Cognitive Insight in Education
Vol. 1 No. 1: 25-34
https://journal.liacore.org/cognitive/index

Learning related to the Concept of Science and Technology According to Islam

Endro Tri Susdarwono

Ilmu Komunikasi, Fakultas Ilmu Sosial dan Ilmu Politik,
Universitas Peradaban Brebes, Indonesia

Corresponding Author Email: indrarasyidjulianto@uinsu.ac.id

ABSTRACT

This study aims to delineate the concepts of science and technology within Islam through a literature review. Modern humanity demonstrates collective intelligence in the form of science and technology, necessitating a profound understanding of these concepts from an Islamic perspective. The research findings indicate that QS al-Alaq, 96: 1-5 and QS Fushshilat 41: 33 implicitly classify fundamental human knowledge into natural and social sciences (derived from 'cakrawala' or 'afaq), and humanities (derived from 'self or 'anfus), which include philosophy, linguistics, logic, and mathematics. Technology in Islam is understood as a human endeavor to channel and disseminate divine grace to all creatures, manifesting human devotion to the Creator.

Keywords: concepts, science, islam, technology

INTRODUCTION

Torches, lamps, or candles are sources of light in dark situations. Darkness, which hinders our ability to see the surroundings properly and perceive things clearly, must be fought and overcome with a source of light. When put into perspective, our ignorance or lack of understanding about something is a form of darkness. Meanwhile, efforts to search for, present, and condition the existence of knowledge are the source of that light. By God as the Most Intelligent Essence, both of them (namely darkness and the source of light) were deliberately created so that as humans we become wiser and smarter, and are willing to take various religious methods in order to have these two characteristics.

An important issue that cannot be separated from human existence in life in this world is education. Education presents expertise, skills, knowledge, and even attitudes, which are something that is formed through the educational process (Arni et al., 2016). Education is an integral part of development. The educational process cannot be separated from the development process itself. Development is directed and aims to develop quality resources. Quality humans can be seen in terms of education. This is contained in the goals of national education, which aims to educate the life of the nation as a whole, apart from having faith in God Almighty and being physically and spiritually healthy, also having abilities and skills (Rachmawati et al., 2016).

Education has a very important role in creating an intelligent, democratic and open life with the aim of providing balance to the progress of knowledge in all aspects of life (Mujakir, 2015). Learning is an activity process that is expected to bring about changes in the attitude and mentality of each student (Arni et al., 2019).

Received: June25, 2025; Accepted: July16, 2025; Published: July17, 2025

Learning is the process of teaching and learning activities that occur between students and teachers. In the learning process, there is intense interaction between students and teachers (Jayawardana, 2017; Alisa et al., 2017). Gagne explained that learning is a series of activities to help make learning easier for someone, so that an optimal learning process occurs. Saylor also stated that learning is student involvement with planned learning objectives. The main aim of learning is that what is learned is useful in the future, namely helping us to continue learning in an easier way, so that a lifelong learning process (long life education) is achieved (Adinugraha, 2017; Rosita & Leonard, 2013).

Life cannot be separated from its existence with science. There is a very close relationship to all aspects of life with the existence of science. One of the things that can be seen is the very rapid development of technology in recent times which cannot be separated from the existence of science. Experts use scientific discoveries to develop various types of technology (Nihlah, 2017). The nature of science itself is the basis for understanding science learning (Tursinawati, 2013).

The Koran, as one of the holy books, cannot be separated from discussing matters of science and technology. Even during the time of the Prophet, the urgency of science was proclaimed. But in the current context, "the role of the Koran is increasingly difficult". Some Muslims only use it as a means of justifying progress in science and technology, not as a means of triggering and encouraging the creation of new (latest) ones, in order to change the image of Muslims' apology for the Koran for advances in science and technology (Sumarni, 2017).

Based on the background above, this research aims to provide a description regarding learning regarding the concept of science in Islam and the concept of technology according to Islam. The active attitude of humans in modern times is manifested in collective human intelligence in the form of science and technology, so understanding is needed through learning about science and technology according to Islam.

RESEARCH METHOD

This study employs a literature review methodology to analyze and synthesize information related to the concepts of science and technology according to Islam. The literature review process involved a systematic search of scholarly journals, books, and other relevant publications using keywords such as ‘Islamic science,’ ‘Islamic technology,’ ‘science in the Qur’an,’ and ‘Islam and IPTEK.’ The collected sources were then critically analyzed to identify key ideas, arguments, and finding pertinent to the research objectives. Extracted data were subsequently categorized and synthesized to construct a comprehensive conceptual frame work of science and technology from an Islamic perspective.

