Online Learning Design for Animalia Classification Materials With Discovery Learning-Based Learning Videos and Vee. Diagrams

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ABSTRACT

A preliminary study was done by giving a cognitive test using a two-tier diagnostic test to 147 students of 10 high schools from 5 districts. It showed that the questions that a respondent can accomplish were only 56%. This research aims to 1) know the characteristics of online learning using video for Animalia classification materials based on discovery learning and vee diagrams 2) determine the feasibility of learning videos for animal classification based on discovery learning and Vee diagrams. This research is qualitative descriptive research. The research subjects were biology teachers and grade ten students of public senior high school in Wonogiri. The respondents were purposively selected. Data was collected from observation, interviews, and documentation. Data collection instruments were questionnaires for teachers on learning models and animal classification materials, students' questionnaires on learning video. The findings are 1) The video for Animalia classification made the learning more interesting, help the students to build concepts, and make learning more meaningful 2) learning video is suitable for use in online learning animal classification based on the results of teacher questionnaires at four aspects: (1) selection of learning resources and media teaching 87,50% (2) learning approaches and methods 87,50% (3) learning model syntax 90,63% (4) Evaluation 83,3% and the average result for material content 91,11%. Students also gave positive responses on learning video: (1) display 82,47% (2) materials 81,24% (3) learning model 81,9%.

Keywords: Discovery Learning, Video-Based Learning, Vee Diagrams, Animalia Classification

INTRODUCTION

Literacy related to the diversity and classification of living things is indispensable in conserving biodiversity resources in Indonesia (Dawson, 2014; Iancu, 2014). Diversity is defined as natural support that has many types, so it cannot be separated from grouping or classification to facilitate identification. Materials on diversity and classification of living things are studied by students at the high school level (SMA), applied in learning in Basic Competencies (KD) 3.3. The achievement of competencies expected in the KD includes students being able to explain the principles of classifying living things in five kingdoms and compiling cladograms based on the principles of classification of living things (Permendikbud No. 37 of 2018).

Classification material in biology learning is one of the materials that is considered difficult and requires a good level of understanding to master the material. The basic taxonomic concepts that need to be mastered in biology learning include identification, description, classification, and making cladograms (Wheeler, 2012). Classification learning materials teach the description and grouping of diverse living things. One example of mastery of the material in Animalia classification is that students are required to recognize animalia species to classify them into a certain category level (Yusriya, 2014). Kubiatko & Prokov (2007), in their research, stated that students often misclassify penguins as mammals and turtles as amphibians or invertebrates. This shows that there are still difficulties or errors in understanding concepts during classification learning. The low understanding of students' concepts can have an unfavorable impact on student learning outcomes.

The learning outcomes of the classification material for high school students in the Surakarta residency are still considered low. Based on the results of initial observations conducted through cognitive evaluation tests with 147 respondents in 10 high schools from 5 districts, it shows that the maximum number of questions that can be done by a respondent is only 56% referring to the criteria of Boz (2006). Cognitive evaluation tests using questions are *two-tier diagnostic test* which has been pilot tested on 31 respondents with 67% of the items having high validity and a reliability value of 0.7513. The question instrument is made by considering general indicators referring to BC (Base Competence) 3.3 based on general indicators that have been agreed upon by the subject teacher forum (MGMP).

The indicators set out in the questions include identification of taxon traits that are important for making key determinations, identification of similarities and differences in taxon traits for making taxonomic, taxonomic, and category descriptions, applying an understanding of the character of living things, identifying similarities and differences in taxon traits for making cladograms, binomial nomenclature. The use of the key of determination to trace the identity of the taxon, the importance of grouping living things, approaches in grouping living things, and the preparation of cladograms based on the identification of similarities and differences in the characteristics of living things. The low learning outcomes on the classification of living things indicate that the competency achievement indicators for the BC have not been achieved.

The results of observations at Public High School 3 Wonogiri involving teachers and students were carried out through interviews referring to the lesson plan, indicating that during the lesson, the teacher delivered the material using the lecture method. The learning media used by teachers are still conventional in the form of package books and material summaries from the teacher. Most students feel bored, so that learning becomes less meaningful. The identified problems indicate the need for an improvement in the learning process. Students need active learning designs, including interesting learning media, media can contain text, images, sound, and video.

