

# Some Important Concepts of Teaching Evolution in the Indonesian High School

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## Abstract

*The theory of evolution explains that diversity of many life forms can exist as the result of genetic changes. The idea of evolution can be accepted by most scientist, however it is also rejected by other community because its contradiction with some religious values. The most controversial issue is that the theory of evolution tries to explain about the origin of human. It is difficult to deal with that controversy because it involves science, philosophy, and theology, in which each group view the theory from its own specialization without considering other aspects. Some moslem scientist try to accept or reject the theory of evolution by using al Qur'an as their reason. Basically there is no controversy between al Qur'an and science although al Qur'an does not give detail explanation for all science or theories. The purpose of that explanation is to show the mighty of Allah SWT and encourage Moslem ummah to arrange more observation and research.*

**Keywords:** creationism, Darwinism, evolution, religious view.

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## Introduction

Science is a way to find out based on descriptions that can be retested and obtained through interpretation of observable natural data (Bube, 1984). Science assumes that everything can be explained materially (Campbell & Reece, 2001). Evolution extends the scope of materialistic explanations to living things (Futuyma, 1986). This theory incorporates positivism into biology, namely by explaining humans and life from the side of matter (Jacob, 1992).

Evolution is the most important concept in biology (Enger & Ross, 2000). Even Dobzhansky (1973) said that biology would not make sense unless viewed from evolutionary perspective. The theory of evolution explains why millions of species can exist. This principle unites the whole history of life. In summary evolution states that the diversity of life forms arises as a result of changes in their genetic makeup. Modern organisms are descended from previously modified life forms (McKane & Karp, 1994). The study of biological evolution requires a lot of understanding of genetics, biochemistry, embryology, biogeography, geology, biology, paleontology, molecular biology, and so on (Indriati, 2003).

Ironically, although the idea of evolution has been accepted by most scientists (Raven & Johnson, 1999), this idea has been widely opposed by society because of its contradiction with some aspects of the teachings

of several religions (Stearn & Hoekstra, 2001). The most controversial thing about this theory is its attempt to explain the origin of humans from natural processes (Berry & Hallam, 1989). Quthub (1986) rejects it on the basis of the lack of purpose in the evolutionary process, even though God created the world with a specific purpose. This theory is also considered to endanger the faith of students. It is feared that students' religious beliefs are shaken and can fade (Abbas, 1984). Furthermore, it is said that the theory of evolution is clearly contrary to the principles of Islamic faith (Taufikurrahman, 2001), so that Muslims must choose one of two things: faith or evolution (Husain, 1984). In recent times the controversy has intensified with the publication of books by Harun Yahya which popularized Islamic contradictions with evolution (Indriati, 2003).

Circumstances are exacerbated by the atheistic interpretation of the theory of evolution. Richard Dawkins (1995) asserts that it is impossible to become a true atheist before the publication of Darwin's book, *On the Origin of Species*. This theory is considered to provide a strong scientific foundation for atheist beliefs. Futuyma (1986) states that religion becomes redundant with an evolutionary explanation.

Contradictions about evolution are very difficult to reconcile because of the vast area of disputes, namely science, philosophy, and theology. Each group tries to view from its own field of specialization without feeling

the need to know the point of view or its relation to other fields (Plantinga, 1991). Although this theory has attracted the interest of the wider community, there are still many misconceptions about the idea of evolution (Enger & Ross, 2008).

According to Berra (1990), evolution or the science of creation is a domain of religion that cannot be part of the public school curriculum. In addition, the theory of evolution is one theory that is difficult to teach in secondary schools for two reasons: 1) the theory of evolution is a complex science that integrates all fields in biology (Wylie, 2003) and 2) the theory of evolution can always be associated with the interpretation of religion in the formation of living things or about the origin of living things (Wylie, 2003).

Today there have been many attempts to reconstruct the paradigm of science and technology integration (science) and Islam (Abraha, 2003; Muslim, 2003). Because evolution is a sharp thorn in the relationship between science and religion (Bagir, 2003), it is interesting to examine some important aspects of the theory of evolution and its relation to religion. This article will explain some of the basics and important things conveyed in evolutionary learning in high school.

## Methods

The method used in this study is literature review, providing a description, summary, and critical evaluation of scholarly articles, books, and other sources relevant to this issue.

