted in this study was carried out through analysis of cognitive learning outcomes, psychomotor and affective. Cognitive tests were performed by giving posttest problems. There were 38 items of problem made. Calculation of given score is presented as follows:

$$N = \frac{JB}{\sum S} \times 100$$

- information :
- N : post-test score
- JB : correct answer
- $\sum S$: total of test items

Psychomotor test analysis was conducted through student practice with 12 criteria of assessment aspect. Here is formula to know psychomotor value of students:

$$\text{Average value of all aspects} = \frac{\sum \text{average value each aspect}}{\sum \text{all aspect}}$$

Average value of all aspects can be described as follows:

- Very good : 90 ≤ score ≤ 100
- Good : 75 ≤ score ≤ 8
- Enough : 60 ≤ score ≤ 74
- Bad : 40 ≤ score ≤ 59
- Very Bad : 0 ≤ score ≤ 39 [7]

Affective test analysis was implemented by assessing students' spiritual and social attitudes during learning process. Following are steps to calculate students' affective values:

$$\frac{\text{score}}{\text{maximum score}} \times 4 = \text{final score}$$

Then the final score of each student is described as follows:

Very good	: $3,33 < \text{score} \leq 4,00$
Good	: $2,33 < \text{score} \leq 3,33$
Enough	: $1,33 < \text{score} \leq 2,33$
Bad	: $\leq 1,33$

D. Analysis of student responses.

Assessment of students' responses to media was done by students of SMK Mater Amabilis Surabaya.

TABLE III. LIKERT SCALE[6]

Assessment Criteria	Scale
Very good	5
Good	4
Pretty Good	3
Bad	2
Very Bad	1

Results of student responses obtained then analyzed by looking at assessment made by students. The analysis was done by calculating average of each indicator and then converted into value interval form.

$$\text{Interval Score} = \frac{\text{highest score} - \text{lowest score}}{\text{total classes}} = \frac{5-1}{5} = \frac{4}{5} = 0,8. [7]$$

(6)

1,0 s/d 1,8	: Very bad.
> 1,8 s/d 2,6	: Bad
> 2,6 s/d 3,4	: Pretty Good.
> 3,4 s/d 4,2	: Good
> 4,2 s/d 5,0	: Very Good

The average result of each indicator can be deduced by matching the interval of values already described.

E. Statistical Test Results Learning Analysis

Student learning outcomes were obtained from classes which did not use computer-based learning media with metacognitive strategy (control classes) and classes using computer-based learning media with metacognitive strategy (experimental class). Statistical test of learning result analysis was done by normality test step, homogeneity test and hypothesis test.

III. RESULTS AND DISCUSSION

A. Media validity

Computer-based media in this study used adobe captivate 6.0 software which has a variety of multimedia features i.e. video, audio, text, color, color gradation, object shape, motion effects objects, animation effects, and interesting quizzes which facilitate students to learn using metacognitive strategy as well as enabling students to learn independently. Adobe captivate 6.0 is an application created from Adobe Systems Incorporated which is best application in building interactive multimedia content or CBT (Computer Based Training / Testing) interactive, feature-rich and easy to use . [8]

Computer-based media is a medium which uses learning programs with computer software, containing learning materials which include title, purpose, learning materials, and evaluation of learning [9].

B. Learning implementation

Based on the results of learning implementation, it can be obtained that the development of computer-based learning media with metacognitive strategy on Indonesia food processing subject can be applied. This is because this medium is considered effective as intended media to develop learning process which will convey purpose of learning and connect teachers with students [10].

C. Learning outcomes

Improving learning outcomes after using computer-based learning with metacognitive strategy was better than those which did not use computer based learning with metacognitive strategy. This is because computer-based learning with metacognitive was more interesting and fun as well as easy to understand. It is argued that computer-based with metacognitive strategies can improve learning outcomes, problem-solving skills, and make learning fun [11]. Computer based learning using metacognitive strategy is utilized to achieve goal of learning outcomes and help students deal with problems as well as explain steps in handling problems [12].

D. Student responses

Students' responses to computer-based learning with metacognitive strategy can improve students' learning motivation, increase student activeness, make students understand the material, can more easily do post-test problem, increase absorption and memory of material, help construct knowledge and analyze problem, can be used in vocational schools where students learn, can be used for all materials, especially food processing materials of Indonesia, as well as easy to operate. The media are very attractive and easy to carry anywhere with help of a flash or compact disk (CD). Computer based learning by collaborating with effective metacognitive strategy helps students to complete discussion task by solving discussion problem so that the learning materials can be well absorbed by the students.

IV. CONCLUSION

Computer-based learning with metacognitive strategy in Indonesian food processing subject developed were very valid. Computer based learning with metacognitive strategy developed can be used as a learning medium although with a little revision but need to be refined to have better quality. Implementation of learning using computer based with metacognitive strategy on Indonesia food processing subject showed good category that can be applied. Improved learning outcomes by using computer based with metacognitive strategy in Indonesian food processing subjects versus those not using computer based learning with metacognitive strategies. Learning outcomes include cognitive, psychomotor and affective learning outcomes. Students' responses to computer based learning with good metacognitive strategy because it can help students understand material and easy to carry anywhere.

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