Learning Effectiveness of Department-based Integrated Science Interpretation

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Abstract. Al-Qur'an is a guide and instruction revealed by Allah to humans in living life on earth, including for students of Sciences Department (Tadris IPA) Teacher Training and Education Faculty (FTIK) IAIN Salatiga. Efforts to understand Al-Qur’an are very relevant in learning process. Tadris IPA students can take a concrete role in understanding the imitation cues in the Al-Qur'an physically based on physical, chemical and biological perspectives. Science motion written in Al-Qur'an are very important sources of knowledge to be explored, researched, and disseminated to the benefit of people. One of the scientific motion is found in QS. Al-Baqarah verse 168. The purpose of this study is to determine the learning effectiveness of department-based integrated scientific interpretation. This is a quantitative research with the "One-Group Pre-test-Post-test" research design. The population is all Tadris IPA students in, the sample is third semester students of class C with total 27 students. The pre-test and post-test data that have been obtained are continued by parametric test (paired t-test). The result of paired t-test = 12.684, p=0.00 < 0.05 with the conclusion that the learning effectiveness of department-based integrated science interpretation is effective in improving the learning outcomes of the science interpretation for Tadris IPA students of IAIN Salatiga students.

Keywords: Department; Integrated science interpretation; Learning.

1. Introduction
The learning of Tafsir (interpretation) subject at Tadris IPA FTIK IAIN Salatiga has been done by integrating interpretation and science. But the reality in the field is still limited to certain scientific material. Results of interviews with Magfiroh in [1], Fitria in [2], Mutiara in [3] and Sulistyoningsih in [4] stated that the course has been harmonized interpretation of Al-Qur’an, the Hadiths with Science. This is in line with Mas'ud that stated the interpretation lecturer at Tadris IPA Study Department. As for the material that has been combined is the truth of the world and its creator, thaharah, earth, fluid, the law of pork [5]. While the preliminary findings of researchers towards learning science integrated interpretation are as follows: (1) the determination cues have not scientifically referred to the basic science syllabus (General Physics, Chemistry and biology), (2) it has not involved the lecturers of science, (3) the Science material is still not conditioned on the determination of the potential of fixed material combined, (4) the potential of the fixed material combined has not been attached to the Study Implementation Plan (RPS) because there is no standard material stipulation, (5) learning evaluation does not involve science lecturers.
Al-Qur’an as a guide and guidance revealed by God for humans in living this life. Humans are supposed to understand Al-Qur’an which is still global. This is in line with Yuliarto in his article that the interpretation of Koran by using the experimental sciences has produced many books of scientific interpretation (tafsîr 'ilmy) and became an important reference [6]. Muchlisin and Nisa stated that their study shows that the dynamics of ‘ilmî interpretation journey in Indonesia are very dynamic [7]. The concept of science and technology in Qur’an is also applicable and relevant to be applied in learning process at Islamic education institution. But, there is still a problem in it. The problem can be solved by integration project in education, namely: science integration (islamization of sciences) [8].

For students of Tadris IPA, the effort to understand Al-Qur’an is very relevant in learning process. Tadris IPA students can take a concrete role in understanding the religious cues in the Al-Qur'an based on physical, chemical and biological perspectives. The scientific cues contained in Al-Qur'an are a very important sources of knowledge to be studied, and the results are disseminated to benefit the people on this earth. One of the scientific cues is found in QS. Al-Baqarah verse 168 is the following.

QS. Al Baqaroh: 168

Jennifer: "O people, eat what is lawful and good from what is on the earth, and do not follow the steps of shaitan; for surely the devil is a real enemy to you."[9]

By paying attention to scientific cues and their meaning, the theme of science interpretation based on QS. Al-Baqarah: 168 is energy, in which energy comes from good food and food is not necessarily halal. Likewise, the aspects of physics, chemistry and biology about energy can also provide links with these scientific cues. This is in line with Rosa in the results of his research that the main purpose of Al-Qur’an, namely the Al-Qur'an hadyu is able to provide solutions and will be achieved, when thematic interpretations are carried out ideally with a holistic thematic interpretation epistemology [10]. Saputro and Kuswaya conducted a study that supports this research that the concept of scientific cues is effective in the development of integrated science model interpretation at Tadris IPA FTIK IAIN Salatiga [11].