## Result and Discussion

### *Mechanism versus Vitalism*

The main contribution of Greek civilization to science was the philosophy of mechanism, by which it marked the release of science from the roots of supernatural traditions (Weisz & Keogh, 1982). The root mechanism is the philosophy of materialism. In the mechanistic worldview, nature is governed by a set of natural laws, namely physical and chemical laws. Mechanistic philosophy holds that if all the physical and chemical processes in nature can be explained, there are no more remaining things unknown. Consequently, life must also be the product of mere physical and chemical processes, and life events must be determined by physical and chemical events in living matter.

Contrary to the mechanistic philosophy, vitalism maintains the opinion that nature, and especially living organisms, are governed by supernatural forces (Johnson et al., 1984). This power controls the behavior of atoms, planets, stars, living things, and all

the components that exist in nature. Almost all religious philosophers adhere to this view. It seems clear that the difference between vitalism and mechanism illustrates the conceptual conflict between science and religion. But this conflict does not have to be reconciled. To bridge the gap, one can reflect on how natural law exists. It is believed that natural law cannot just happen by itself. Natural law is God's provision for the universe.

On the other hand, when a biologist ponders a problem, the question "why" or "how" will appear. Both of these questions must be better understood in terms of immediate causes rather than within the scope of metaphysics (Sober, 1993). So, even though a biologist believes in God, in solving a scientific problem it will certainly use physical and chemical approaches. Scientists cannot answer a scientific problem by merely making observations on the surface and immediately saying that it is God's will, without examining its natural causes.

The power of God includes everything (*causa prima*), both which can be explained or which cannot be explained by science. The main task of scientists is to explain the natural causes or causes of a problem. Accepting scientific explanations and giving religious meaning at the same time is not impossible. But it is not wise if we always insist on using religious ideas as an explanation for scientific problems, or vice versa. Science is only one way to find out how nature works. Religion gives meaning, why and for what it all exists.

### *What is evolution?*

Like most concepts in science, the basic idea of evolutionary biology can be traced back to the days of Ancient Greece. Approximately 2500 years ago, Anaximander proposed the idea that life emerged in water and simpler forms of life predated more complex forms. In contrast to this view, Aristotle, whose thoughts influenced many western cultures, argued that species were fixed/unchanged. Judeo-Christian teaching strengthens this idea with the literal interpretation of Genesis (Genesis). The Church states that questions about the origin of species diversity and earth's history have been completely answered by the gospel. This is not something that is permissible / needs to be theorized or researched. The alternative to the gospel of the evolutionary process is centered on two ideas in the Old Testament, namely separate creation (creationism) and species immutability. Separate creation is the view that God created all living things simultaneously in a number of living things that exist today (McMullin, 1993).

There are two main ideas for Darwin in his book *The Origin of Species*. First, the species that are present are descended from their ancestral species. In the first edition of his book, Darwin did not use the word evolution. He called it descent with modification. The

second main idea is natural selection as a mechanism for hereditary modification (Darwin, 1859). When a biologist says "Darwin's theory of evolution" he means natural selection as a cause of evolution, not an evolutionary phenomenon itself.

The basic idea of natural selection is that a population can change from generation to generation if individuals who have certain genetic characteristics produce more offspring than other individuals. Natural selection produces adaptive evolution, which is an increase in the frequency of population genes in a characteristic that is suitable for a particular environment. In modern terms it is said that the genetic composition of a population changes over time, and this is one definition of evolution. However, on a broader scale, we can interpret the term evolution with the overall history of biology, from the earliest microbes to the extraordinary diversity of modern organisms.

Darwin based his theory of natural selection on two key observations. First, Darwin observed that all species tended to produce offspring in excessive amounts. Because of the limited natural resources, individual production exceeds the environment resulting in a struggle to continue (struggle for existence) among individuals in a population. It often happens that only a small number of offspring will survive in each generation. Many eggs are produced, animals are born, seeds are scattered, but only a few complete their development and produce offspring. The rest die of hunger, prey, cold, sick, not married, or cannot reproduce for other reasons.

The second observation is the variation between individuals in a population. Individual variations occur in almost all species. Most of these variations are revealed by siblings to have more common characteristics compared to members of the population who are less close to their kinship.

From these two observations, Darwin came to the conclusion that defines natural selection: individuals with genetic traits most suited to the local environment are more likely to survive and reproduce compared to individuals whose genetic characteristics are not suitable. In other words, the best functioning individuals tend to produce more offspring.