RESULTS AND DISCUSSION

Humans and nature are a pair of divine creations that are closely intertwined. On the one hand, humans passively experience and submit to nature, on the other hand, humans actively explore and master nature. This active human attitude in modern times is manifested in collective human intelligence in the form of science and technology. These two attitudes are the main drivers of modern civilization.

The characteristic of the modern world is the existence of a positive reciprocal relationship between science and technology. The development of science accelerates

technological progress and vice versa (Budianto et al., 2021). As a result, these two institutions develop and grow faster than other social institutions, so that it is not uncommon for cultural gaps to occur, which are often accompanied by a number of social and psychological tensions. If we look more closely, we will find that the cultural gap and socio-psychological tensions originate from the delay in human comprehension relative to the broadening of perspectives brought about by developments in science on the one hand. On the other hand, these gaps and tensions also stem from delays in society's responsiveness to the challenges and demands brought by technological advances.

These gaps and tensions suggest that we seek powerful controls for scientific development and technological progress. Apart from that, facilities are also needed to encourage the development of human responsiveness and community responsiveness. With proper control and means, it is hoped that humans can overcome the wild developments in science and technology that modern humans face today.

Science and technology as a part of human civilization also reflect a complete order. The objects of knowledge form a hierarchy of material systems. This is the structural aspect of science, while the dynamic aspect of science is the measurement experiments carried out on these objects. The functional aspect of science is the theories created to explain the results of these experiments. The principles underlying these theories are fundamental or foundational aspects of science.

Technology as the application of science also has four aspects of an integral system. The principles underlying a technological activity are the foundational aspects of technology. Meanwhile, the functional aspects of technology are engineering design along with the models used in compiling the design. The process of realizing the design along with the process of using the results is a dynamic aspect of technology. The structural aspect of technology lies in the various material systems used and produced by the technological operation process.

Between technology and modern science there is a reciprocal relationship. On the one hand, the results of science in the form of theories are used by technology in formulating its models. On the other hand, the results of technology in the form of products and processes are used by science. So technological progress will enable the development of science and vice versa. This is why science and technology are the components of society's cultural order that are developing most rapidly.

The rapid development of science and technology gives rise to changes or transformations in society's culture which have positive effects. The positive effect of technological development is clear, namely increasing the material welfare of society. However, developments in technology and science also have quite a negative impact. These negative impacts can be classified into two types, namely destructuring impacts and induction impacts (Taufik et al., 2016).

The impact of this destructuring is in the form of an overhaul of the structures of parts of human civilization caused by the gap between the speed of development of technology and science and the speed of development of other parts of human civilization. An example of this socio-cultural destructuring is the collapse of the traditional picture of the universe by scientific criticism. Another example is the erosion of social solidarity due to the material abundance brought by industrial technology.

The second negative impact is the impact of induction in the form of imitating the unique characteristics of science and technology on other subsystems of civilization. One example of this balancing process is the spread of racial values originating from the rational nature of science and technology. Another example is the tendency for totalitarianism in politics, which originates from the comprehensiveness of modern technology.

Secondly, the negative impact of industrial technology seems to have hit many developing countries, including Muslim countries, while in developed countries, the negative impact of post-industrial technology has begun to work, causing various crises which are closely related to each other. The current world economic recession is another symptom. This global crisis of societal culture needs to be addressed, and this is where the role of Islam lies (Lasmanah et al., 2023).

The Concept of Science According to Islam

Of course, Muslim scientists, like every other Muslim, base their activities on the commandments of Allah SWT as reflected in the noble Qur'an. The basis of their thinking is the first Word of Allah conveyed to Muhammad, the beloved Messenger of Allah, whose translation reads:

> "Read it in the name of your Rabbi who created it
> Who created humans from a clot of blood
> Read it and your most noble Rabbi
> Who has taught humans with kalam
> He has taught man what he did not know." (QS, al-Alaq, 96: 1-5)

Based on this verse, they read Divine verses in the form of natural and human phenomena as confirmed by Allah SWT:

> "We will show them
> Our verses are covered in horizons
> And within themselves,
> So that the truth will be clear to them..." (QS, Fushshilat, 41: 53)

This verse implies the basic classification of knowledge that a human can possess. Cakrawala or afaq is a symbol of all phenomena that exist in the human environment, while self or anfus symbolizes everything that exists in the human soul. The first knowledge produces science in the form of natural sciences and social or societal sciences. Meanwhile, the second knowledge develops into humanitarian sciences or humanities. This last branch of science includes philosophy, linguistics, logic and mathematics.