Based on previous research finding, this study aims to provide interpretive learning solutions at Tadris IPA, by integrating real science interpretations and sourced directly from Al-Qur’an. Thus Tadris IPA students can concretely apply their knowledge in real science interpretations and contribute to a holistic and integrative science learning with Islamic values. Whereas for interpreter lecturers can facilitate the holistic integrative learning of science interpretations.

The rest of this paper is organized as follow: Section 2 describes the proposed research method. Section 3 presents the obtained results and following by discussion. Finally Section 4 concludes this work.

2. Research Method

This is a quantitative research by using "One-Group Pre-test-Post-test Design"[12]. The population of this study are all students of Tadris IPA IAIN Salatiga, and the sample is the third grade students of class C with 27 people. Data is taken from pre-test and post-test values. In testing the effectiveness of integrated science interpretation learning based on study programs, it is shown in Figure 1.

![Figure 1](https://via.placeholder.com/150)

Figure 1. Design of "One-Group Pre-test-Post-test Design" [12]
3. Results and Discussion

Based on the results of the Focus Group Discussion, the material of integrated science interpretation on the theme of energy used in this study is based on QS. Al-Baqarah verse 168. Integrated science interpretation of QS. Al-Baqarah verse 168, that there is an order to all mankind (not only for Muslims, or only those who believe). This is in accordance with the rules of Ulumul Qur'an in the fragment of the verse (........ يا أَيُّهَا النَّاسُ) which means "O all men ..." is a verse of nida ' (the one who is called) shows the generality (........ ... ...) ... man ..., this verse is for all mankind (not only for Muslims / faithful people). However, each nida ' is more meaningful for Muslims/ faithful people, even though the word shows generality. So the results of this study can be disseminated for the benefit of human life in general, and for Muslims in particular.

Fragment of verses (......) ... eat ... is fi'il amar (command). This means that God commands all humanity to eat. In Hissi, this eating order is a scientific gesture that is very familiar with science. Humans are ordered to eat to get energy for the body so they can carry out various activities. Energy from food is chemical energy that the digestive system is converted into other forms of energy. The digestive system is an advanced energy converter machine for the body created by Allah.

This sophisticated energy converter machine (read: digestive system) is assembled from components with special and tiered functions that are very unique. According to the study, the energy converter forms a channel that, if stretched, is about 30 feet long (+ 9 meters). Food enters through the mouth and then through various digestive processes into substances and energy and waste substances are removed from the body. The following is a brief and concise explanation of the digestive system in the human body [13].

The human digestive system is a system that helps humans digest the food and drinks they consume into substances that are more easily digested by the body and various contents are taken which are useful for internal organs and parts of the body as a whole. Another understanding of the digestive system is the process of changes in food and absorption of food extracts in the form of nutrients needed by the body with the help of enzymes which break down complex food molecules into simple ones so that they are easily digested by the body.

The human digestive system includes, (1) the process of entering food into the mouth (Injesti), (2) the process of converting food into small and soft by the teeth (mechanical digestion), (3) the process of converting complex food molecules into sediment by enzymes, acids, 'bile' and water (chemical digestion), (4) absorption of nutrients and sewage disposal (removal process). Below is the main digestive tract in humans as shown in Figure 2.
Figure 2. Human Digestion System [14]

The part of the human digestive system is:

a. **Mouth Section**
   The forefront of the human digestive system is the mouth. This section is the door for the food and drinks you consume to enter and pass on to the next digestive system. In the mouth there are several important parts. Among them are the tongue which serves to feel food, position food so that it is easy to chew and help food to be swallowed. Second, there are teeth that function to chew food consumed so that it becomes smoother and easier to digest. Thirdly there is also saliva that will help you swallow food more easily and also function as a protector of the oral cavity. Chemically, the oral cavity contains an amylase enzyme that converts starch into simpler carbohydrates [15].

b. **The Esophagus**
   The esophagus is the hall that will be entered into the finished food. You chew between the oral cavity to the stomach and through the digestive process that follows. Esophagus (scientific language). In doing its job, it performs a movement called peristalsis which helps to encourage chewed food to enter the stomach slowly. According to research, food will pass through the esophagus in just 6 seconds.

