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# Senior High School Biology Teachers' Perception towards Evolution Learning

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## Abstract

Teachers' perception of a particular material is an influential aspect of the way teachers learn the material. Since evolution is a debating material, teachers affected by this condition when they teaching the evolutionary topic. For those reasons, this descriptive study aimed to identify teachers' perception of evolution learning, which consists of four main aspects: learning material, strategy, sources, and assessment. The population is all biology teachers at Padang, Sumatera Barat, Indonesia. Sampling was taken by purposive sampling, with criteria biology teachers that already taught the evolutionary topic in senior high school. Data collected from the questionnaire and analyzed descriptively in percentage. The result showed that for the majority of biology teachers at Padang have perceptions toward four aspects of evolution learning in a category very good, good, and good enough. In details, more concerns are needed for some less valued descriptor related to the contradiction issue between evolution theory and Islamic beliefs. In the average, each score of perception for four aspects are: learning material 3.71; strategies 4.11; sources 3.64; and assessment 3.92 with all average criteria in good category. Each aspect performed is discussed.

Keywords: Perception, Evolution Learning, Biology Teacher

## INTRODUCTION

Learning is a process of gaining information and values in a managing system. Rahyubi (2012) stated that learning is an interaction of students with educators in a learning environment. This statement in line with Wilson & Peterson (2006), explain learning as a process of active engagement; learning as individual and social, and learner differences as resources. It indicates that learning consists of four main aspects: material, strategy, sources, and assessment.

One of biology topic that taught in senior high school grade XII is evolution. In Indonesia, this regulates by Permendikbud No. 24 the Year 2016. Evolution is a biology topic which explains the gradual change of organisms to be adapting with times and places (Henuhili et al, 2012). But, this theory is still a debating topic since Darwin named it evolution theory.

Controversy on evolution caused doubting of the truth on evolution. Schulteis (2010) reported that in the US, teachers tend to emphasize certain materials in evolution and vice versa for the others because of it really controversial. Consequently, evolution in society still gets pro and contra among scientist, academic, teachers, religious leaders, and public (Darussyamsu, 2013), that caused by people's misunderstood on it (Nadelson & Sinatra, 2010). It makes various interpretations on evolution theory and influence to perceptions.

Saputra (2017) identify the pre-service biology teacher perceptions regarding evolution, which describe that evolution is important to be taught for students in senior high school; it should be taught with various learning models, and misconception could being minimum by developing evolution materials based on scientific discoveries. This study has included three main aspects of learning, but do not explain the evaluation yet. In Georgia, Glaze (2018) found that pre-service secondary science teacher opinion on evolution is influenced by family, religious experience, and teachers/ professors (Dorner & Scott, 2016).

The learning process will be well done when teachers have a good perception concerning the learning, which consists of learning material, strategy, resource, and evaluation. Pramitasari, Indriana & Ariati (2011) presented that positive perception will create positive attitudes. Teachers' perceptions influence both teaching and students performance (Dorner & Scott, 2016). Not different with in-service teacher, pre-service teacher attitudes of evolution also influence their intentions to teach it next time as teachers

(Balgopal, 2014), and it also depends on human self-concern (Sanders & Ngxola, 2010).

Considering evolution as a controversial topic, it is important to know the teachers' perception of evolution. The perception here distinguishes the thinking and conviction of teachers which composed of learning materials, strategies, sources, and evaluations. It will represent the teachers' learning process that they do in the classroom study.

Some studies have been conducted to identify teachers' perception of evolution in some countries, such as; Brazilian teachers difficult to dealing with evolution (Silva & Mortimer, 2019); American strongly rejected evolutionary theory as a scientific knowledge (Pobiner, 2016). However, this case is rarely studied in Indonesia as a dominantly Moslem citizen, and does not identify at Padang yet. This research aimed to identify teachers' perception of evolution learning at Padang, Sumatera Barat, Indonesia.

## METHOD

This research is a descriptive study that recognizes teachers' perception of evolution. The populations are all biology teacher in state and private senior high school at Padang, totally 51 schools. Sampling was done by purposive sampling based on criteria the teacher that has ever been teaching evolution topic for students grade XII, which willing to fill the questionnaire. The sample was 39 biology teachers who come from 16 state schools and 10 private schools in Padang.

Primary data was taken from the questionnaire that adapting based on an instrument of Putri (2015), which consist of learning materials, strategies, sources, and evaluations. The instruments designed by identify the indicators and formulating it become questions. The questionnaire used five points of Likert's scale. Before using, the instrument validates logically by experts.

