Improving Cognitive Learning Outcomes through Science Learning Videos Integrated with Local Potencies

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Abstract. Using video in student education could improve their ability to apply knowledge. This study aimed to reveal the feasibility of science learning video integrated with local potencies and improve cognitive learning outcomes. To improve cognitive learning outcomes using video learning, we applied the quasi-experimental design. Research population consisted of 168 first graders of SMPN 1 Pundong, SMPN 1 Sanden, and SPM Muhammadiyah Sanden. Research sample was selected by conducting cluster random sampling consisting of control classes and experiments. Pre-score and post-score data were obtained through a test of cognitive learning outcomes given before and at the end of the learning process. The data were analyzed by using normalized gain scores. The analysis results showed that normalized gain scores were low in control class and medium in experiment class. The results included the validation of science learning video integrated with local potencies based on experts, science teachers, and students in preliminary field testing. The validation result showed that the science learning video integrated with local potencies was feasibly used in science classes and could improve cognitive learning outcomes.

Keywords : science learning video, local potential, cognitive learning, science education

1. Introduction
To plan an education policy, the national education involves local potencies as one of the fundamental principles. It is regulated by the Law Number 20 Year 2003, the Government Regulation Number 32 Year 2013, and the Regulation of the Ministry of Education and Culture Number 81A Year 2013 confirming that education for each educational unit has to contain potencies, learning processes of those potencies, and local uniqueness in accordance with each region. It becomes an opportunity for teachers to conduct learning by utilizing any existing local potency.

Character-based local potency education is a solution alternative for science learning. Constitutions of science learning are minds-on and hands-on, so science learning processes have to activate those three aspects. The outcomes are built by thinking skills and experiences, leading to learning that obliges learners to find the learned concept by themselves by using hands-on experiences and contextual learning. Hands-on experiences can be derived by using local potencies as a nearby learning source. Besides, educators should be more creative and pay more attention to the needs of learners in accordance with their interests and skills. By that, learners can implement their knowledge to be a contributive skill for their future and internalize their characters to control both utilization and preservation of local potencies.

Previous research using onion farming potencies in science learning was conducted by Setiawan, D. and Wilujeng, I. [18]. They developed a local-potency-based learning instrument validated by the good
category. This instrument was effective to improve science process skills, cognitive learning outcomes, and environment caring attitude of the seventh graders of SMPN O Bulakamba. The research was elaborated by Cahyaningtyas, R.N., Wilujeng, I., and Suryadarma, I.G.P. [5] by testing effectiveness of instrument integrated with local potencies on larger subjects. It proves that the learning instrument developed gives a significant effect on the improvement of science process skills, learning outcomes, and environment caring attitude of seventh graders.

Based on the findings of the first and second research, there are barriers in time and cost when educators have to perform learning out of the classrooms, so that the implementation of learning integrated with local potencies was difficult to conduct. Therefore, media to overcome the barriers and expand the dissemination stage are required to be developed. Using media can help students understand materials faster and better, prolonging the longevity of knowledge [13].

Advanced technology and information enable teachers to choose media supporting their material delivery. Teachers are obliged to master technology to ease students in learning [12]. Learning integrated with technology in its activities is proven to be more effective to improve learning outcomes [18]; [4]. Media going to be developed must be in accordance with students’ needs. They need media that are able to save cost, time, and space; creating learning integrated with local potencies in classrooms. In such case, the most appropriate media is learning videos. Videos make us able to manipulate time (by cutting the time) needed to observe an event or object and space [3]. Learning video media have several advantages. Imamah [8] argues that video can give inspiration of the relation between learning materials and environment to students. Munadi [15] adds that video media have some features: to be able to overcome both distance and time limitation, be repeated to make the materials clearer, deliver messages faster and more memorable, develop learners’ thinking skills, develop learners’ imagination, clarify abstract materials and present more realistic images, influence an individual’s emotion, explain a process and skill well, stimulate learners in accordance to the expected objectives and responses, enable all learners to learn, develop learning interests and motivations, and influence learners’ attitudes and emotion. Learning videos ease learners to observe and imitate stages of process or procedure that has to be learned. Additionally, learning videos can influence the development of learners’ attitude and emotion.

