

# Lesson Plan Analysis and High School Students' Difficulties on Understanding Basic Concepts of Animalia

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**Abstract.** This research aims to know the perceptions and cognitive level of students on Animalia, and the perception of teachers on teaching Animalia. Twenty-five of 11<sup>th</sup> graders of high school and five biology teachers from public and private of five high schools in Surakarta were selected purposively as participants. Data of students' cognitive level was tested by sort of validated instrument using QUEST program, whilst data on students' perceptions was collected by questionnaire. Lesson plan of teachers were analyzed to obtain teachers' perceptions. The result shows the average of students' cognitive level score was 77.22 in lower order thinking, and 43.46 in higher order thinking skills. Students said that memorizing and understanding the biological nomenclature of Animalia is the most difficult matter (40%). Students prefer to learn by memorizing the concepts and connecting to the real phenomena (36%). However, there were 32% students did not meet the minimum requirement. Students said that learning process are mostly expository (28%), but only 25% of students get bored. The result of teachers' lesson plan analysis show that teachers scored 75 on making indicators; 75 on content; 50 on method; 60 on topic sequences; and 75 on assessment, and the average was 67. It can be concluded that students found some difficulties in understanding basic concepts of Animalia, particularly related to nomenclature and classification. Whilst, teachers' lesson plan has not meet yet the good category, and it should be improved by some related trainings on how to design the qualified lesson.

## INTRODUCTION

Students experiencing biology learning activities are expected to show changes in better cognitive, affective, and psychomotor aspects. Changes in cognitive aspect can be indicated by the results of test on students' concept understanding. Poor results show students' difficulties in learning. Understanding on biology concepts is highly required for integrating nature and technology in world real life. As stated by Grant, Malloy, and Hollowell, the challenge in science learning is preparing students to act scientifically and to be able to solve problems. Students' learning strategies cover not only reading and listening, but also getting experiences directly and relating them to daily phenomena [1].

*Animalia* is one of biology topics learned by senior high school students in Indonesia. In 2013 Curriculum applied in Indonesia, *Animalia* is learned in the Basic Competence 3.8 with the competence of "students are able to classify animals in level of phylum based on their observation". On the basis of the competence, students are expected to identify the similarities and differences and put animals in the correct classification. Object studied in *Animalia* is concrete, and therefore it should be easier to understand than other abstract biology objects, such as genetics, cell division, physiological process of living things, etc.

An obstacle found in learning about *Animalia* lies on its highly-broad coverage of content. Teachers are expected to prepare the material in such a way that students are motivated to learn further. The broad scope of the material results in learning problems to students, difficulties in understanding concepts, and misconception. Learning obstacles of biology can be caused by: the nature of the topic, teacher's teaching style, students' learning habits, students' negative perception and lack of learning sources [2]. Many students state that knowledge is boring, difficult to understand and irrelevant to real life [3]. Negative perception on knowledge triggers the lack of students' interest to learn the material.

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Teachers should have knowledge on students' perception towards biology subject and students' learning style. Understanding on students' perception towards biology is used as a reference in arranging attractive learning strategies for students. A biology concept which is regarded difficult is that relating to abstract concepts in which students find difficulties in observing biology object directly. Abstract concepts include: plant transportation, genetics, cellular respiration, protein synthesis, photosynthesis, and cell division [4]. Thus, we can say that *Animalia* is quite understandable because it is concrete and the objects of the learning can be easily found around us. However, the fact indicates that students find difficulties in understanding the concepts. Their difficulties are probably associated with learning designs created by teachers, and the textbook. Teachers should arrange learning designs through a method which facilitates students to master *Animalia* concepts. Teachers' teaching method is closely related to students' difficulties in learning [5].

In reference to the background, this study hence aims at investigating teachers' perception and analyzing students' difficulties in understanding the basic concepts of *Animalia*. The research questions proposed include: (1) What is students' perception on *Animalia*? (2) How is students' understanding of *Animalia*? and (3) What are teachers' perception on *Animalia* analyzed from the lesson plan?

## EXPERIMENTAL

This research is a quantitative research, carried out from November 2016 to February 2017. The samples consisted of 25 of 11<sup>th</sup> graders and five Biology teachers from two public and three private high schools in Surakarta. Samples were taken using purposive sampling technique, i.e. selecting samples with the criterion of being willing to participate in the research. Prior to the research, researcher had invited more than 30 of 70 teachers randomly to join the research, but only five teachers agreed.