Perception profile is described in the frequency of teachers who perform each category of descriptor which classified into five criteria that has modified from Purwanto (2009), as present in Table 1.

Table 1. Criteria of Teachers' Perception

| Range | Category |
|---|---|
| 4.20 to 5.00 | Very good |
| 3.40 to 4.19 | Good |
| 2.60 to 3.39 | Good enough |
| 1.80 to 2.59 | Not good |
| 1.00 to 1.79 | Worst |

## RESULTS AND DISCUSSION

Perception is simply defined as a thought, belief, or opinion which is mainly held by many people based on appearances. Matlin (2014) stated that perception uses previous knowledge to

gather and interpret stimuli triggered by the senses. Perception in learning is important for recognizing learning components which potentially describe learning advancement as well as learning obstacle. In related to the learning process, teachers' perception of evolution learning obtained from learning material, strategy, resources, and evaluation. It reports orderly as below.

**Teachers' Perception of Evolution Material**

Teachers are main influential factor that determinant the achievement of learning. The way of teacher organize learning for depend on teachers' view toward the characteristic of the evolution learning material. Biology teachers' perception toward evolution material at Padang presented in Figure 1.

It can be seen in the figure 1, majority of teacher own a relatively good perception toward learning materials (in the average score: 3.71), especially for descriptor the importance of evolution topic to be taught for students, material support for enhancing literature study, need for analytical thinking level, and relate to the emotional spiritual quotient. It represents that evolution is including to a moderate difficult material because in this material teachers have to engage higher order thinking ability to comprehend the material. As stated by Tidon & Lewontin (2004), evolution integrates some biological fields with a complex and interactive way, which need a comprehensive understanding of knowledge in various areas.

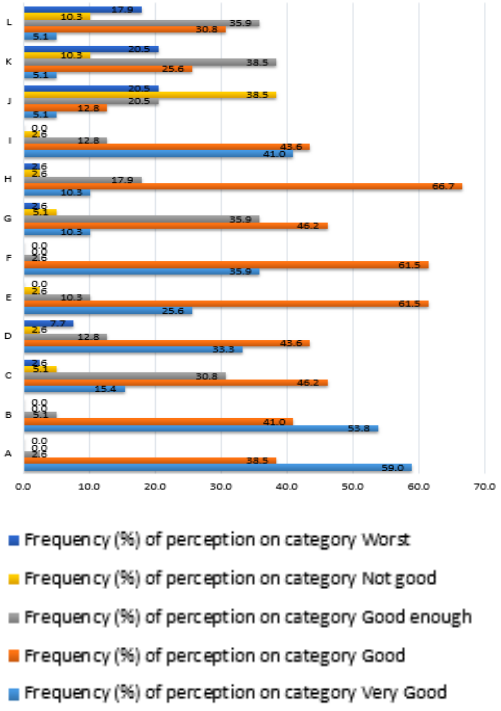


Figure 1. Perception to Evolution Learning Materials

Legend:

| | |
|---|---|
| A | Need comprehension thinking |
| B | Need analysis thinking |
| C | Consist of scientific procedure |
| D | Increase the belief in the only one God |
| E | Drill teacher to think systematically |
| F | Supports teacher to do literature study |
| G | Asks teacher to apply evolutionary principal |
| H | Important to be taught for students |
| I | Could be linked with Emotional Spiritual Quotient |
| J | Darwin's theory contradict with Islamic religion |
| K | Teacher convince that evolution theory appropriate with Islamic religion |
| L | Students convince that evolution material appropriate with Islamic religion |

On the other hand, the need for comprehensive understanding causes difficulty for the teachers to comprehend evolution materials. As stated by Sari & Jusar (2018), difficulties of comprehending a material will affect the acquired of the learning process. Thus, this problem has to be solved, because it will affect the learning process.

Jirana & Amin (2016) suggest that learning process strongly influenced by teachers' comprehension of the concept and the way to teach the material, thus making concepts can deliver to students logically. As a result, biology teachers at Padang should be more motivated to do literature study to get an extensive insight into evolution learning material.

In addition, Darussyamsu (2015) also stated that teachers' way of teaching will give a big impact on students' knowledge and acceptance of evolution. One of problem solving suggested by Pobiner (2016) that stated: 'collaboration between scientists and teacher is essential to make teacher understand evolution scientifically'.

