

STUDENTS' MOTIVATION AND ACADEMIC ACHIEVEMENT IN A "FLIPPED" GENETICS LESSON USING YOUTUBE VIDEO

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Abstract

The flipped classroom is a pedagogical model in which the typical lecture and homework activities are reversed. This study aims to describe students motivation and academic achievement in a "flipped" genetics lesson using YouTube video. The subject of this research are 40 high school students in West Bandung regency, Indonesia. Seven days before learning activities, students are asked to watch a video of the genetic materials on YouTube which is already determined by teacher. While in face-to-face class, students are given the opportunity to ask questions about the concepts that have been learned at home and discussed it in small group with the teacher's guidance. Data was collected using observation sheets, cognitive tests and motivations' questionnaires. The results showed that 87.5% of students passed formative test ($\bar{x} = 79.85$) and students' motivation scores were at least as high ($\bar{x} = 3.10$). The results of this study indicate that the implementation of flipped classroom can stimulate students' motivation in keeping the attention during lesson and students feel very satisfied in participating learning activities. Implementation of flipped classroom gives discretion to the students to perform learning independently so the slow learners have more time to redo the video learning until they have better understanding of the concepts presented.

Keywords: flipped classroom, genetics lesson, students' motivation, academic achievement.

1 INTRODUCTION

Teachers and students have numerous difficulties to achieve the objectives in genetics lesson. The difficulty in learning genetics is because most of genetic objects are abstract and there is no good enough instructional media that support learning process. Duncan and Reiser (2007) asked the question that why learning genetics phenomena so difficult for the learners? Two answers were developed for this question in the literature. The first one is that students have difficulties in the invisibility and inaccessibility of genetics concepts. The second one is that genetics included complicated structure. Genetics involved multiple biological organization levels-genes, proteins, cells, tissues, organs, etc (Duncan & Reiser, 2007).

In Indonesia, genetics lesson is typically taught through lecture and note-taking. There is widespread consensus among developmental psychologists and educational theorists that learning is optimized when students construct and negotiate meaning (Leo & Puzio, 2016). This notion is incredibly important for educators designing learning environments aligned with principles of evidence-based learning. Instead of

being the “sage on the stage,” teachers should support students to negotiate, construct, and debate the meaning of important scientific concepts.

With this basic notion in mind, this research aims to investigate motivation and students’ achievements in a flipped genetics lesson. When the primary content is delivered outside of class, there is time and space in class for active learning. Although flipped approaches to instruction have improved science achievement, most of the existing researches have been conducted in undergraduate settings (Leo & Puzio, 2016).

Some studies have reported an increase in student achievement with flipped methods of instruction. Researchers found that flipped-class pedagogy enhanced critical thinking, task value, and peer learning (van Vliet, Winnips, & Brouwer, 2015). Students are living in a digital age and many students can comprehend and follow directions better on technology than they do through verbal and book instructions. The flipped classroom can be a successful mode of learning that has the potential to enhance student learning while incorporating all state mandated learning standards in a modern way (Chen, 2016). Besides that, flipped instruction had a positive effect student achievement, and some students reported that they preferred watching video lectures outside of class and appreciated more active approaches to learning (Leo & Puzio, 2016).

Despite the success of flipped classroom in some researches, its use in the classroom for teaching genetics lesson to slow learners have not been explored. Kephart (1971) defined a slow learner as one who has reached his potential and yet achieves quite poorly in school subjects. The slow learners pattern of poor achievement is basic and consistent over time and across school subjects. The slow learners also processes information in a slightly different way from other learners (Udeani & Okafor, 2012). They are difficult to understand abstract objects and that are also having trouble to apply the concepts taught into new situations (Borah, 2013; Shaw 2010). In addition, they have trouble in time management, so it is often too late in completing the task (Malik, Rehman, & Hanif, 2012).