Development of learning video integrated with local potencies in junior high schools should become one of the solutions to implement learning integrated with local potencies in classrooms. Learning videos can present objects of local potency in classrooms, giving learners chances to directly observe local potencies of their region without worrying spatial and time limitations because the activity can be done in the class simultaneously. In addition, by using videos as learning media, learners can create the same and correct perception and understanding besides accepting the learning materials [20]. Several research has indicated that videos can be effective learning media [1]; [7]; [10]; [16].

2. Research Methods
This research was research and development performed in three schools located in Bantul that were SMPN I Pundong, SMPN I Sanden, and SMP Muhammadiyah Sanden with the population consisting of 168 students. Data were analyzed to investigate the feasibility of learning video integrated with local potencies validated by two expert lecturers, six science teachers as validators, and ten learners as respondents. Data collection instruments used to validate were validation questionnaires for media and material experts and response questionnaires for learners. Scoring analysis was conducted by using a conversion scale presented in Table 1.

| No. | Score Range | Score | Category |
|-----|-------------|-------|----------|
| 1.  | X ≥ 3       | A     | Excellent|
| 2.  | 3.00 > X ≥ 2.50 | B     | Good     |
| 3.  | 2.50 > X ≥ 2.00 | C     | Average  |
| 4.  | X < 2.00    | D     | Bad      |
Learning videos were feasible to use in science learning if the mean of validation score was at least > 2.8 and in the good category. Students’ learning outcomes were measured by doing pretest and posttest and applying the non-equivalent pretest-posttest control group design which can be seen in Table 2.

| Class     | Pretest | Treatment | Posttest |
|-----------|---------|-----------|----------|
| Control   | O₁      | X₁        | O₂       |
| Experimental | O₃    | X₂        | O₄       |

Details:
O₁: the average value of control-class students
O₂: the value of control-class students
O₃: the value of experiment-class students
O₄: the value of experiment-class students
X₁: learning using PowerPoint
X₂: learning using videos

Pretest and posttest scores were used to find the gain value after learning. The data were then measured using normalized gain to determine the average normalized gain (g) of each group. The average normalized gain was calculated and classified using the following formula and categories.

\[ g = \frac{\text{posttest score} - \text{pretest score}}{\text{maximum score} - \text{pretest score}} \]

The gain scores were categorized into three: high, medium, and low as presented in Table 3.

| No | Score (g) | Categories |
|----|-----------|------------|
| 1  | (g) > 0.7 | High       |
| 2  | 0.7 ≥ (g) ≥ 0.3 | Medium   |
| 3  | (g) < 0.3 | Low        |

Sources: Hake (1999: 66-67) [6]

Cognitive learning outcomes were stated to have increased if the gain score achieved the medium-high categories.

3. Results and Discussion
Expert assessments on video quality: (1) from the media quality aspect, the video was given the score of 3.83 with the excellent category and (2) from the technique aspect, the video was given the score of 3.84 with the excellent category. The average score from video quality assessments was 3.84 with the excellent category. Expert assessments on video materials: (1) the content feasibility aspect of video was excellent with the score of 3.75, (2) the linguistic aspect of video was excellent with the score of 3.38, (3) the presentation aspect of video was excellent with the score of 3.85, and (4) the local potency aspect of video was excellent with the score of 3.85.

Material quality of video was given the score of 3.71 with the excellent category. Video quality was developed in order to be able to be used in science learning in junior high schools. The development was regarded as one of the solutions to implement learning integrated with local potencies at schools. Results of video assessment are presented in Table 4 and Table 5.
Table 4. Results of learning Material Assessment

| Aspects          | Average | Category |
|------------------|---------|----------|
| Content feasibility | 3.75    | Excellent |
| Language         | 3.38    | Excellent |
| Presentation     | 3.85    | Excellent |
| Local potency    | 3.88    | Excellent |
| Average          | 3.71    | Excellent |

Table 5. Results of Media Quality Assessment

| Aspects          | Average | Category |
|------------------|---------|----------|
| Video media      | 3.83    | Excellent |
| Video technique  | 3.84    | Excellent |
| Average          | 3.84    | Excellent |

Based on the results of validation displayed in Table 4 and Table 5, from the learning material aspect, feasibility of science learning video developed was given the score of 3.71 with the excellent category; while the video media quality was given the score of 3.84 with the excellent category as well. This indicated that the developed video were feasibly used to support learning instruments (lesson plan, student worksheet, and evaluation).