Considering the connection evolution learning material to religion or beliefs, it is generally acknowledged that several parts of scientific facts contained in evolution are yet fully accepted according to Islamic belief. This study performs that around 20 percent of teachers' view that evolution learning materials are still debatable, especially to Islamic beliefs. Teachers put their worst judgment appropriateness of evolution content with Islamic belief, which illustrates those teachers still in doubt with the truth of evolution. In the general comments that give at the last aspect of the questionnaire some teachers also stated it. This finding similarly relates to the previous study reported by Darussyamsu, Fadilah & Putri (2018). The study revealed that biology pre-service teachers before learn evolution have low acceptance of evolution. However, their acceptance shifts to moderate after involving in ESQ based evolution learning.

Both teachers and pre-service teachers accept evolution material moderately. In other words, they are sure on particular topics; and at the same time mistrust with the other materials. This finding similarly with report study from North America that focused the research in Canadian and Pakistani Moslem science teachers; they are moderate accept evolution and especially rejected the theory of human evolution (Asghar, 2013). It is such a difficult problem of teaching evolution that should be solved.

A further look is important to be focused on relatively bad perception given by teacher toward Darwinians

theory. The interesting point is the teachers' agreement about contradictions between Darwin's theory and Moslem beliefs. The data imply that near 70% of teachers thought that Darwin's theory opposes with Islamic religion and others vice versa. Luthfi & Khusnuryani (2005) stated that not all scientific theory can find the truth based on Holy Quran and Hadith because it does not specifically talk about scientific aspects, even though for particular aspects we can find in it. As the effect, some Moslem scientists support evolution with Quran and other contradict it also from the Quran.

Another contradiction related to evolution learning material has been found in the study conducted by Tekkaya, Akyol & Sungur (2012) in Turkey. In this case, the researcher presented that evolution teachers' understanding and teaching ability, linked to their view about acceptance of evolution theory and creationism. There was a tendency to deny creationism due to the absence of scientific evidence. Yet, their teaching for supporting evolution theory was also under ideal.

The negative acceptance of evolution also Comparing to Brazil, Pentecostals group in Rio de Janeiro which is dominantly Christians, they were greater accept biblical narrative than evolution as a scientific aspect (Teixeira, 2019).

Evolution Theory versus creationism contradiction is still in the trending path of evolution study. According to Wilson (2005), one of the biggest tactical errors in teaching evolution is to avoid discussing humans or to restrict discussion to remote topics such as human origins. Parallel with it, Teixeira (2019) stated that studying evolution give challenges to stimulate a critical understanding between science and religion.

However, we can start to elaborate a number of scientific evidence which corresponds to Islamic recitation. For instance, based on hadith cite by Bukhori explained that Adam, as the ancestor of human had a height of about 30 meters (Tri, 2012). Lets' make a comparison to average human height in near to recent decades. Empirically, human gain height only about two meters, extremely shorter that early ancestor. Significant differences exhibited in the evolution process. In this case, evolution content corresponds to the Islamic religion.

Overall, reviewed from evolution material, biology teachers have good perception. It represents that teachers will do the learning process with excellent ways, because good perspective in learning material will

stimulate a good attitude (Lufri, 2004). It supports by Satiadarma (2001) that perception of learning material has an essential role in learning because good perception encourages learning material. This perception also proves that evolution in the biology curriculum has to be taught among students and have to be comprehended by teachers.

**Teachers' Perception toward Evolution Learning Strategy**

Learning strategy also suggest as the main factor that manipulate learning achievements. In this research, teachers' perception of evolution learning strategy present in Figure 2.

Based on the graph in Figure 2, taken as a whole, the majority of teachers' perception of evolution learning strategy is in a good category, performed by near to 77% of respondents with the average score 4.11. Learning strategy is one essential aspect of learning evolution. Jirana & Amin (2016) said that in the learning process have to create a convenience condition with learning strategy to obtain learning purposes. This supports a teacher to find the appropriate method to explain the material.