In this verse it also appears that these two sciences are only worth studying or developing to deepen our knowledge of the religious truths revealed by Allah SWT to humans through His apostles. This religious revelation of God is the object of religious sciences. So in Islam we basically have three large groups of knowledge, namely natural sciences, human sciences and religious sciences. The order of mention in the verse above seems to clearly reflect the existence of an epistemological hierarchy of human sciences as well as reflecting the existence of an epistemological hierarchy of human sciences in addition to reflecting the ontological hierarchy of nature-humans-God who is the object of human knowledge.

It is also implied in this verse that there is a methodological hierarchy of the five senses, reason, revelation, or perception, conception, relevance, which are the main sources of human knowledge. Drawn to the field of science itself, this methodological hierarchy is reflected in the

science-philosophy-aqidah hierarchy, which is the core of the epistemological hierarchy that we mentioned earlier. The Western world has thrown away this element of aqidah and epistemological hierarchy so that what remains is only the science-philosophy or science-humanities pair.

As a result, a science-humanities dichotomy has emerged that has been well explored by the English novelist physicist C.P. Snow in his famous book "The Two Cultures" where he indicated that there was mutual ignorance or mutual disdain between scientists in the two branches of science. These two branches of science seem to form two cultures that are separate from each other. These two cultures are not only separate from each other but also contradictory.

As a continuation, the Western world recorded a terrible development in the conflict between these two cultures. Philosophy that questions the deepest questions of human existence and nature is castrated to become merely a science of scientific methodology in the flow of nepositivism. Apart from that, there has also been scientific methodological colonization of the human sciences. The quantitative approach and operationalist methods were deified and considered the only valid methods that had to be applied in the human sciences because they were considered to have demonstrated their superiority in the field of natural sciences.

As a result, the myth of the neutrality of science, including the humanities, has emerged. This myth of the neutrality of science was soon followed by a more dangerous myth, namely the myth of the neutrality of technology, which often obscures the reality that technology in its modern form is more devoted to a small number of people who dominate economic power.

You can imagine how this myth and the rapid advancement of technology can shake up the balance of a society. Therefore, science must immediately be placed again on a foundation of philosophy or wisdom, while wisdom itself must be placed again on the basis of revelation and all forms of appreciation (Rifky et al., 2023). In short, the integrity of the science-wisdom-aqidah hierarchy must be restored as it was at the beginning of the development of science. Only in this way can the crisis brought about by the development of modern science be overcome.

Concept of Technology According to Islam

For a Muslim technologist there is no meaning of man versus nature because he knows the words of God:

> "Don't you all see that Allah has made easy for you everything in the heavens and everything on earth and has sent down on you His spiritual and spiritual blessings?" (QS, Luqman, 31:20)

So, according to a Muslim technologist, nature is not something that must be defeated or conquered, but must be processed and utilized so that the physical and spiritual blessings contained in it are realized. Who and how to use it is also explained in the closing sentence of the same verse:

> "But there are some people who argue about Allah without knowledge, guidance, and the Book that provides enlightenment?" (QS, Luqman, 31:20)

In this verse it is clear that those who utilize nature are people who have knowledge, guidance and the Book of Allah. The science referred to in this case is of course the science of

utilizing nature itself, namely technology (Hidyat et al., 2022). Meanwhile, the instructions referred to must be related to the good or bad purpose of an activity which is usually found in the human conscience and is formulated in what is called ethics or morals. Likewise, what is meant by His book here is of course a book that contains the laws of human action, known as the Shari'ah.

Thus, Islam has emphasized the existence of a praxeological hierarchy of 'technology-morals-shari'ah' as a complement to the epistemological hierarchy of 'science-wisdom-aqidah'. Indeed, Islam emphasizes the existence and need to complement knowledge with charity in addition to basing knowledge on faith. By abandoning the transcendental dimension of the praxeological hierarchy developed by Muslim scientists, Western technologists were forced to face the technical-ethical dichotomy which in its modern form manifests itself in the conflict between technology and ecological balance. Of course, a Muslim technologist will avoid the conflict between technology and nature if he relies on His book which clearly emphasizes:

> "Created by humans with intelligence,
> The sun and moon according to calculations,
> And the plants and trees prostrate themselves,
> And the universe was built and given a plan of balance,
> So that you don't violate the balance
> And uphold the balance fairly
> And don't break your balance." (QS, ar-Rahman, 55: 3-9).

Human attitudes towards the natural environment are reflected in the form of technology they develop. The technology of society which holds the view that humans must submit to nature is simple as we encounter in primitive societies, while the technology of modern Western society which wants to conquer nature is increasingly complex, giant, expensive and drains, even destroys, the natural environment.