A small-scaled test was done in the VII class in SMPN 1 Sanden to ten learners. Data obtained from this test were learners ‘responses to a learning CD integrated with local wisdoms. The results of responses are showed in Table 6.

Table 6. Learners’ Responses to the Video

| Indicators          | Average | Category |
|---------------------|---------|----------|
| Graphic quality    | 3.50    | Excellent |
| Audio quality       | 3.70    | Excellent |
| Video presentation  | 3.70    | Excellent |
| Linguistic clearness| 3.70    | Excellent |
| Information clearness | 3.50 | Excellent |
| Average             | 3.62    | Excellent |

Result of small-scaled test revealed that the results of learners’ responses to learning videos integrated with local potencies were excellent and could draw learners’ interest to study. Based on the results, we could conclude that the final product of this video development result was feasibly used in science learning. The product could be massively produced to improve learning quality, especially that relating to science objects and observations in junior high schools. Hopefully, the product could also be used in classroom or independent science learning.

The developed learning video should improve learners’ understanding of science objects and observations. Assessments to measure achievements in the improvement of students’ learning outcomes were conducted by using assessing items developed by Dani Setiawan and Insih Wilujeng [18]. Feasibility of the instruments of cognitive learning outcome results had been validated and categorized as valid.

Table 7. Cognitive Learning Outcomes Results

| Assessment Statistics | Experiment Group | Control Group |
|-----------------------|------------------|---------------|
|                       | Pre-score | Post-score | Pre-score | Post-score |
| The average value     | 54.38      | 84.09       | 54.92      | 66.07       |
| Gain score Categories | 0.65      | Low         | 0.25       |
| Standard deviation    | 15.85     | 8.27        | 14.48      | 12.15       |
| Minimum value         | 18.18     | 68.18       | 31.82      | 45.45       |
| Maximum value         | 86.36     | 100.00      | 90.91      | 100.00      |
Cognitive learning outcomes were measured by using assessing items given before and after the whole learning process in control and experimental classes. The outcomes were then analyzed to figure out the gain score. Based on Table 7, the average post-score of learning outcomes on both classes had a higher score than the average pre-score. Analysis results proved that the gain score in the experimental class was 0.66 and could be categorized as medium. It revealed that there was a difference between cognitive learning outcomes in the class experiment before and after we used learning videos integrated with local potencies. Control class gained the gain score of 0.25 and categorized as low, suggesting that learners’ cognitive learning outcomes in the experimental class using learning videos integrated with local potencies were higher than that in the control class that was not given learning videos integrated with local potencies. Learning integrated with technology in its activity was proven to be more effective to improve learning outcomes [20]; [4]. By using video media in learning, learners could get the same and correct perception and understanding besides accepting learning materials [17].

Learning videos integrated with local potencies were proven to be effective to improve learners’ cognitive learning outcomes based on the scores obtained before and after we used the video in learning. Experimental class using the video had more increased cognitive learning outcomes if compared to the control class that only used uninteresting PowerPoint media. Interesting media were important to draw learners’ interests. Such media could help learners understand materials faster and better, so that cognitive learning outcomes can increase [13]. It was supported by Means, et al. [14] stating that technology could improve learning quality.

Formation and achievement processes of a concept by learners were an active process [2]. By learning videos, learning materials would be clearer, enabling learners to be able to understand more and achieve learning objectives [19]. Some research had suggested that videos could be effective learning media [1]; [7]; [11]; [16]. Finally, the results of this study are supported by Jeenthong’s findings, which conclude that classes that experience meaningful experience with the right guidance will show a better understanding of the real-life context and mastery of concepts that are better than classes taught by conventional methods so that cognitive learning outcomes can increase [9].

4. Conclusions
Based on the results of research and discussion showed that the science learning video integrated with local potencies was feasibly used in science classes according to expert lecturers and science teachers. The analysis using normalized gain score shows that the experimental class’ group is better than the control group, indicated by the result of the normalized gain analysis in which the average normalized gain score for the experimental group is 0.65 and categorized medium. These results show that science learning video integrated with local potencies can be used in science classes and can improve cognitive learning outcomes.

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