Flipped classroom is one of pedagogic model where the implementation time face to face activities in the classroom and work tasks are reversed. A short video about the subject matter seen by students at home before they follow the learning activities in the classroom. Learning in the classroom is devoted to working on assignments in the form of exercises, simulations, project or discussion. One important characteristics in flipped learning approach is using of video lesson to substitute material lecturing by teacher (Educause, 2012). Flipped approach is considered attractive because it involves the use of the internet including audio and video narration by competent people. This video can be created by teachers and then uploaded online or distributed offline to the students. The availability of the material in the form of video gives freedom to the students to pause, or repeat the material at any time (Herreid & Schiller, 2013).

Flipped instruction is not one instructional practice. It refers to a wide variety of instructional techniques that have been implemented differently by different researchers and educators. Typically, in flipped classroom instruction, content dissemination (lecture) is moved outside of the classroom to create more time for active learning inside the classroom. The in-class, active learning may include discussions (Critz and Knight 2013; Talley and Scherer 2013).

2 METHODOLOGY

Research was conducted using descriptive method, which is describing or depicting phenomena that exist, both natural phenomenon or by human selection. Descriptive study does not provide treatment, manipulation or alteration of the independent variables, but describes a present condition (Sukmadinata, 2006).

The subject of this research are 40 high school students in West Bandung regency, Indonesia. All participants are slow learners who achieves poorly in school subjects consistently. The lesson were done in two meetings. First meeting was used to discuss characteristics of chromosomes, DNA and RNA. Second meeting was used to discuss replication, trancription and translation processes. Seven days before learning activities, students are asked to watch a video of the genetic materials on YouTube Channel which is already determined by teacher. For students who don't have internet access at home, the teacher gives a soft copy of the video so that students can view it offline at home. Duration of the video no longer than 20 minutes. While in face-to-face class, students are given the opportunity to ask questions about the concepts that have been learned at home and discussed it in small group with the teacher's guidance. Then the teacher give exercise or assignments for deepening the concepts understanding.

In this study, researcher used some of techniques to collect the data, such as: (1) observation sheet to measure the learning activities, (2) student achievements are collected using cognitive tests (post-test), and (3) questionnaire to assess the student's learning motivation. All the data collected in this study were

analyzed using descriptive statistics.

3 RESULTS

In general, flipped instruction had a positive effect both for students' achievement and student motivation. Learning activities for two meetings indicate positive result or 'good' category.

3.1 Learning Activities

The result showed that mean score of learning activities for two lessons were 85.26. It can be concluded that mean score of learning activities in a flipped genetics lesson was in the good level category. The results of learning activities during two meetings can be seen in table 1.

Table 1. Score of Learning Activities in a "Flipped" Genetics Lesson using YouTube Video (N=40)

| Meeting | Observer | Score* | Score (%) | Levels of Achievement** |
|---------|----------|--------|-----------|-------------------------|
| First | A | 70 | 89.74 | Excellent |
| | B | 60 | 76.92 | Good |
| Second | C | 63 | 80.77 | Good |
| | D | 73 | 93.59 | Excellent |
| Average | | 66.5 | 85.26 | Good |

*) maximum score = 78

**) levels of achievement based on Arikunto (2010)

The aims of the learning activities assessment is to determine the percentage of achievements' criteria that reflect the learning activities goes well. This result indicate that the lesson follows designated lesson plan, learning activities both by teachers and students have been met. The result means that the mastery of concepts and students' motivation were affected by flipped learning strategy.

3.2 Mastering the Concept

The results of students' achievement in cognitive test can be seen in table 2. The results showed that 87.5% of students passed formative test with average were 79.85, considered as good level category (Arikunto, 2010).

Table 2. Students' Achievement in a Flipped Genetics Lesson

| Percentage of Students Formative Test | | Cognitive Test Average |
|---------------------------------------|---------|------------------------|
| Pass* | Failed* | 79.85 |
| 87.50 | 13.50 | |

*) minimum passing marks is 70

Based on the table 2, it can be seen that some students did not achieve minimum passing marks. Further interviews to students who did not pass, they did not do the tasks that teachers provide such as watching videos and filling out worksheets. During the discussion, students who do not do homework will be passive during the discussion. As a result, they will not understand the material discussed in the classroom.