Technological developments in this last form have led to the emergence of movements aimed at replacing advanced technology which drains and pollutes the environment. This movement calls its technological concept an alternative technological concept.

For power generation technology, the alternative technology movement advocates the use of flowing natural energy (for example, sunlight, water flow and wind currents) as a substitute for the use of distorted natural energy (for example, petroleum, coal and uranium ore).

Islamic technology is the realization of environmental prosperity or acculturation as a statement of human praise and gratitude for the abundance of blessings they receive through their natural environment (Ariyadi, 2018). Prosperity is carried out by uncovering hidden wisdom, hidden potential or implicit functions in natural processes in the human environment. Thus, according to Islam, technology is a human effort to channel and spread the abundance of Divine grace back to all creatures as a manifestation of human devotion as creatures to their Creator.

Nuklir Learning the Concept of Science and Technology According to Islam in Nuclear Materials

The word atom comes from 2 root words, namely a - temnein. A means "not", while temnein means can be divided/split/split. The word atemnein then weakened to become the atom we know today. According to the old understanding, atoms are the smallest part of an

object that cannot be divided further, but according to the latest understanding, atoms can still be divided into atomic nuclei and electron shells. Meanwhile, according to modern atomic physics theory, the atomic nucleus itself can still be divided further, namely consisting of protons and neutrons (Wardhana, 2009).

Nuclear is the equivalent of the word in Indonesian which is taken from the deed in English, namely: nuclear which means atomic nucleus. Meanwhile, the word nuclear itself comes from Latin: nucleus, which means core (Maemunah et al., 2019). Based on the concepts of physics and chemistry, an atom is the smallest part of a material that still has the basic properties of that material. Even though atoms are very small, atoms have a size (diameter) of around 1 Angstrom or 10-8 cm. imagine 1 cm divided by 100,000,000 that's 1 Angstrom. So what is the size of the atomic nucleus or nuclear size? The size is much smaller, namely 10-4 Angstroms or the same as 10-12 cm. This is even smaller, 1 cm divided by 1,000,000 is still divided by 1,000,000 which is the size of the atomic or nuclear nucleus (Wardhana, 2009).

Every object in this universe, including atoms and nuclear elements, has a size, regarding this, see Surah Al Qamar in the Qur'an which states that everything in this universe was created with a size:

> "Indeed We created everything with measure." (QS. Al Qamar, 54: 49)

If you pay attention to the verse above, in fact, it is not only objects that have size, but all physical quantities that can be measured must have been created by God with a certain size, which in the language of exact sciences is called a physical unit. For example, heat can be measured by how many degrees the temperature is, the speed of an object's movement can be determined by how fast it is, noise can be measured by how much the noise level is, the intensity of light can be measured by how much it is, and so on.

The Qur'an, which was revealed 15 centuries ago, is truly a great gift as "hudal linnas" and "hudal lilmutaqien" for mankind who want to use their minds in order to get closer to the Creator of this universe. Everything in the sky and everything on this earth, everything is God's creation intended for mankind, including atoms, which are very, very small in size.

To get the term atom in the Qur'an requires the same understanding, namely an understanding of "dzarrah" which is a very small grain, which is none other than an atom. The Indonesian Ministry of Religion itself has determined that the term "dzarrah" in the Qur'an is what is known in everyday language as "atom" (the Indonesian translation of the Qur'an published by the Indonesian Ministry of Religion). If we agree that the translation of the Qur'an is carried out textually and contextually, then the term dzarrah in the Qur'an is nothing other than atom (Wardhana, 2009).

Atoms that are very small in size, which in the Qur'an are called dzarrah, are actually mentioned in several letters. Even in one letter the word "dzarrah" is mentioned in several verses.

> "There is nothing beyond the knowledge of your Lord as small as a dzarrah on earth or in the sky, there is nothing smaller than that and nothing greater than that except that it is written in a real book." (QS. Yunus, 10: 61)

> "There is nothing hidden in Him, all the dzarrah that is in the heavens and that is on the earth, and nothing (nor) that is smaller than that or greater than that except in a clear book." (QS. As Saba, 34: 3)

> "Say: "Call on those whom you regard as other than Allah, they do not have the weight of dzarrah in the heavens or (nor) on the earth, ..." (QS. As Saba, 34: 22)
>
> "So whoever does good deeds as heavy as dzarrah, surely he will see (the reward). And whoever commits a crime as serious as dzarrah, he will see (retribution)." (QS. Al Zalzalah, 99: 7.8)

If you pay attention to the meaning implied in the Letter of Yunus (QS. 10: 61) above, then the Qur'an, for 15 centuries, has indicated that dzarrah or atoms are small. It is not explicitly stated how small the size of the atom is, but it is implied that the atom, even though it is small, has a size. This is in accordance with the word of Allah in Surah Al Qamar verse 49, which means:

> "Indeed, We created everything with measure" (QS. Al Qamar, 54: 49)

Scientists have now been able to determine the size of the atom (dzarrah). In the previous discussion, we have explained the size (diameter) of the atom, namely 10-8 cm. So even though the atom is very small, the diameter (size) of the atom can be determined. The Qur'an has hinted at the existence of size in all objects created by Allah, including atoms which are very small in size.