Improvement of learning by choosing learning models and media that are in accordance with student characteristics can affect the success of the learning process so that learning

becomes more meaningful (Scott, 2015). The learning model that actively involves students, as suggested by the 2013 curriculum, to overcome the problems of learning biology is to use the discovery learning model. Discovery learning leads students to actively find their knowledge and concepts to achieve a meaningful learning process (Khabibah, 2017). The discovery learning model is suitable for constructing concepts, helping students in building knowledge, skills, and attitudes through a scientific approach (Vermans et al., 2000). This learning model is based on the student center, which is influenced by the flow of educational constructivism. Students can independently solve problems, find and build ideas or concepts to encourage students to be more active in learning. Discovery learning can improve students' cognitive processes (Putrayasa, 2014). This learning model consists of 5 stages, namely: orientation, hypothesis generation, hypothesis testing, conclusion, and regulation (Suphi & Yaratan, 2016).

The design of classification learning with the discovery learning model needs to be complemented by other supports so that learning is effective and efficient. The weakness of the discovery learning model can be complemented by the advantages of the Vee diagram, which is systematic and efficient in constructing student knowledge. Novak & Gowin (1984) have developed vee diagrams to construct concepts and are able to increase understanding of concepts in learning. The shape of the vee diagram resembles the letter V and has two different sides, namely the conceptual side (thinking) and the methodological side (doing) (Evren, Bati, & Yilmaz, 2012). Vee diagrams are able to help students construct their knowledge with the learning process so that students will more easily achieve understanding (Ling et al., 2019).

The 2019 Coronavirus Diseases (Covid-19) pandemic that is currently happening has had a major impact, especially in the field of education (Dewi, 2020). As a result of the COVID-19 pandemic, there has been a change in the learning paradigm from face-to-face in class (offline) to learning that is connected to the internet network (online) (Susilo, 2020). On March 24, 2020, the Minister of Education and Culture of the Republic of Indonesia had issued a circular letter. No. 4 of 2020, which explains that learning activities are carried out online as an effort to reduce the impact of the Covid-19 pandemic (Dewi, 2020).

This pandemic has completely changed the education system; without proper preparation, teachers are simultaneously required to change learning methods and media as a form of realization of online learning. The platforms used for online learning are of various kinds, including Google Classroom, Zoom, Whatsapp Group, and several other applications (Mansyur, 2020). Online learning does not guarantee that learning can be carried out effectively and meaningfully because based on interviews with students of Public High School 3 Wonogiri during online learning, the teacher provides only a summary of the material and written assignments to students that will be collected within a certain time limit. Thus, an effective online learning design is needed so that learning is more meaningful.

Another way to design learning to be more meaningful cannot be separated from the use of learning media. Learning media is a tool that encourages the learning process (Harahap, 2015). Advances in science and technology (IPTEK) require teachers to be more creative and innovative in the use of technology results for the learning process, one of which is by using learning videos. Video is a recording of live images or moving images accompanied by sound. Video is one type of audio-visual media (Choi & Johnson, 2005). Video media can increase students' curiosity and motivation to learn so that it is expected to facilitate understanding and mastery of the concepts of the material presented. Classification learning in biology using video can present information,

Learning using discovery learning-based learning videos and vee diagrams is expected to be a solution to problems related to learning classification materials and can help facilitate student understanding.

METHODS

This research is a qualitative descriptive study. Sampling was done using the purposive sampling technique. The research subjects were students of class X MIPA (Mathematics and Natural Sciences) of Public High School 3 Wonogiri covering 103 students from three classes, namely class X MIPA 1 a total of 36 students, X MIPA 2 a total of 33 students, and X MIPA 3 a total of 34 students, a biology teacher at Public High School 3 Wonogiri a number two people and 10 MGMP Biology teachers.

Data collection techniques used in the study were observation, interviews, expert validation, questionnaires, and documentation. Initial observations were carried out through cognitive evaluation tests with 147 respondents in 10 high schools from 5 districts. This cognitive evaluation test uses questions that are two-tier diagnostic tests made by considering general indicators referring to BC 3.3, which has been agreed upon by the subject teacher forum (MGMP). The initial study aimed to determine student learning achievement of the classification material. Interviews in the study were conducted with teachers and students at Public High School 3 Wonogiri by providing structured questions related to the implementation of learning.

The research was carried out in the odd semester of the academic year 2020/2021. Questionnaires given to students and teachers were made using a summated rating scale covering the following score categories (Sugiyono, 2010).