Based on the questionnaire, 92% slow learners play the video more than twice. They assume that genetics included complicated structure. Students have difficulties in the invisibility and inaccessibility of genetics materials. Application of *flipped classroom* gives discretion to the students to perform learning independently so the slow learners student have more time to redo the video learning until they have better understanding of the concepts presented. Therefor, their cognitive test score increasing. In contrast, the students in traditional classroom are trying very hard to understand the explanation given by teacher. Slow learners

have a less confident pattern. They are rarely even afraid to ask the teacher to repeat the material being discussed. (Maylina, 2014).

In a traditional lesson, students often try to capture what is being said at the instant the speaker says it. They cannot stop to reflect upon what is being said, and they may miss significant points because they are trying to transcribe the instructor's words. By contrast, the use of video and other prerecorded media puts lessons under the control of the students: they can watch, rewind, and fast-forward as needed (Educause, 2012). This ability may be of particular value to students with accessibility concerns, especially where captions are provided for those with hearing impairments. Lessons that can be viewed more than once may also help those for slow learners. Devoting class time to application of concepts might give instructors a better opportunity to detect errors in thinking, particularly those that are widespread in a class. At the same time, collaborative projects can encourage social interaction among students, making it easier for them to learn from one another and for those of varying skill levels to support their peers.

Face to face class activities filled with work assignments and class discussions for deepening the material. Students give positive feedback for the teacher to recognize the learning styles of their students even better. The use of study time in the classroom has become more effective. Another positive finding in the research literature was enhanced discussion between students and instructors. Tune *et al.* (2013) found that they were better able to engage students in discussion, and that students asked more specific questions about key material and more follow up questions as compared to students in a traditional classroom (Leo & Puzio, 2016).

Learning activities through video help students to learn using their senses of hearing and sight all at once and pay attention to a process which moves (simulation process) making it easier to understand the material. Mayer (O'Day, 2006) has proven that students learn more effectively when there is a merger between words with images for audio-visual (multimedia effects) rather than just reading text even if it equipped by pictures (spatial proximity effect). This can happen because many of students sense organs actively involved in the learning process (Sugapriya and Ramachandran, 2011)

To assure a good learning results, students should have the attention to materials that he will learn. Therefore, it needs to organize that learning materials always interesting and attractive (Slameto, 2003). If students already feel interested in something, then it will develop an interest in students to study the learning material. It expressed through a statement that shows students prefer something than other (Hamalik, 2007).

A teacher's interaction with students in a flipped classroom can be more personalized and less didactic, and students are actively involved in knowledge acquisition and construction as they participate in and evaluate their learning. This is different from traditional lecture. In the traditional model of classroom instruction, the teacher is typically the central focus of a lesson and the primary disseminator of information during the class period. The teacher responds to questions while students defer directly to the teacher for guidance and feedback. In a classroom with a traditional style of instruction, individual lessons may be focused on an explanation of content utilizing a lecture-style. Student engagement in the traditional model may be limited to activities in which students work independently or in small groups on an application task designed by the teacher. Class discussions are typically centered on the teacher, who controls the flow of the conversation. The flipped classroom intentionally shifts instruction to a learner-centered model in which class time explores topics in greater depth and creates meaningful learning opportunities, while educational technologies such as online videos are used to deliver content outside of the classroom (Abeysekera et.al, 2015).

3.3 Students' Motivation

Student motivation is measured using ARCS questionnaire developed by Keller. The ARCS model is based on a synthesis of motivational concepts and characteristics into the four categories of attention (A), relevance (R), confidence (C), and satisfaction (S). These four categories represent sets of conditions that are necessary for a person to be fully motivated, and each of these four categories has component parts, or subcategories (Keller, 2000). The result of students' motivation is showed in table 3.