Apart from the size of the atom, namely by determining its diameter, today's scientists have also measured how much 1 atom weighs (Wiyatmo, 2010). Regarding the weight of one atom, the Qur'an has also indicated that although the atom is small in size, the atom has weight. Look at God's word in the verses above.

These three verses, namely As Saba (QS. 34: 3. 22) and Al Zalzalah (QS. 99: 7-8), explicitly say that dzarrah has weight. How much does one atom (dzarrah) weigh? When the Qur'an was revealed 15 centuries ago, humans did not really care how much one atom (dzarrah) weighed. The desire to know how much one atom actually weighs has encouraged scientists to investigate further the knowledge of atoms. As stated by Bohr, the atom is divided into smaller parts, namely: the atomic nucleus (nuclear), the electrons which rotate around the nucleus according to the orbit of each electron. Meanwhile, the atomic nucleus is still divided into: protons and neutrons. So atoms are divided into smaller parts: protons, neutrons and electrons, which does not contradict the verses in the Qur'an. The Qur'an actually supports this scientific opinion, as implied in the verses from the letter of Yunus (QS. 10: 61) and the letter of As Saba (QS. 34: 3) which read:

> “Your Lord will not escape the knowledge even if he is as big as the dzarrah on earth or in the sky. There is nothing smaller and nothing (nor greater than that..." (QS. Yunus, 10: 61)
>
> "There is nothing hidden from Him as heavy as a dzarrah that is in the heavens and that is on the earth and there is nothing (nor) that is smaller than that or greater..." (QS. As Saba', 34: 3)

Protons, neutrons and electrons are smaller parts of atoms (dzarrah), so they are in accordance with the verses of the Qur'an as mentioned above. The Qur'an never shackles the human mind who wants to progress, in fact it commands us to always look, pay attention and observe what Allah has created. The command to observe and pay attention to God's creation as stated in the verse:

> "Pay attention to what is in the heavens and on the earth..." (QS. Yunus, 10: 101)

So how much does each part of the dzarrah (atom) weigh? Currently, scientists with various kinds of experiments have been able to determine the weight of protons, neutrons and electrons as follows:

Proton weight = 1.673 x 10-27 kg
Neutron weight = 1.675 x 10-27 kg
Electron weight = 9.109 x 10-31 kg

Physically, its existence proves the truth of the verse of the Qur'an, Surah Al Qamar, 54: 49.

According to the atomic model, protons have a positive electrical charge, neutrons, as the name suggests, are "neutral" meaning they have no electrical charge, while electrons have a negative electrical charge. So in short, the nucleus (nuclear) has a positive charge and is surrounded by electrons which have a negative charge (Basri, 2014). There is an atomic nucleus (nuclear) which has a positive electrical charge and electrons which have a negative electrical charge, then these two particles (namely: atomic nucleus and electrons) will become a pair and according to Coulomb's law there will be an attractive force between the two pairs (Wiyatmo, 2010). The existence of a pair between protons and electrons or between positive and negative electrical charges, does not seem to be something that happens by chance, but there must be a purpose from Allah as the Almighty Creator, namely balance, pay attention to the following words of Allah:

> "You never see in the creation of Allah the Most Gracious anything that is not balanced." (QS. Al Mulk, 67: 3)

CONCLUSION

The modern world is characterized by a positive reciprocal relationship between science and technology, where the advancement of one field accelerates the other. From an Islamic perspective, as implicitly stated in QS al-Alaq, 96: 1-5 and QS Fushshilat 41: 33, knowledge is classified by its source: natural and social phenomena (‘afaq’) giving rise to natural and social sciences, and human inner phenomena (‘anfus’) developing humanities such as philosophy, linguistics, logic, and mathematics. Technology in Islam is viewed as a human endeavor to channel and disseminate divine grace to all creatures, a manifestation of devotion to the Creator. This concept emphasizes achieving environmental prosperity or civilization through uncovering hidden wisdom and natural potential, while upholding balance.

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