

The Integration of Tawheed in the Topic of Cell Structure and Organization in the I-Bio Module

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ABSTRACT

The Tawheed Science Module in Biological Education (I-Bio Module) was developed with the aim of producing a teaching aid that integrates the elements of Tawheed with Biological Education. This module was built using steps in the ADDIE Model and was based on several theories such as the Islamization Framework of Science Subjects, Constructivism Theory and BSCS 5E Teaching and Learning Model. This module focused on the Cell Unit contained in the Form 4 Malaysian Biology syllabus. It contained four topics and was organized according to the 5E Inquiry steps, namely Engage, Explore, Explain, Elaborate and Evaluate. This module contains games, videos, simulations, virtual labs, notes and exercises to facilitate and strengthen students' understanding of each topic. In each chapter, verses from the Qur'an and explanations were inserted to relate the Biology topic to the element of Tawheed. This article explains how the steps in 5E Inquiry are used to integrate the elements of Tawheed in the first topic of the module which is Cell Structure and Organization. The usability of this module was tested on 24 pure science students in a religious school. Study participants were selected by purposeful sampling. Students think that this module was interesting and fun, allowed them to be more interested in learning Biology while strengthening the faith and taking *ibrah* (teaching), strengthening awareness of the truth of the Qur'an and believing in the power of God as creator. It is hoped that this module could help teachers in applying the element of Tawheed in the teaching of Biology and attract students to learn Biology so that Biology learning became more meaningful.

Keywords:

Education, Tauheedic Science, Integration, Cell Structure and Organization, Form 4, Biology.

Article Received: 18 October 2020, Revised: 3 November 2020, Accepted: 24 December 2020

Introduction

The Malaysian Education Development Plan 2013-2025 (Ministry of Education Malaysia 2013) has outlined the appreciation of values as the main agenda in the third shift out of the eleven major shifts to transform the national education system. This means that in addition to leadership skills, students need to have an appreciation of universal values such as integrity, compassion, fairness and love to guide them in making ethical decisions in facing the challenges of the world. The current situation shows many cases of power abuse and white collar crime involving the educated people. For example, the Malaysian Anti-Corruption Commission media statement on 5 October 2016 entitled "MACC arrested 4 individuals including two civil servants involved in corruption, confiscated RM 53 million in cash" (Azam Baki, 2016) and such similar cases. Therefore, the emphasis on the appreciation of good values in students is important.

In applying the appreciation of values, Islam has provided a clear guidance. Appreciation of religion and belief in God will produce students who are not only appreciative of values, but also ethical in their lives. However, this aspect of divinity is rarely integrated in other subjects especially Science and Pure Science subjects such as Biology, Physics and Chemistry. As a result, religious subjects are "dry" from the *aqli* (conventional knowledge) values and science subjects are left "free" from the *naqli* (reveal knowledge and the source comes from the Quran and the Sunnah) values (Zetty Nurzuliana Rashed & Ab. Halim Tamuri, 2014). The separation of knowledge into the concept of *dunyawi* (worldly) knowledge and *ukhrawi* (hereafter) knowledge is known as the system of dualism. To overcome this problem, some figures such as SM Naquib al-Attas and Ismail R. al-Faruqi have introduced the Islamisation of Knowledge which is translated in

various fields such as economics, sociology, politics, education, linguistics including science and technology (Ahsan, Shahed & Ahmad, 2013).

The efforts to unite science and the elements of divinity or monotheism have been made by many researchers. For example, the STEMind integrated STEM Module that combines science, technology, engineering and mathematics (STEM) with Islam and da'wah (Faszly Rahim et al. 2014). Shafiah Abdul Rashid et al. (2014) integrate Tawheed science education in the use alcohol. While Zanaton H. Iksan, Md Noor Saper and Zetty Nurzuliana Rashed (2016) integrate Tawheed science through the Lesson Study Approach in the teaching and learning of Science or Islamic Education.

Teachers' perceptions of the application of Tawheed science are also studied. A study on science teachers' perceptions of the application of Tawheed science into primary school science teaching found that the majority of teacher respondents agreed that Tawheed Science was beneficial in teaching Science in schools. However, most non-Muslim teacher respondents expressed uncertainty about the application of Tawheed Science and some did not want to apply this Tawheed Science elements because they felt it was for the Islamic Studies (Normaya Md Zamri & Zanaton Hj Iksan, 2016).