Table 1. Summated rating scale score

Category Answer Source	Score for Items
Very not good (STB)	1
Not good (TB)	2
Good (B)	3
Very Good (SB)	4

The results of student questionnaire responses to learning videos were analyzed using the technique of calculating student response scores (NRS) with the following formula (Setiawati, 2017).

$$\%NRS = \frac{\Sigma_{i=1}^{n} NRS}{NRS \; maximum} \; x \; 100\%$$

Information:
%NRS: Percentage of student response scores
$\Sigma_{i=1}^{n} NRS$: Total student response scores
NRS Maximum   : total score for correct answers

After obtaining the results of calculating the student response value (NRS), interpreting the percentage of student response scores in each aspect of the statement in the questionnaire, the response is categorized as positive if the results of the response are strong or very strong and vice versa. The category of student response scores can be seen in Table 2.

Table 2. NRS category

%NRS	Category
0% %N< 20%	Very weak
20% %N< 40%	Weak
40% %N< 60%	Enough
60% %N< 80%	Strong
80% %NRS 100%	Very strong

(Source: Setiawati, 2017); N = total score gained

There were two types of data collection for teachers' responses. The first was to respond to the implementation of the syntax of the discovery learning model and the Vee diagram in the topic of animal classification. This assessment was done by two teachers who taught at the treated class. The second type was a questionnaire measuring for aspects of animal classification video. This questionnaire was filled out by ten biology teachers. The results of the teacher's responses were analyzed using the formula according to Tegeh and Kirna (2010) as follows:

$$percentage = \frac{\sum(answers \; x \; score \; per \; item)}{n \; x \; highest \; score \; per \; item} \; x \; 100\%$$

Σ : amount
n : total number of questionnaire items

Interviews were also conducted with biology subject teachers at Public High School 3 Wonogiri regarding the implementation of classification learning in the classroom. Based on the results of interviews conducted by the teacher, data about learning planning were obtained, including preparation of lessons, syllabus, lesson plans (RPP), the process of implementing classification learning in class, and evaluation of learning.

RESULTS AND DISCUSSION

The results of the preliminary study showed that the maximum number of questions that could be done by a respondent was only 56% overall. This indicates that students were not achieved the competencies optimally. According to the respondent's perspective, the classification concept with a high level of difficulty is the concept of identifying important taxon traits for making key determinations, approaches to grouping living things, compiling cladograms based on identifying similarities and differences in the characteristics of living things, identifying similarities and differences in taxon traits for making taxonomic descriptions, concepts taxon and category,

The percentage of correct answers from all respondents according to each basic concept of classification is presented in Figure 1.
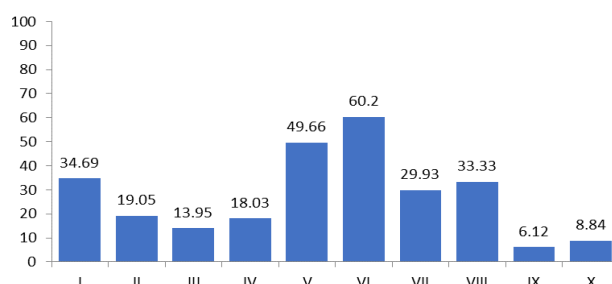
Figure 1. Percentage of correct answers for all respondents

I. Identification of taxonomic traits that are important for the key determination
II. Identification of similarities and differences in taxonomic characteristics for making taxonomic descriptions
III. Taxon and categories
IV. The application of understanding of the character of living things in order to kingdom categories to compile a taxonomic description
V. Identification of similarities and differences in taxonomic characteristics for the manufacture of cladograms
VI. Binomial nomenclature
VII. Use of the key to the determination to trace the identity of the taxon
VIII. The importance of grouping living things
IX. Approach to the grouping of living things
X. Compilation of the cladogram using an application program based on the identification of similarities and differences in the characters of living things.

Follow-up observations through interviews by students were carried out to find out data about the classification learning process applied by the teacher to the diversity and classification material. Summary of data from student interviews in the learning process, namely the learning process in the classroom is conducive, and students listen to the teacher deliver the material orally with textbooks and power points. After the learning process is changed to online, students only receive a summary of material and practice questions from the teacher through the Google Classroom platform. Some students still do not understand some materials, for example, making determination keys and making cladograms that have not been taught by teachers to students.

