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Developing Instructional Video to Enhance Biology Pre-Service Teachers' Metacognitive Skills

Endang Susantini
Biology Department
Universitas Negeri Surabaya
Surabaya, Indonesia
endangsusantini@unesa.ac.id

Sifak Indana
Biology Department
Universitas Negeri Surabaya
Surabaya, Indonesia
sifakindana@unesa.ac.id

Isnawati
Biology Department
Universitas Negeri Surabaya
Surabaya, Indonesia
isnawati@unesa.ac.id

Sonia Dianita Savitri
Biology Department
Universitas Negeri Surabaya
Surabaya, Indonesia
soniasavitri@mhs.unesa.ac.id

***Abstract*— An instructional video might help learners to conceive learning attainment better or acquire specific skills. This study aimed to describe video quality, metacognitive skills, and responses of pre-service teachers. The video was developed using ASSURE model consisted of six stages; analyzing learner, stating objectives, selecting materials or designs, utilizing materials, requiring learner's response, and evaluating product. The metacognitive skills measured in the present study included monitoring and evaluation skills. The design of this research was one-shot case study to address objectives. Three experts of biology education were invited to examine the quality of the video. There were 138 pre-service teachers majoring in biology education at Universitas Negeri Surabaya and Universitas Negeri Malang, Indonesia as research participants. Results showed that video quality was good on the stage of metacognitive learning strategy. Another finding was the fact that pre-service teachers' metacognitive skills were excellent and they also showed positive response towards video, especially in learning stages, learning strategies, and metacognitive skills. This study suggests that the video can be used as a standardized modelling video to teach metacognitive skills.**

Keywords*— *instructional video, metacognitive skills, pre-service teacher

I. INTRODUCTION

Over the past few years, video has seen extensive use in classrooms for supporting teacher's curriculum and helping students learn the material faster than ever. Video can be used to facilitate students to get more interested in learning and enhance their communicative competences since they can acquire rich learning experiences [1, 2]. The use of video also affects students' motivation [3, 4]. There are seven different ways students can learn with videos effectively and quickly [5], which are (1) visual processing, brain responds to visuals fast, better than text or any other kind of learning material, (2) learning through demonstration, the other way to learn abstract concepts generally difficult to understand is by watching people perform or demonstrate the process. This demonstration can accelerate learning, (3) self-study, through videos, anybody can do self-study. This self-study technique leaves a powerful impact on the brain, which might even be better than reading the same lesson from a book, (4) classroom learning, videos have now become a dominant part of classroom learning. Students throughout the country interact with each other and collaborate while learning, (5) on the job training, students learn through videos to perform tasks intended for them, (6) contextualization, students can develop connection between the transformation of knowledge and its practical implementation, (7) illustration, visual analogy clarifies the concept better than any other thing. The latest study demonstrated that using educational video could also improve teaching skills of pre-service teachers via scientific approach [6]. In this study learning process was conducted with metacognitive strategy involved the use of video as learning medium.

Metacognition or 'thinking about thinking' involves the awareness and regulation of thinking processes [7, 8, 9, 10, 11, 12]. Metacognitive strategies are strategies which require students to think about their thinking as they engage in academic tasks [13, 14]. The presentation of metacognition definition does not mean that there is a unanimous agreement on the borders of the concept. This is due to the fact that over time, the scope of the definition has grown in tandem with metacognition and became a multifaceted concept [15]. Despite this, a need for theoretical clarity is undoubtedly present. It should include improved definitions and descriptions of the numerous components of the concept [16]. Hence it can be concluded that metacognition from an educational standpoint refers to one's knowledge and the monitoring and control of one's own systematic cognitive

activity which requires specific metacognitive skills such as planning and evaluation [17, 11, 14, 18]. In order to be effective learners, students must not only use their memory and the language skills they have internalized, but they must also develop their own way of learning. There are several advantages of using metacognitive strategy in the learning process; (1) make learning more active (2) emphasize on thinking about their thinking [19].

II. METHODS

The video was developed using ASSURE method which included six phases (Figure 1) [20].