strategy

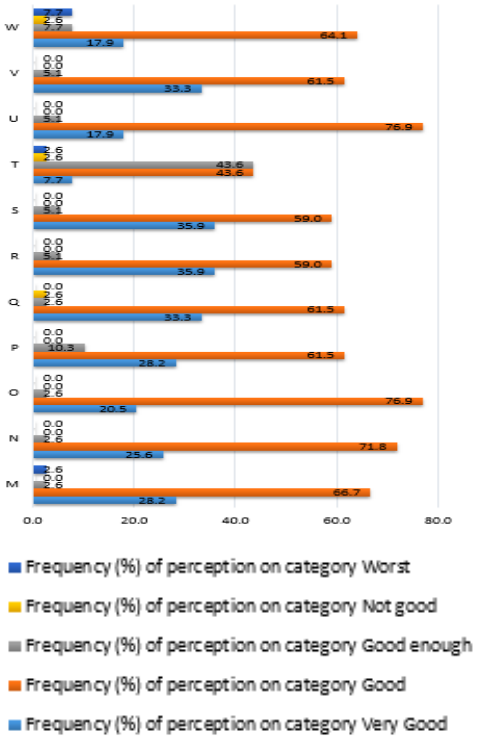


Figure 2. Teachers' Perception of Evolution Learning

Legend:

| | |
|---|---|
| M | Appropriateness with the characteristic of material |
| N | Appropriateness with students' academic ability |
| O | Appropriateness with time allocation |
| P | Support the students' learning motivation |
| Q | Support students to practice deep thinking |
| R | Stimulate student to apply higher order thinking |
| S | Stimulate students to asking questions |
| T | Apply lecture method in evolution learning |
| U | Apply discussion method in evolution learning |
| V | Apply various method in evolution learning |
| W | Learning strategy in evolution used based on Emotional and Spiritual |

Based on this research, the majority of teachers agreed on perception in a category very good and good toward almost learning strategy descriptor. The most prominent agreements performed by teachers are subjected to consideration of appropriateness learning strategy with students' academic ability and time allocation and applying discussion method for evolution learning. Besides, teachers also expressed very good perception toward support students to apply higher order thinking, stimulate students to active in asking questions, and conduct the learning with more various methods to avoid students being bored. Thus, the learning becomes more effective.

A very good perception reflects the teacher moderate accepted of evolution material, but they still teach this material with the various learning strategy. This opinion indirectly informed that even the lecture method mostly assumed as conventional teaching, but it is possible to apply it in the class, besides other methods like a discussion. Kosasia and Sikolia (2015) found that there was an association between students' perception and teaching technique of evolution. Therefore, teachers suggest to use project based learning, practicum and field trips to make evolution being comprehend by students rather than using students-centered approach.

In addition, whether the teacher thinks that evolution is such difficult material, but they convince that their students are appropriate to learn it and stimulate the active learning process. As reported by Nelson (2008), there are some changes in evolution learning, include the using of active learning strategy makes students' contribution in learning optimally; focused on scientific and critical thinking; also decrease misconception and rejecting theory by students.

Overall, good perception assigned by the teacher for evolution learning strategy. Yet, it is still found that a little number of teachers put less and worst perception toward integration Emotional Spiritual Quotient (ESQ) based for the learning process. Therefore, ESQ based learning is a recommended approach to enhance people acceptance on evolution (Darussyamsu, Fadilah & Putri, 2018) and to decline the gap of theory with religions (Dahler, 2011). ESQ approach balancing the students' attainment both on knowledge and attitudes (Pratiwi, Ardi & Putri, 2017) and make students mastery the comprehension learning material better (Utama, 2018). For that reason, it is a good choice for a teacher to use it in learning, especially in evolution. Adding up, short-term

professional development can be an alternative solution to solving problems of teachers' evolutionary knowledge and acceptance (Ha, Baldwin & Nehm, 2015).

Teachers also suggest using contextual teaching and learning, which asking students to develop their own concept based on daily experiences that close to their life. This could be one alternative to gain high-quality evolution learning because students saw the evolution facts around them. As Wilson (2005) found that real word implication is a first basic mechanism for effective evolution learning. Furthermore, he argued two reasons. Firstly, it should explain the world as it has existed in the past and exists in the present. Second, it should provide ways to improve the world in the future. This contextual approach can apply through such learning strategy, Problem Based Learning; Cooperative Learning; Inquiry-Based Learning; and Process Approach (Sidiq, 2016).

Besides, a broader learning strategy is potentially developed to accommodate students' development. An interesting finding presented by Wilson (2005), who conducted a single course called Evo-S, as a potential model for evolution education. The course model has involved a wide range of participant academic level and proved enhancement of students' acceptance of, interest in, and knowledge about evolution, political orientation, religious orientation, prior evolution and science education, and general cognitive developments.

**Teachers' Perception of Evolution Learning Sources**

Learning sources affect students' achievement. Teachers have to create in search and share the material from diverse sources, in order students get complete and comprehend the material. This research finding on evolution learning sources offers in Figure 3.