The variables which measured was cognitive level of students on *Animalia*, students' perceptions and difficulties on learning *Animalia*, and teachers' perception. The understandings of students were measured by the essay tests consisted of 20 items refer to cognitive level of revised Bloom taxonomy. The maximum score of each item is four. The instrument was validated by QUEST program with infit meanscore of 1.00 and outfit 0.03 that means the instrument was categorized as good. Where as the students' perceptions and difficulties was assessed through validated questionnaire which consisted of six items, namely 1) difficulties to understand topics, 2) ways of understanding *Animalia* concepts, 3) academic achievement, 4) students' perception on the method used by the teachers, 5) methods commonly used by teacher, and 6) learning situation.

Meanwhile, teachers' perceptions on how to teach *Animalia* was obtained by doing document analysis of lesson plans constructed by teachers. To assess the lesson plans, researchers developed an instrument measuring the components of indicator (12 items), content (15 items), method (4 items), topic sequences (4 items), and assessment (12 items). All components were scored by following the Likert scale system (1 to 4), which was finally converted to 0-100 score system. The status of lesson plan was grouped into four categories, i.e. poor (0-25), satisfactory (26-50), good (51-75), and excellent (76-100).

## RESULT AND DISCUSSION

The results of questionnaire dealing with students' perception on learning about *Animalia* are presented in Table 1. It indicates that 1) 40% students considered that difficult-to-master *Animalia* topics included Latin names, due to their unfamiliarity, 2) a total of 44% students stated that mastering the concepts of *Animalia* was done by relating them with everyday life phenomena, 3) 68% students had met the Minimum Mastery Criteria of the topic, 4) students stated that the methods used by teachers varied, including lecture, discussion, presentation, observation and game, but 28% students argued that the only method used by teachers was lecture, 5) a total of 68 % mentioned that they could understand the concepts easily using the method provided by teachers, 6) 75% students said that *Animalia* learning is interesting. The data have proven that the presentation of *Animalia* in the class is relatively attractive, but the learning is less meaningful. Some students still face difficulties in learning about some parts of *Animalia* and did not meet the Minimum Mastery Criteria.

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**TABLE 1.** The results of interview on students' perception on learning about *Animalia*

No	Aspect	Students' perception	Percentage
1	Difficult-to-understand topics	Latin names/Binomial nomenclature	40 %
		Animal classification	20 %
		Animal physiology	16 %
		<i>Mollusca phylum</i>	4 %
		All parts of the topics	20 %
2	Ways to understand <i>Animalia</i> concepts	Memorizing and relating to everyday life phenomena	36 %
		Memorizing	20 %
		Relating to everyday life phenomena	44 %
3	Academic achievement	Met the Minimum Mastery Criteria	68 %
		Failed to meet the Minimum Mastery Criteria	32 %
4	Method used by teachers	Lecture	28 %
		Discussion	24 %
		Presentation	24 %
		Observation	20 %
		Game	4 %
5	Students' perception on the method used by teachers	Understand the concepts easily	68 %
		Difficult to understand the concepts	32 %
6	Learning situation	Boring	25 %
		Interesting	75 %

Note(s): Numbers in brackets show the percentage of number of students choosing certain answers.

Data of students' perception on learning about *Animalia* were followed up by measuring students' cognitive level from level C1 to level C6. The questions tested included the aspects of C1 (remembering), C2 (understanding), C3 (applying), C4 (evaluating), C5 (analyzing), and C6 (creating). Data of cognitive level are presented in Table 2.

**TABLE 2.** Average of Students' Cognitive Level

Category	Cognitive Level	Score*
Lower Order	C1 (remembering)	89.00
	C2 (understanding)	77.00
	C3 (applying)	65.67
Higher Order	<b>Average</b>	<b>77.22</b>
	C4 (evaluating)	53.17
	C5 (analyzing)	39.20
	C6 (creating)	38.00
	<b>Average</b>	<b>43.46</b>

\* The assessment consists of 20 essay items each was scored four and the participant consist of 25 students The maximum score is 100

Data of test on cognitive level reveal that students' cognitive level in lower order thinking is considered low. The average of lower cognitive level of students is 77.22 (C1, C2, C3). Whilst, the average score of higher order of cognitive level is 43.46. The highest score is C1 with the average of 89.00; and the lowest is C6 with the average score of 38.00. The results indicate contradiction between data of students' perception on learning about *Animalia* and the results of test on concept understanding.