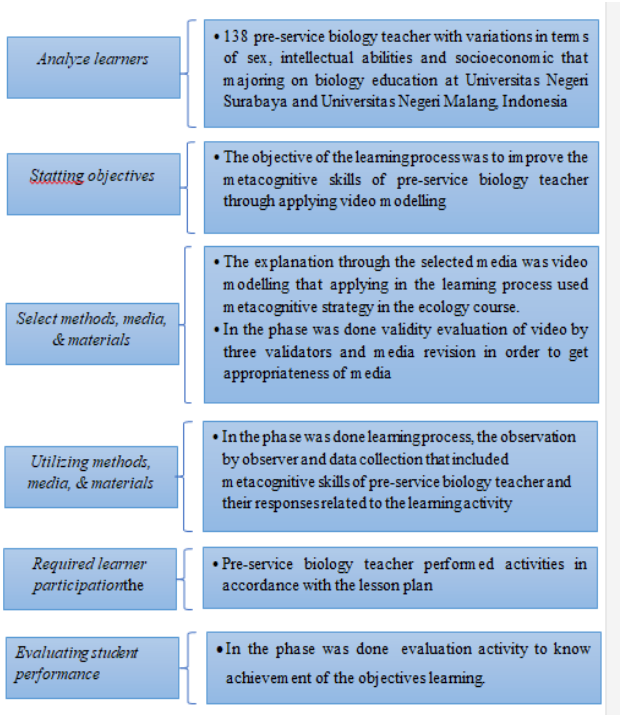

Fig. 1. Six Phases of ASSURE

III. RESULTS AND DISCUSSIONS

The results of the study included video quality description (Table 1), metacognitive skills of a pre-service biology teacher, and response of pre-service biology teacher related to video modelling application. These results are presented in Table 1.

TABLE I. QUALITY OF VIDEO MODELLING

No	Video Evaluation Aspects	Score			Average
		V1	V2	V3	
Presentation Aspects					
1	Conformity to purpose	4	4	4	4.00
2	Picture clarity	4	4	3	3.66
3	Picture size	4	3	4	3.66
4	Picture lighting	3	4	4	3.66
5	Picture composition	4	4	4	4.00
6	Picture color	4	4	4	4.00
7	Clarity of text	3	3	3	3.00
8	Clarity of sound	2	2	2	2.00
9	Music support	3	3	4	3.33
10	Sound effect	3	2	4	3.00
11	Exacting role of teacher and student	4	4	3	3.66
12	Serving metacognitive strategies	3	4	3	3.33
13	Ruffling of activities in the video	4	4	3	3.66
Content Aspects					
14	Concept conformities	4	4	3	3.66
15	Ease of purpose to emulate	4	4	4	4.00
16	Ease of tools and materials to prepare	4	4	4	4.00
17	Learning activity in video help to identify and describe learning objectives and student preparation phase	4	4	3	3.66
18	Learning activity in video help to identify and describe demonstrated knowledge and skills phase	4	4	3	3.66
19	Learning activity in video help to identify and describe guided practicing phase	4	4	4	4.00
20	Learning activity in video help to identify and describe the feedback phase	4	4	4	4.00
21	Learning activity in video help to identify and describe the advanced training phase	4	4	3	3.66
22	Learning activity in video help to understand *iMind Map* learning strategy	4	4	3	3.66
23	Learning activity in video draw how to use *iMind Map* learning strategy in ecosystem topic	4	4	3	3.66
24	Video modelling helps to understand metacognitive strategy (write the prior knowledge, determine the level of confidence, discuss in the group, to compare prior and new knowledge, self-evaluation)	4	4	3	3.66
Language aspects					
25	Conformities with Indonesian rules	3	4	4	3.66
26	Ease to understand	4	4	4	4.00
27	Teacher articulation clarity	4	4	3	3.66
28	Teacher intonation quality	4	4	3	3.66
Validity score					**3.63**
Category					**Very good**

Note: V1= Validator 1, V2 = Validator 2, and V3 = Validator 3

Table 1 shows that the overall quality of the video modelling for *iMind Maps* Learning Strategy/LS to be very good with validation score of 3.63.

Video produced in this study had good quality because its manufacturing process paid close attention to several aspects,

including (1) the equipment needed for filming. Proper lighting is essential aspect, production of video considered filming in location with good natural lighting during the daytime, while lights were also added during filming location to induce bright feeling in the educational video, (2) choosing excellent microphone. A good microphone helps the message come through loud and clear on educational video, (3) choosing good filming location. The place chosen had minimum surrounding noise, as otherwise could possibly interfere with video recording, (4) choosing comfortable video editing tool. A tool such as Windows Movie Maker (for a PC) or iMovie (for a Mac) can be useful for editing and finishing an educational video.