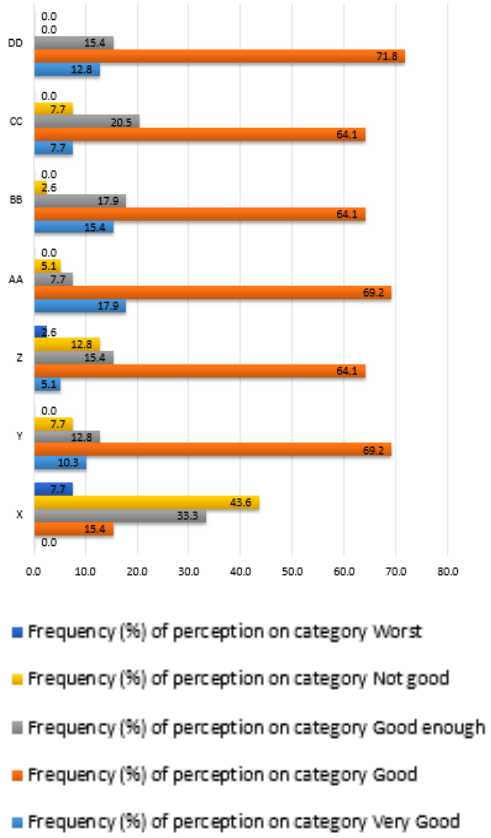


Figure 3. Teachers' Perception of Evolution Learning Sources

Legend:

| | |
|---|---|
| X | Unavailability in the proper amount |
| Y | Renewable (minimum last 5 years) |
| Z | Easiness of access |
| AA | Teacher try to find the other references out of school |
| BB | Teacher use learning sources that available at school |
| CC | Teacher create their own evolution learning sources |
| DD | Teacher use the ESQ learning sources |

The learning process has to support by some aspects; including learning sources (Jirana & Amin, 2016). Figure 3 illustrates the teachers' perception of evolution learning sources in good criteria, in the average score 3.64. Based on this study, teachers have two categories of perception on evolution learning sources; good and not good.

Good perception provides by teacher toward the statement: evolution learning sources always renewable and accessible at school easily. Besides using schools' learning sources, teachers also attempt to find the other learning sources out of their school and make their own learning material as well. Moreover, teachers also integrate ESQ aspect in their learning material.

Teachers expressed a not good perception of the negative statement that evolution learning sources do not available at school in an adequate amount. It implies, while there are many accessible books at school, but just a few of them talk about evolution. Jirana & Amin (2016) reported by a semi-structural interview survey, discover that the respondents use a minimum quantity of a book, not appropriate, and not update. It involves that teachers need an update evolution learning sources that accommodate recent research result about evolution. It in line with Dopo & Ismaniati (2015) who stated that teachers' perception is an essential predictor to motivate teacher exercise learning sources.

Evolution learning sources not only in the form of the textbook but also could be using environment and prehistorically site, such as Sangiran and Trinil to give a direct experience to the students. Case in point, the Museum Purbakala Sangiran conserves a variety of past time life heritage before century and have appointed by UNESCO as a global heritage (Saputra, 2017). Adding up, Saputra, Maridi & Agustina (2016) reported that biology pre-service teachers have a high percentage of perceptions about the using of Sangiran Site as an evolution learning sources in the number 80% for Sangiran give a real illustration of fossil discoveries history in Java; 70% pre-service teacher said this site is a very big laboratory of ancient human which give an evolution of learning sources being more meaningful; and 80% of them stated that

learning evolution through visiting Sangiran site is a contextual learning that can improve pre-service teachers' understanding toward evolution.

Sangiran site is located in Sragen, Central Java, Indonesia. This location is very far from Padang, Sumatera Barat. Therefore, it will be impossible to facilitate students to come to Sangiran site. But, it could be solved by present such a video of Sangiran with the facts on it. Furthermore, Sumatera Barat also has a place that accessible to be an evolution learning source, which name Museum Adityawarman. This museum conserves parts of the ancient human body; include skulls, jaws, leg bones, and brains of Homo sapiens and Homo erectus. Although it still minimum in size and only replicas, those things are good being contextual evolution learning sources. Teachers and students can visit that place and compare the different of ancient human with a human now which imply that evolution is occurring before century until now (Museum Adityawarman, 2017).

Teachers in the utilization of learning source have responsibilities to help students learn easier, more fluency, and more directional. Hence, teachers should have the creative ability to using learning sources. Some strategies can be used in utilizing learning sources, such identify the characteristic of learning sources it should be appropriate with teachers' and students' academic ability; and learning objectives (Nur, 2012).