The evolutionary theory used today is a modern synthetic theory. This theory was developed for more than 100 years and uses all biological disciplines such as geology, biogeography, genetics, embryology, anatomy, taxonomy, and molecular biology. Indeed there are still many things that are not satisfactory and there are criticisms in terms of genetics, evolutionary biology and biomatematics. But until now there has been no alternative theory that can replace it.

Evolution in principle is a change in the frequency of genes in a population. For example, the moth *Biston betularia*. Before the industrial revolution, the common moths were white. After the industrial revolution, the moths were mostly black. Black moths come from

white moths that experience mutations in genes that determine pigment. In this period there was a change in the frequency of pigment determining genes in the population of *Biston betularia*. It can be said that in such populations there has been evolution. It's just that evolution of 1-2 genes in the short term like this is called microevolution. In race microevolution does not change, let alone species. Changes in gene frequency occur because of gene mutations, natural selection, gene flow and random inheritance. But in microevolution we can see the process in a controlled manner, it can even experiment with creatures with short generation times such as fruit flies, bacteria and others.

If there is a massive change in gene frequency over a very long period of time macroevolution will occur. Macroevolution is the evolution of taxa above the level of species categories (eg emergence of amphibians from fish; reptile evolution from amphibians). Unlike microevolution that has been well understood, macroevolution is not fully understood and cannot be simulated in a laboratory. In this macroevolution, we cannot see the process because of the very long time (Jacob, 1992).

### **Evolution: Fact atau Theory?**

Dawkins states that evolution is a fact. This fact is as certain as everyday reality such as the fact that we have heads or have legs. A simple reality that is certain and cannot be doubted. According to Wilson & Eisner (1973), the process of evolution is a fact that really happened. Biologists have observed and measured evolution at the level of genes. They gave rise to new species in the laboratory, collected fossil remains, studied biogeographic patterns, and so on which rationally cannot be explained by any hypothesis other than evolution. How the mechanism of evolution is another problem, it is a problem that is the subject of theory. Of the two prominent theories in the 19th century, namely Lamarckism and Darwinism, it was Darwin's theory that was used to explain evolutionary phenomena (Wilson & Eisner 1973).

On the other hand there are those who question the validity of the theory of evolution by stating that this is only a theory. Such a response seems to arise because there is an understanding of the relationship between facts and theory. The use of theoretical terms in science is not the same as the use of theoretical terms in everyday language. Theory in science is a comprehensive explanation supported by evidence, whereas theory in everyday terms is more speculation.

A theory is not an uncertain fact or an imperfect fact. Nor does it describe a lower level of trust (Mayr, 1986). Theory is a systematic idea that tries to explain why and how the facts that exist in this world manifest and interact. The apple from the tree falls to the ground. That is a fact. Newton's theory of gravity tried to explain

how this happened. Einstein's general theory of relativity provides a more accurate explanation. Scientists will always debate the theory and sometimes they totally change their views on how the world works around it. But the apple will always fall down. All living things now have the same gene code. This is also a fact. The theory of evolution helps us interpret this fact and relates it to the whole history of life. Even though there is debate about how evolution occurs, this does not mean that evolution is a myth.

Is evolution a fact? No, if we interpret facts as an essential truth that does not need to be tested and proven. Evolutionary theory is the scientific theory of natural selection and other processes that cause evolution (Futuyma, 1986). Evolutionary biology as a science will never find the final truth. He continues to be falsified, verified, and his progress is achieved by conjectures and refutation (Indriati, 2003).

Trust in God is transcendent, more of a religious experience, unique to each individual. Trust in God should not always be connected with accepting or not, agreeing or not, to theories in natural science (Indriati, 2003). Faith is based on trust in God, which is actually possessed by every human being.

### ***Evolution in Religious View***

Any scientific theory really cannot negate God. Some atheistic interpretations of scientific theory are forms of "scientism", namely a belief that only science is the only way to know. Scientism views that only nature (material) is the only reality that exists, and everything that cannot be reached by science is an illusion (Bube, 2001). Such interpretations are wrong because they go beyond the things science can explain (Barbour, 2002).