The lesson plan used by the teacher is developed based on the 2016 revised version of the 2013 Curriculum. The teacher uses a lecture model and a package book or PowerPoint as a medium of learning. During the pandemic, learning was carried out online, and the teacher only provided a summary of material and a sort of drill sent through the Google Classroom platform.

Student Questionnaire Response

The results of the student response questionnaires can be seen in Table 3. It shows the data on student responses to learning videos for animalia classification based on discovery learning and Vee diagrams. The average value of the student response questionnaire for class X MIPA 1, class X MIPA 2, and class X MIPA 3 have not differed significantly.

Table 3. Student response

Assessment Aspect	Percentage (%)			Average	Criteria
	XA 1	XA 2	XA 3		
Display	82.29	84.04	81.07	82.47	Very strong
Theory	81.71	81.43	80.57	81.24	Very strong
Learning model	81.48	81.90	82.33	81.90	Very strong

Overall, the results of the questionnaire show a very strong criterion. Therefore, it can be interpreted that the design to learn animal classification using the discovery learning-based videos and Vee diagrams received a positive response from students so that the learning design can be applied in the online learning process during pandemic conditions or can physical classroom.

Learning to use the Vee diagram is still new for students, so that direction is needed at every stage of the process. The learning video contains information about the stages of making Vee diagrams to ease the students to solve the problems given. The display of the explanation of the Vee diagram can be seen in Figure 2.
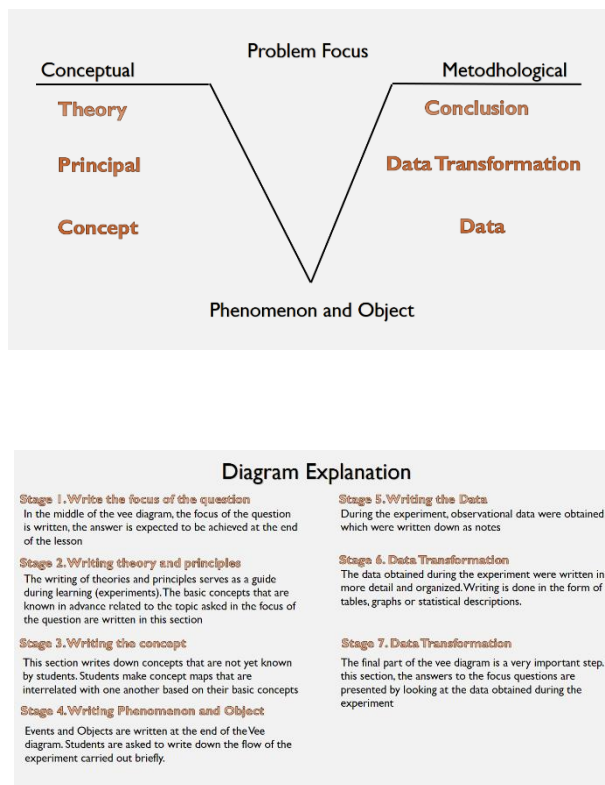

Figure 2. Stage display and explanation of the vee diagram diagram

Teacher Questionnaire Response Results

The questionnaire was responded to by two biology teachers at Public High School 3 Wonogiri. The data from the teacher's response questionnaire can be seen in Table 4. Based on Table 4, teachers agreed that the video of animal classification based on discovery learning and Vee diagrams a positive approach. The aspect of the selection of learning resources and teaching media, the approaches and learning methods, and the syntax of the learning model, and the evaluation were categorized as very strong. It means both teachers agreed that the video to learn animal classification is qualified.

Table 4. Teacher response

Aspect of assessment	Percentage (%)	Criteria
1. Selection of learning resources and teaching media	87.5	very strong
2. Learning approaches and methods	87.5	very strong
3. Learning model syntax	90.63	very strong
4. Evaluation	83.3	very strong

The second type of teacher assessment was obtained by filling out a questionnaire to assess the content of the material presented in the learning video. This assessment was carried out by 10 MGMP Biology teachers who are currently residents in Surakarta. The results of the questionnaire can be seen in Table 5.

Table 5. Responses of teachers who are the member of biology teacher learning community (N=10) on the material of the video

Aspects of assessment	Percentage (%)	Criteria
suitability	94.17	very strong
accuracy	88.75	very strong
sequence	88.75	very strong
attraction	92.50	very strong
content updates	92.50	very strong
availability	90.00	very strong
Average	91.11	Very strong

Overall, from the six aspects of the assessment for the material in the learning video, the average score was 91.11%, with very strong criteria. These results indicate that learning animalia classification with discovery learning-based learning videos and vee diagrams obtains a positive response.