c. **Gastric Section**
   The stomach or in scientific language is called Ventricular, shaped like a puffed pouch and located on the left in the cavity in the stomach. The hull is broadly composed of 3 parts. It has an important function in the digestive system, one of which is producing hydrochloric acid which will eradicate all microorganisms in the food we consume. Chemically, the stomach that is connected to the duodenum is equipped with a layer (mucosa) that contains glands that secrete mucus, hydrochloric acid (dilute HCl), and pepsin enzyme [15].

d. **Small intestine**
   The small intestine has several parts, including the duodenum, empty intestine and intestinal absorption. There are many processes that occur in the small intestine. Inside the small intestine also produces various kinds of enzymes that can convert some food substances into ingredients that the body needs to be more easily absorbed. The small intestine wall is amazing, in the form of millions of villi like the fingers which, if enlarged, show the presence of capillaries and lymph vessels so that the process of absorption of food nutrients to the blood can take place quickly [15].

e. **Colon**
   The colon is where food remains and then will be decomposed using Escherichia coli bacteria so that it can become dirt which will then be removed through the anus.

f. **Rectum and anus**
   At the end of the colon is called the rectum which is the path through which dirt passes to its final dump, the anus. When dirt enters the rectum, it means that the storage area of the dirt above is full and that's when you feel stomach pain and the desire to defecate. While the anus as we all know is a hole where dirt will be removed from the body to be removed. Food digestion process in humans. Explanation of the order of the digestive process is almost the same as the explanation in the previous section, which starts from the mouth then ends in the anus. Here is the sequence of human digestive devices: Mouth · Pharynx · Esophagus (esophagus) · Stomach · Pancreas · Gallbladder · Liver · Small intestine (duodenum, empty intestine, intestinal absorption) · Colon · Appendicitis · Anat · Rectum · Anus.

In simple explanation, food will enter the mouth and through the process of mastication to be smooth then (mechanical digestion) is passed into the stomach gradually through the esophagus. After
being in the stomach. The digestion process will be carried out chemically related to enzymes in the stomach. Food will be in the stomach for approximately 3 or 4 hours. After that it is passed on to the small intestine, it is in the small intestine that later the food will be sorted out from the contents that are needed by the body and leftovers. The rest of the food is continued into the large intestine and converted into feces. While the food content needed by the body is distributed to various parts of the body that need it. After the remaining food becomes feces, it will be passed on to the rectum when it is full and removed through the anus.

During and after the food is digested, the digestive system which acts as an energy converter performs its physical functions which can be explained by the laws of thermodynamics and body chemistry (thermochemistry). Thermodynamics is the process by which energy is transferred as heat and as work. Thermochemistry is the application of thermodynamics to chemistry, studying the heat and energy associated with chemical reactions.

Humans live doing work. Work requires energy. Energy is also needed for growth, making new cells, and replacing old cells that have died. This process is called metabolism as can be explained by the following First Law of Thermodynamics: $\Delta U = Q - W$, for all organisms, including human body, $W$ is done by the body in its various activities, and if the result is not a decrease in energy in the body (and temperature), energy in a way must be added to compensate. However, energy in the body is not maintained by the heat flow of $Q$ into the body. Usually, body temperature is higher than the environment, so it usually heats out from the body. Even on a very hot day when heat is absorbed, the body does not use this heat to support its vital processes. Thus the energy source is the inner energy (chemical potential energy) stored in food.

In a closed system, energy changes only as heat flow or work done. In an open system, the energy in itself can flow into or out of the system. When humans eat, energy from food increases energy in the total body $U$ in the body. This energy is ultimately used for work and heat flow from the body according to the first law of thermodynamics. The speed of metabolism is the speed at which energy is changed in the body. This speed is usually expressed in kcal/hour or in watts. Humans with an average mass of 65kg have a metabolic rate of 70 watts when sleeping, 115 watts when sitting upright, 1150 watts when running and 1270 watts when cycling.

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Next, in QS. Al-Baqarah verse 168 also contains a text of scientific cues in fragments of verses (...... حَﻼَالٌ ﺪِﻴْﺒًﺎ ... )... halal and good ... is a form of na'at (adjective) and man'ut (noun modified by adjective) with masculine form. Both words are phrases derived from two words that have different but interrelated meanings. "Halal and good" is a standard / criteria written in Al-Qur'an. According to an opinion, halal comes from the word halla, yahillu, hillan, which means freeing, releasing, dissolving and allowing. Thayyib means delicious, healthy, reassuring, and most important.