The learning activity was displayed in the video was in accordance with the steps of Direct Instruction/DI [21], which consisted stating learning objectives and students preparation (phase 1), demonstrating knowledge and skills (phase 2), guided practicing (phase 3), feedback giving (phase 4) and advanced training giving (phase 5).

The language aspects mainly regarded were conformities with Indonesian rules and whether word/phrase/sentences were easy to understand. The teacher model in video modelling was suggested to speak with excellent articulation and intonation.

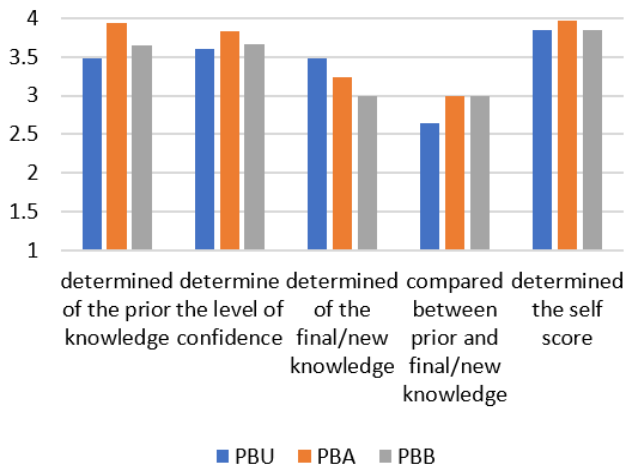

Fig. 1. Evaluation of metacognitive skills of pre-service biology teacher

Based on the data in Figure 1, it could be inferred that the metacognitive skills of students in all classes were found to be very good on 4 indicators, which were determining initial knowledge, determining the level of confidence, determining final knowledge, and determining the self-score and good on 1 indicator; comparing prior and final/new knowledge. The implementation of metacognitive strategy in the learning process improved students' self-efficacy. Self-efficacy is a person's belief in his ability to achieve the desired results of actions taken. It is a determinant of behavior for someone when choosing whether someone will be involved and persistent in facing obstacles and challenges or vice versa [22, 23] The high self-efficacy would cause a person to have better metacognitive skills [24], including five metacognitive skills examined in this study. The following Table 2 presents the responses of pre-service biology teacher related to learning activity performed.

TABLE II. RESPONSES OF PRE-SERVICE BIOLOGY TEACHER TO VIDEO MODELLING AND LEARNING PROCESS

No	Aspects	Average of Pre-Service Biology Teacher Positive Responses	
		Unesa	UM
Presentation Aspects			
1	Picture clarity	96.59%	100%
2	Sound clarity	30.68%	72%
3	Text clarity	64.77%	100%
4	Perfection of roles	100%	90%
5	Activity	100%	100%
Content Aspects			
6	Conformities to the course concept	98.86%	94%
7	Accuracy based on ojectives	98.86%	92%
8	Tools availabilities	96.59%	94%
9	Learning activity in video help to identify dan describe DI phases for LS modelling	98.86%	88%
10	Learning activity in video help to identify and describe the stating learning objectives and students preparation phase	96.59%	94%
11	Learning activity in video help to identify and describe the demonstrating knowledge and skills phase	92.04%	78%
12	Learning activity in video help to identify and describe the guided practising phase	94.31%	84%
13	Learning activity in video help to identify and describe the feedback phase	98.86%	66%
14	Learning activity in video help to identify and describe the advanced training phase	88.63%	72%
Language Aspects			
15	Conformities with Indonesian rules	100%	88%
16	Ease to understand	97,72%	96%

The data in Table 2 shows that the pre-service biology teacher of Unesa and UM responded positively to video modelling on aspects of language and metacognitive phase. In addition, most of the students also gave positive responses on several presentation aspects such as display of pictures, writing, the role of teachers and students during learning process, as well as sequence of learning activities in the video. The lowest positive response was given by students on the clarity of sound aspect.

IV. CONCLUSION

Results showed that the video quality was good on the stage of metacognitive learning strategies, consisted of writing prior knowledge, determining level of confidence, discussing among groups, comparing prior and new knowledge, and performing self-evaluation. Another finding was that pre-service teachers' metacognitive skills were excellent and they also showed a positive response to the video, especially of learning stages, learning strategies, and metacognitive skills. This study suggests that the video can be

used as a standardized modelling video to teach metacognitive skills.

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