Table 3. Questionnaire Result of Students' Motivation Scores

| Score average | | | | Overall score |
|------------------|------------------|-------------------|---------------------|---------------|
| <i>Attention</i> | <i>Relevance</i> | <i>Confidence</i> | <i>Satisfaction</i> | |
| 3.25 | 3.09 | 2.96 | 3.10 | 3.10 |

The result showed that students' motivation was good level category for all aspects, with an overall average for *attention* (3.25), *relevance* (3.09), *confidence* (2.96), and *satisfaction* (3.10). This means the use of video can encourage students to have high learning motivation. Video tutorial does have its own uniqueness in terms of display coupled with its run in audio visual. Mayer (2003) has provided evidence that students learn more effectively when words and pictures are combined ("multimedia effect") than from words alone and when printed words are placed adjacent to corresponding pictures ("spatial contiguity effect"). These results are consistent with the cognitive load theory, which is based on the concept that there is a limited amount of working memory, and by using both visual and auditory channels, working memory is increased (O'day, 2006). The audio-visual can trigger and motivate students to learn better through its own charm and attractiveness (Sanaky, 2011).

The result for attention aspect showed good level category. It is strengthened that use of animation media as an audio-visual media in learning could increase the students attention during the learning session. Sanaky (2011) suggests one of the four functions of instructional media, especially visual media is to stimulate students' attention. The function of attention means that visual media as the core, attractive and directing the attention of learners to concentrate on the content related to the meaning of the displayed visual or text accompanying the subject matter. According to Keller (2000), to maintain the students' attention need to be made a specific effort that stimulates the curiosity of students against it. Using the animated media in learning can be one good strategy for improving students' attention seen from the results obtained through the learning process that has been done.

The result for relevance aspect showed good level category. The result indicates that overall the students convinced that learning it has compatibility with the needs of the students so that students are motivated to follow the instruction and keep learning. According to Keller (2000) motivation is lost if the content has no perceived value to the learner. Relevance results from connecting the content of instruction to important goals of the learners, their past interests, and their learning styles. One traditional way to do this is to relate instructional content to the learners' future job or academic requirements. Another, and often more effective approach is to use simulations, analogies, case studies, and examples related to the students' immediate and current interests and experiences. Today, social media play an increasingly more important role in the life of society because users spend a lot of time online and they view social media as an important source of information about issues which users are concerned with. YouTube, being one of the mainstream social media, allows users to share their videos online, create their channels and, thus, create their virtual communities united by common interests.

Confidence aspect in the motivation questionnaire earned the lowest average scores than the other aspects. Most students showed that students did not have the confidence to be able to follow the lessons well and get satisfactory results. According to Keller (2000), confidence will empower students to have positive expectations of success. The results of the questionnaire shown that there are words that are not understood during the learning activities implemented. This is related to the use of English in the media. A number of students who filled out the essay on learning motivation questionnaire recommended the video which use Indonesia subtitles because they didn't understand English.

The result of satisfaction aspect indicate a good category. Implementing animation media in learning makes students feel satisfied with the learning process. It refers to positive feelings about one's accomplishments and learning experiences. It means that students receive recognition and evidence of success that support their intrinsic feelings of satisfaction and they believe they have been treated fairly (Keller, 2000). Image or visual symbol will be able to arouse the emotions and attitudes of learners (Sanaky, 2011).

4 CONCLUSIONS

The results showed that 87.5% of students passed formative test ($\bar{x} = 79.85$) and students' motivation scores were at least as high ($\bar{x} = 3.10$). The results of this study indicate that the implementation of flipped classroom can stimulate students' motivation in keeping the attention during lesson and students feel very satisfied in participating learning activities. Implementation of flipped classroom gives discretion to the students to perform learning independently so the slow learners have more time to redo the video learning until they have better understanding of the concepts presented. The use of video puts lessons under the control of the students: they can watch, rewind, and fast-forward as needed.

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