The scientific cues show that humans are ordered to choose halal and thayyib (good) foods. God provides a lot of food on this earth, but humans are commanded to eat halal which is also good. Good food is one that provides enough energy (calories) and does not damage the body, does not cause disease if consumed in the long or short term [15].

The standard / criteria for "halal and good" is intended so that humans get energy according to what is needed by the body and have no side effects that damage organs. This explanation will be easy to understand if it is associated with humans who have the following digestive disorders. Of course, in the process the digestive system also often experiences interference. There are many disturbances that can occur, one of which is very common and known to the public is the ulcer. This stomach disorder occurs because of the increasing amount of stomach acid which causes the stomach to become very sore. Halal standards are again good if applied to ulcer patients are halal, not acidic and not spicy so it is safe for the stomach.

Based on the results of the pre-test and post-test from students of Tadris IPA FTIK IAIN Salatiga, descriptive data is obtained as Table 1.

| Table 1. Descriptive data of Interpretation pre-test and post-test |
|---|---|
| | |

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Table 1 shows the results that the research respondents were 27 students. In descriptive details, the pre-test data are as follows: mean = 41.77, median = 40.00, mode = 40.00, minimum = 15 and maximum = 74. While the descriptive details of the post-test data are as follows: mean = 80.92, median = 81.00, mode = 81.00, minimum = 60 and maximum = 97. The descriptive histogram of pre-test data is as shown in Figure 3 and the histogram is a description of the post-test data as shown in Figure 4.

Data pre-test and post-test before the t test is carried out, then the normality of the data is tested by the results as in Table 2.
Table 2. Results of the data normality test

| Shapiro-Wilk Statistic | df | Sig. |
|------------------------|----|------|
| .959                   | 27 | .353 |
| .958                   | 27 | .335 |

Based on the results of the data normality test using SPSS Shapiro-Wilk, it is obtained the significance of pre-test 0.353 p > 0.05 and post-test 0.335 p > 0.05. Based on these results, it can be concluded that the pre-test and post-test data are normally distributed. Thus, the effectiveness test uses paired \( t \) test. The paired \( t \) test result is as the Table 3.

Table 3. The paired \( t \) test results

| 95% Confidence Interval of the Difference | T |
|------------------------------------------|---|
| Pair 1 Pre&Post tests | -45.49245 | -32.80384 | -12.684 | 26 | .000 |

Based on the paired \( t \) test results, it is obtained \( t \) count 12.684 p=0.00 < 0.05, it can be concluded that the learning of department-based integrated science interpretation can effectively improve the learning outcomes of integrated science interpretation of Tadris IPA FTIK IAIN Salatiga students. Thus the integrated science interpretation can understand students scientifically. This is in line with Armainingsih in his article that there are interpretive scholars who use scientific interpretation [16]. It is also in line with Laila that if you want to understand Al-Qur’an in depth, it will get the truth and proof of science in it [17]. Article Faizin’s showed that Tafsir Ilmi was the one which was deductive-confirmatively implemented in the integration of religion and science [18]. This is in line with Azhar in his article that without the power of science how can humans can understand the universe to see the greatness of Allah swt [19]. The result of this research is Tafsir Ilmi by Julkarnain, M that: Plants in Quran and Science Perspective from ministry of religious affairs is a comprehensive effort to interpret phenomena of universe within which the plant is bound to. Rich and complex description and explanation ranging from theology to ethics are able to pose answer for the dispute in Tafsir Ilmi. Eventually an effort to discuss it in academic realm, the places wherein sciences and religions meet each other, should be done in order to reach comprehensive understanding of it [20].

4. Conclusion

Based on the results of research and discussion of learning and evaluation on integrated science interpretation in materials of energy with the source of QS Al Baqarah 168 for students of Tadris IPA FTIK IAIN Salatiga, it can be concluded that department-based integrated science interpretation learning is effective in improving the learning outcomes of Tadris IPA IAIN Salatiga. The results of paired \( t \)-test = 12.684 or Sig. (2-tailed) p = 0.00 < 0.05.

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