The results of the learning design have been developed based on indicators that are used as a reference in making discovery learning-based learning videos and vee diagrams. Learning videos are used as an alternative to learning during the pandemic. The impact caused by the pandemic has changed the education system, which was originally implemented offline to be online or online. Classification material in its implementation needs to use native species to determine the diagnostic characters used for identification. Pandemic conditions that do not allow students to practice can be overcome with learning videos, where learning videos contain pictures of species that can provide semi-contextual images. The implementation of online learning requires teachers to make learning innovations so that the material can be conveyed properly and can facilitate student understanding so that learning becomes meaningful.

Specifically, the characteristics of learning using discovery learning-based learning videos and vee diagrams are learning videos containing the scope of animalia classification material which is made according to the indicators set out in the lesson plan and associated with basic taxonomy concepts including identification, description, classification, and making phenograms. Learning videos contain steps or tutorials in applying the skills of making cladograms. Making a cladogram based on the identification of similarities and differences in the characters listed in the achievement of indicators should still be taught to students so that students can more easily understand the close relationship between one species and another.

The learning steps applied in research based on discovery learning models emphasize learning activities that require students to actively (student center) be able to solve a problem (Liao, 2012). Discovery learning is a learning model that requires student activities to understand a learning concept through the facts provided (Kono et al., 2016). Discovery learning can make students build their knowledge by conducting experiments or finding a concept from the experiment (Joolingen, 1998). The student worksheets used in learning the animalia classification material are different from those in general because they use a diagram called a vee diagram whose stages intersect with discovery learning syntax and can complement the shortcomings of the discovery learning model. The use of vee diagrams in the learning process can make students discover new concepts or reconstruct previous

concepts so that they can make learning meaningful. According to Ausubel, meaningful learning is a process in which new information or concepts are associated with relevant (previous) concepts (Da silva et al., 2013). The use of vee diagrams in learning leads students to have the courage to express their curiosity by writing focus questions on the vee diagram so that it greatly influences student learning outcomes (Husna, 2016; Syifa et al., 2016). However, in its application, it is very important to guide students to work on the stages of the vee diagram from beginning to end because the use of the vee diagram is still new to students, and it is necessary to ensure that the focus of the questions in the vee diagram made by students is in accordance with the learning objectives.

Based on the results of the analysis of student and teacher responses to the design of learning materials for animalia classification using discovery learning-based learning videos and vee diagrams as a whole in terms of assessment of learning videos, the materials and learning models used obtained very strong results. The video display aspect obtained an average result of 82.47%. Learning videos use pictures in accordance with the learning materials provided so that they do not complicate students' understanding. Alhakim (2013) explains that the images displayed in the video according to the subject will make the material presented easy to understand. The selection of the type and size of the letters and the color of the writing in the learning video are appropriate and attractive, making it easier for students to read the material (Sulastri, 2019).

The response is very strong, with an average (82.32%) in the aspect of the material assessment. This shows conformity with the characteristics of a good video, namely the content of representative material so that the material is easy to understand. Learning videos have met the criteria for clarity of message, good video media allows students to understand learning messages more meaningfully, and information can be received as a whole. The learning video has met the criteria for a good video, namely user-friendly, video media using language that is easy to understand and common language. Learning videos as a whole have met the characteristics of good media, namely stand-alone, because learning videos can be used classically or individually, not only accessible at school but also at home (Choi & Johnson, 2005).

CONCLUSION

Conclusions are written briefly, concisely, and clearly in one paragraph, which is a summary of the results and discussion and answers from the objectives of the research/publication — emphasis on the novelty of discovery or development. If there are suggestions from research relating to the results of research for practical activities or further research based on the renewal results found, it can be delivered briefly and clearly at the end of a paragraph or can make a new paragraph.

Based on the results of the research conducted, it can be concluded as follows: (1) The characteristics of learning using video learning materials for animalia classification based on discovery learning and vee diagrams are that learning becomes more interesting and has a combination of six discovery learning syntax and eight stages of vee diagrams that help students in build concepts, improve understanding and make learning more meaningful. (2) Learning using discovery learning-based learning videos of animalia classification materials and vee diagrams is appropriate to use in learning animalia classification materials based on the results of student and teacher questionnaire responses which show very strong results.

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