On the contrary, scientific theory cannot simply produce religious conclusions, because scientific truth is relative and relies on basic assumptions and depends on existing theories. Religion (revelation) is a guide for mankind, the truth is absolute. Religious beliefs by themselves do not need support from or need to support any scientific theory. The history of the church's conflict with scientists should be a valuable lesson in looking at the relationship between science and religion.

Nevertheless, it cannot be denied that observation, investigation, and contemplation of nature will evoke a certain sense of awe and wonder. All scientists, both atheists and theists, even ordinary people, are aware of the order and harmonization of nature. Nature exhibits a variety of wonderfully enchanting phenomena, namely diversity, similarity, symmetry, regularity, relative preservation, and probabilistic events. Furthermore, the findings of science have been able to show the unity of the universe, namely the interrelation of all parts and aspects.

A person who chooses atheism will only stop at the awareness of harmony, order and unity of nature. They don't realize the meaning behind all that. Natural events are considered solely probabilistic problems that exist and become available by themselves, without direction and purpose. Not surprisingly, a prominent physicist, Steven Weinberg, said that humans are the only creatures with conscious minds that live in a world full of vanity and void meaning. For him science is only solace in the midst of a vast universe that has no purpose.

For believers all these things have a religious meaning and are a symbol of the highest reality, namely Allah, as explained in the verses of the Qur'an. In the language of the Qur'an, it is said that nature contains traces of God. Natural phenomena are called verses (signs) of God (Bakar, 1995). Al-Qur'an is a book of guidance that gives information to humans about everything related to aqeedah, sharia and morals to achieve happiness in life in the world and the hereafter. The Qur'an is not a scripture that covers all types of science in detail.

Scientific theories that exist cannot be justified or blamed on the basis of the verses of the Qur'an. Basically the verses of the Qur'an do not discuss scientific theories in detail, although there are a number of verses that allude to the scientific theories that humans have not discovered or known in the time of the Qur'an's decline.

Every Muslim must believe everything that is contained in the Qur'an. However, he cannot force people to justify or reject a scientific theory based on the Qur'an. If this is done, consequently a person will accept or reject a scientific theory as part of the Qur'an's aqeedah. This also happened to the theory of evolution, where some Muslim scientists rejected the theory of evolution, while other Muslim scientists accepted the theory of evolution. Both groups use the Qur'an together as a reason for rejection / acceptance.

There are Muslims who try to justify the theory of evolution with Qur'anic verses such as "What is the matter with you that you don't attribute to God [due] grandeur while He has created you in stages?" (QS Nuh: 13-14). They interpreted these phases according to the phases recognized by adherents of Darwin's theory of evolution about the process of human events. Besides the verse "... As for the foam, it will disappear as something worthless; as for those who benefit humans, then they remain on earth. ..." (Surat Ar Ra'd: 17) was used as a reinforcement of the truth of Darwin's "struggle for life" theory.

In addition, QS Al An'am: 133 is also considered to support the theory of evolution. Some understand that a species originates from another species or a creature that came from a previous creature. Based on these interpretations it can be concluded that there is no difference between the concept of the Qur'an and the concept of science about the origin of humans. But

then the question arises, is that opinion correct or is it made / directed so that there is conformity? The thing that needs to be considered is that these verses cannot be forced to be the justification of Darwin's theory, but it does not mean that the theory is wrong according to the Qur'an. The author argues that the Qur'an does not explain in detail whether the creation of living things through an evolutionary process or was created individually. Rejection or approval of the theory of evolution should be based on empirical evidence through the scientific method.

Five centuries before the advent of Darwin's theory of evolution, there had been a Muslim scientist who wrote his opinion similar to evolution. The Muslim scientist was 'Abdurahman Ibn Khaldun (1332-1446) who wrote in his book *Kitab al-'Ibar fi Daiwani al-Muhtada'wa al-Khabari* as follows: Animal nature extends so that its various groups and ends the process of occurrence in human times who have thoughts and views. Humans increase from the nature of apes who only have the skills and can know but have not yet reached the level of belonging and thinking (Shihab, 1999). What is meant by apes by urah Abdurahman Ibn Khaldun is a kind of animal included in Anthropoides. When proposing this theory, Ibn Khaldun did not base it on the verses of the Qur'an, but on their research and analysis.

There are several scientific theories mentioned in the Qur'an but the presentation does not provide a detailed explanation. The presentation is to show the greatness of God and encourage people to make observations and research more deeply so that in the end it can increase the faith in Allah SWT.