**Teachers' Perception toward Evolution Learning Evaluation**

Learning evaluation determines which have achieved in learning and what are the next step will do (Sukardi, 2010). So, it should be done by the teacher for each study. Teachers perception about evolution learning evaluation present in Figure 4.

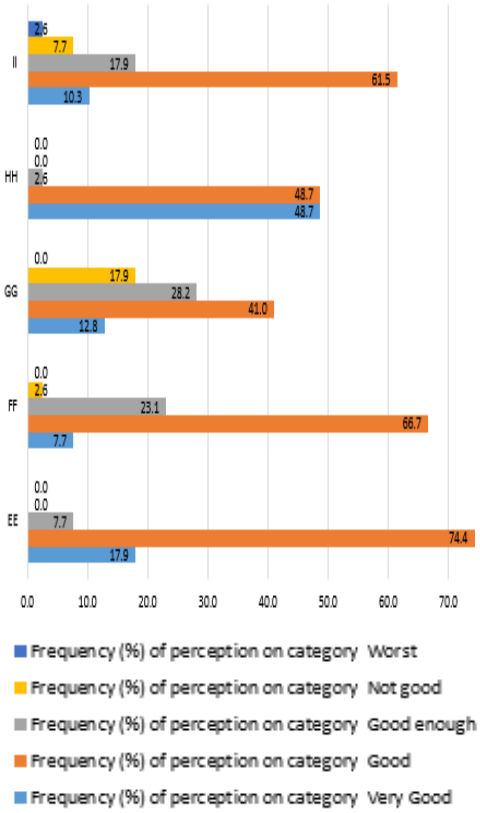


Figure 4. Perceptions Toward Evolution Learning Evaluation

Legend:

| | |
|---|---|
| EE | Using test instrument |
| FF | Using non-test instrument |
| GG | Teachers do not use learning evaluation result in learning process |
| HH | Evaluation result give feedback in remedial activity |
| II | Evaluation consist of ESQ value |

After learning the process done, the teacher must do the evaluation. Arifin (2009) suggest that evaluation is a systematical and sustainable to decide a quality (mark and value) of something based on considering criteria to make a decision. This deliberation uses to give students' feedback from teachers. If the students still low in evaluation, teachers could give feedback in remedial features.

Based on this study, as presented in Figure 4, most teachers have two kinds of perceptions; very good and good. Teachers award very good perception of giving remedial as the response of learning assessment. Good perception offer by the teacher about the statement that teacher use evaluation in the form of test and non-test; the result of evaluation do not role by teachers, and evaluation consist of ESQ values. Generally, teachers have good perception toward evolution learning evaluation, with the average score 3.92. Good perception in the evaluation will affect students in enhancing motivation and increasing comprehension (Rahmi & Ardi, 2016).

Biology teacher that teach in senior high school at Padang in average has a good perception of evolution learning which consists of learning material, learning strategy, learning sources, and learning evaluation. Good perception represents that teachers have good thinking toward evolution whether they do not accept its material totally and although it still debating by some public aspects. Thereby, it can predict that evolution learning process in senior high school at Padang implemented well.

## CONCLUSION

Based on the study conducted, more concerns are needed for some less valued descriptor related to the contradiction issue between evolution theory and Islamic beliefs. The existence of these issues which are well recognized by both teachers and students, need to be responded and considered in developing and organizing evolution learning material. The next teachers' perception descriptors, learning strategy, are also well responded by almost teachers and showed an agreement on applying various methods for evolution learning. Very good, good, and good enough category perceptions were performed by the teacher for the appropriateness students' academic ability, learning time allocation, and applying discussion method, while implementation of lecture method merely agreed by less than half of teachers. For the third aspect; learning resources, also generally responded in Good category, but there was vital information that learning

resources are unavailable in the proper amount, which implied a potential obstacle for learning process at school. The last aspect, learning evaluation, was assumed very good and good by the majority of biology teachers; yet, the use of learning evaluation result needs to be considered well. All of the aspects are in the good category of perception. Good perception reflects that evolution learning in senior high school at Padang in state and private school implemented in a good way.

Nevertheless, this research has a limited sample in Padang, a capital city of Sumatera Barat Province. Larger qualitative and quantitative data in other demographic areas could provide new insights. In addition, for future study it will be possible to use the other method or sample to get more comprehensive conclusion.

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