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**TABLE 3.** The Analysis Results of Teachers' Lesson Plans

Participants	Aspect				
	Indicator	Topic	Method	Topic sequences	Assesment
Teacher A	75	75	50	50	75
Teacher B	75	100	50	75	50
Teacher C	100	75	50	50	75
Teacher D	75	75	50	50	75
Teacher E	50	50	50	75	100
Mean score	75	75	50	60	75
Category	good	good	satisfactory	good	good

\* maximum score is 100

Lesson plan analysis refers to five components comprising indicator, topic, method, topic sequences, and assessment. Data of the analysis results of the lesson plans are displayed in Table 3. The analysis reveal that the scores for indicator, topic, method, the sequence of topic, and assessment aspects are 75, 75, 50, 60, and 75, respectively. The researchers determined 12 items of indicator as the optimum. The results show that the average score of achievement for the indicator is 75, which means that the teachers mentioned 7-9 items in average. The researchers determined 15 items of the aspect of topic, and teachers' average score is 75, which shows that the teachers mentioned about 9-12 items on the aspect of topic. On the aspect of method, the researchers determined 4 items which refer to scientific approach and inquiry learning model. The results indicate that the average score of achievement is 50, meaning that the teachers met 2 criteria of assessment. On the aspect of topic sequences, the determined items are four, and teachers in average scored 50, or met 2 criteria of assessment. On the last aspect, compare to determined 12 items, i.e. 4 points of assessment in cognitive, 4 points for affective, and 4 points in psychomotor domain. The results indicate that the average score of achievement for assessment is 75, meaning that the average teachers only met 7-9 points of assessment.

The aspects of indicator and scope of topics or content presented by the teachers are considered good, but teachers need to complete them in the items which have not been put in the lesson plans. The instruments of learning method refer syntax inquiry-based activities and scientific approach; namely observing, asking, collecting data, associating, and communicating. Analysis on teachers' learning method referring to the above criteria has not shown maximum results. Moreover, the aspects of topic sequences and assessment have not reached maximum scores. The development of cognitive test by teachers only measures low order of cognitive domain. The results reveal that students' cognitive at C3-C6 levels show low level test results. Development of psychomotor test also contributes to students' concept understanding. Types of performance assessment in biology learning can improve students' understanding on biology concepts [6]. Those types of assessment can improve students' motivation and teachers' creativity in developing biology assessment.

Teachers' quality might affect students' concept understanding. Learning quality in class is determined by the roles of teachers and students who are involved. Students' concept understanding is also influenced by teachers' knowledge [7]. Teachers are required to master the concepts sufficiently so that they can present the instructional learning smoothly. Learning process stated in the lesson plan should be presented with understandable, well-organized, and complex materials, and should facilitate students to investigate. If learning activities are well presented, students are expected to understand the concepts. Good quality of learning will emerge students' positive attitude and perception.

Students' perception is influenced by such factors as interest, motivation, attention, self concept and thought and creativity [8]. Students' difficulties in learning can be identified through factors contributing to learning process and achievement. Factors attributable to students' difficulties in learning are method or learning strategy, teachers' quality, school environment, and students' competences [9]. Characteristics of students with difficulties in learning show problems of motor and emotional activities, achievement, perception, and problems to understand the meaning of symbol. The difficulties are influenced by both internal and external factors. Internal factors include perception of learning, learning motivation, learning concentration, learning material formulation, learning achievement acquisition storage, saved learning achievement investigation, ability to reach or to get learning achievement, students' confidence, intelligence and learning achievement, learning habits, and students' ideal future. External factors comprise teachers who provide guidance to students' learning, learning facilities and infrastructures, scoring policy, students' social environment at school, and school curriculum. External factors which contribute to the difficulties in learning involve those related to the situation of learning process including: teacher, learning quality, high quality learning instrument or such facilities as hardware and software and environment, whether social or natural environment.