## Conclusion

In the theory of evolution, Darwin stated that existing species are descended from ancestral species. Darwin mentioned natural selection as a mechanism for evolution. In its development, evolution theory raises the pros and cons among scientists or religionists. Some agree with the theory, some others disagree with giving refutations based on the verses of the Qur'an.

However, understanding the relationship between the Qur'an and science does not mean analyzing whether the existing scientific or scientific theories are listed or explained in the Qur'an or not. The main and important thing is to see whether the Qur'an or the souls of the verses of the Qur'an hinder the development of science or even encourage more study of science.

Efforts to link or reveal the relationship between the Qur'an and science must be done by understanding the characteristics of science and the Qur'an respectively. If we understand the differences in scope, goals and methods between science and religion, basically there is no conflict between the Qur'an and

science even though the verses of the Qur'an do not explain all scientific knowledge or theory in detail.

The theory of evolution, regardless of whether it is true or not, can have certain religious meanings. Even Darwin, wrote in his book that there is a greatness in the theory of evolution, where life radiates from one source (the same ancestor), evolved into various diversity of living things that exist today.

## References

- Abbas, E.W. 1984. "Teori Evolusi Membahayakan Keimanan Anak Didik" in T. Jacob et.al. (eds). *Evolusi manusia dan Konsepsi Islam*. Bandung: Penerbit Risalah.
- Abraha, K. 2003. "Epistemologi dan Paradigma Keterpaduan Iptek dan Islam dalam Perspektif Al-Qur'an dan As-Sunnah" in J. Wahyudi et.al. (eds). *Menyatukan Kembali Ilmu-Ilmu Agama dan Umum*. Yogyakarta: Suka Press.
- Bakar, O. 1995. *Tauhid dan Sains: Esai-Esai tentang Sejarah dan Filsafat Sains Islam*. Bandung: Pustaka Hidayah.
- Barbour, I.G. 2002. *Juru Bicara Tuhan antara Sains dan Agama*. [Translated]. Bandung: Mizan.
- Berra, T. 1990. *Evolution and the Myth of Creationism*. Stanford: Stanford University Press.
- Berry, R.J. & A. Hallam. 1989. *The Encyclopedia of Animal Evolution*. Oxford: Equinox.
- Bube, R.H. 2001. "Three Views of Creation and Evolution" in R.L. Herrmann (ed.). *Expanding Humanity's Vision of God*. Philadelphia: Templeton Foundation Press.
- Campbell, N.A. & J.B. Reece. 2001. *Essential Biology*. USA: Addison-Wesley Longman.
- Darwin, C. 1859. *On the Origin of Species*. London: Murray.
- Dawkins, R. 1995. Creation & Natural Selection. *New Scientist* 3 (1527): 34-39.
- Dobzhansky, T. 1973. Nothing in Biology Makes Sense Except in the Light of Evolution. *American Biology Teacher* 35: 125-129.
- Futuyma, D.J. 1986. *Evolutionary Biology*. Second Edition. USA: Massachusetts Sinauer Associates.
- Enger, E.D. & F.C. Ross. 2000. *Concept in Biology Ninth Edition*. USA: McGraw-Hill Company.
- Indriati, E. 2003. *Waktu dan Evolusi*. Presented in the Workshop on Science and Religion. Yogyakarta: Postgraduate Program of Universitas Gajah Mada.
- Jacob, T. 1992. Teori Evolusi Biologi: Pengaruhnya terhadap berbagai Bidang Pemikiran. *Ulumul Qur'an* 3 (1): 34-35.
- Johnson, K.D., D.L. Rayke, H.L. Wedberg. 1984. *Biology an Introduction*. USA: The Benyamin Cummings Publishing.
- Mayr, E. 1984. Uncertainty in Science: Is the giant panda a bear or a raccoon. *Nature* 323: 769-771.
- Quthub, M. 1986. *Islam di Tengah Pertarungan Tradisi*. Jakarta: Dewan Dakwah Islamiyah.

Shihab, M.Q. 1999. *Membumikan Al-Qur'an: Fungsi dan Peran Wahyu dalam Kehidupan Masyarakat*. Bandung: Mizan.

Sober, E. 1993. *Philosophy of Biology*. San Fransisco: Westview Press.

Wilson, E.O. & T. Eisner. 1973. *Life on Earth*. USA: Sinauer Associates.