Though this research does not consider the influence of gender and parent, gender is argued as one of factors contributing to students' interest to learn biology. Male students show lower interest on biology than female students [10]. Parents' education level is also considered to influence students' internal motivation to learn

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biology [11]. Generally, students have positive point of view on natural phenomena and realize the importance of the knowledge for the future life. However, they are not interested in biology taught in the class [10]. Trumper's research which was conducted to students of middle schools in Greece revealed that 1) almost all students showed neutral attitude towards biology, 2) biology is less useful for daily life, and 3) biology is easier than other science materials [10]. Students with the background of positive experience on the material will be more motivated to learn [12].

Problems in understanding some topics of biology can be caused by the continuous use of lecture method during the learning process [9]. Students who are encountering difficulties in learning can be recognized from behavior, physical appearance, speaking, language, intelligence and learning achievement. Biology learning should be aimed to investigation method to create meaningful learning. Teachers who put a value on process are encouraged to use new method which can help improve the quality of teaching and learning activities and improve students' motivation to learn. Difficulties in learning biology are predicted to be caused by students' lack of competencies to relate topics in biology with everyday life [13]. In fact, in this research, students declared that they could understand biology concepts more easily if they related it to daily life phenomena.

In reference to the Lesson Plans arranged by teachers, it is clear that students have not been taught to think, describe, and evaluate concepts. They have also not yet been trained to think creatively although creativity is a competence to formulate problems, find out the answers, evaluate and communicate to other people. Students with certain skills will understand the concepts easily because they can evaluate the ideas and product solutions for the real problems. Hence, students' difficulties in learning are related to biology curriculum adopted by the school, learning strategy, textbook or learning sources, limitation of laboratory equipments and students' lack of interest [4].

Biology should be taught more dynamically; it is not static subject like in the textbook. Moreover, investigation process should be emphasized. Dealing with the interest on material, Trumper suggests that students have more tendencies to learn about human than on animals or plants due to direct relation to themselves [10]. To anticipate this, teachers should present attractive materials on animals and plants so that students are more motivated to learn.

Learning achievement is influenced by students' perception on the material learned. Teachers are expected to motivate students to learn biology. The development of positive attitude towards knowledge is one of the most important purposes of curriculum. Information on students' perception on learning biology helps teachers plan instructional strategies to improve students' interest on biology learning [14]. Attractive learning can be designed with simulation and participation approaches [15].

Students' difficulties in learning can be solved by using learning strategies through visual media, practices, and by relating them to everyday life phenomena. Initial learning activity is the most important part to emerge students' interest to learn the topic. Teachers are supposed to explain about the application of biology in various fields in the initial learning activity to catch students' attention. The broad concepts of *Animalia* can be solved by mapping the concepts and presenting that in the initial activity. Concept mapping is able to reduce students' negative perception on biology material, particularly for materials with a broad scope. The results of a study indicate that students are more interested in learning process which presents living species in class [16]. Presenting living species in class can facilitate students to directly observe various aspects of animal, such as the morphology and movement of animal. In order to cope with obstacles for presenting large animals, teachers can ask students to observe animals directly in their original habitats and zoos [17]. These ways are effective to improve students' interest to learn about *Animalia*. Students show positive responses on a learning process which highlights direct experiences to improve their understanding [18]. Students will be more interested if teachers motivate them to create mini zoo at school [16]. Keeping some animal species will trigger them to be more interested to *Animalia*.

## CONCLUSION

The average scores of students' cognitive level of *Animalia* at cognitive level are judged as low-order thinking, whilst students revealed that they failed to meet the Minimum Mastery Criteria, encountered difficulties in understanding the concept of Latin name, but they revealed also that learning about *Animalia* was interesting. Students declared that they prefer to master the concepts of *Animalia* by relating it to daily life phenomena. Interestingly, that in contrast teachers mostly did lecturing, and majority of students mentioned that they could understand the concepts easily with the method usually used by teachers. These interesting facts need to be studied further to analyze the consistency of students' perceptions, by exploring the factor analysis which might influence. However, the facts of students' perception and difficulties are importantly used as the references to design learning on *Animalia* which will create meaningful learning.

Teachers have not facilitated yet the students to investigate the *Animalia* in meaningful learning. Learning sources which should be concrete are not contextual, and learning processes are mostly dominated by teachers.

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Further study should be addressed to study the factors attached to knowledge and skills of teachers in developing the lesson plan, and the relationship between instructional designs and students' difficulties and concept mastery.

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