Norjilawati Mohd Amin and Zanaton H. Iksan (2015) studied the influence of Tauheedic Science integration on teachers' beliefs and teaching practices in the classroom. Studies have found that the integration of science into the beliefs of science teachers is at a high level. However, these beliefs are not carried out in the learning process by the teachers. Although some researchers have tried to apply the element of Tawheed in science, it is in general and not specific to the subject of Biology. Although teachers are interested in this integration, they lack skills and need teaching aids related to the Tauheedic science. A study by Khalijah Mohd

Salleh et al. (2011) expressed some suggestions such as holding seminars and workshops as well as providing teaching aids related to Tauheedic Science to assist teachers in the teaching and learning process of Tauheedic Science. Therefore, in response to this call, the author intends to develop and test the Tauheedic Science Module in Biology Education (I-Bio) to help and facilitate teachers to apply the divine element in Biology education and increase religious belief in students so that they are more guided in facing future challenges. Furthermore, the development of modules specific to the subject of Biology based on the curriculum is still lacking. Thus, biological integration strategies in teaching and learning need to be created to help teachers linked the Qur'anic revelation in the biology subjects.

The purpose of the study of this article is to explain how the elements of Tawheed are integrated in the I-Bio Module using the 5E Inquiry Model in the first topic which is the Cell Structure and Organization.

Definition of Tawheedic Science

Science is taken from the Latin term, *scientia* which means knowledge (Mohd Yusof Hj Othman, 2013; Medawar, 1984). Science means 'systematic and formulated knowledge', 'systematic study based on observations and experiments' as well as 'search to rationally explain natural phenomena'. On the other hand, Tawheed refers to the nature of Allah S.W.T who is One and Singular and denying the existence of something similar and in association or allied with Him. Thus, Tawheedic science can be defined as an effort to provide the characteristics that characterize Tawheed to scientific knowledge (Wan Mohd Aimran Wan Mohd Kamil 2012). In other words, Tawheedic Science is the learning of scientific knowledge based on the belief that this natural world was created by Allah S.W.T and all creation is subjected to His authority.

The application of the Tawheed elements in Biology

The glorious history of Islamic Civilization in the ninth to sixteenth centuries AD proves that the mastery of knowledge is the catalyst for the greatness of civilization at this time. There emerge many scholars who master various fields of knowledge such as philosophy, theology, mathematics, jurisprudence, astronomy, law, tasawwuf, logic, metaphysics, physics, chemistry, architecture, geography and many more. These scholars are also actively writing various types of books and masterpieces that are still a reference and be admired to this day. The leading examples of Islamic scholars of the past are Ibn Sina (Father of Medicine), Jabir Ibn Hayyan (Father of Chemistry), Ibn Al-Haitham (a great study in the field of optics), Al-Biruni and many more (Mohamad Faizal et al. 2014). Their love for knowledge motivate them to study, then finding new theories and fields of knowledge that form the basis of the glory of their civilization. Their perseverance should be the motivation and challenge for students so that they strive to seek knowledge in various fields to drive back the success of Islamic civilization in the future.

However, Western influences and colonialism led to the separation of the *dunyawi* and *ukhrawi* knowledges. Unification efforts have been made for decades, but it is still not very developed. Therefore, this module was developed as a small effort to help bridge the gap between science and religion. According to Mohd. Arip (2000), it has been agreed by scholars in the past that the method of knowing Allah S.W.T. is by means of researching, studying and thinking about the creations of Allah S.W.T. which exists in this universe and also by way of recognizing the names of Allah S.W.T. Thus, belief in the existence of Allah S.W.T can be manifested by reading and studying the Qur'an, Sunnah and the creations of Allah.

The Qur'an as a source of reference for the Muslim ummah has also urged its ummah to always remember Allah and think about natural

phenomena. The Qur'an in the following verses states;

"Indeed, in the creation of the heavens and the earth and the alternation of the night and the day are signs for those of understanding. Who remember Allah while standing or sitting or [lying] on their sides and give thought to the creation of the heavens and the earth, [saying], "Our Lord, You did not create this aimlessly; exalted are You [above such a thing]; then protect us from the punishment of the Fire. "

(Surah Ali Imran, verse 190-191)

This verse urges Muslims to observe and study the phenomena that occur in this world. This indirectly stimulates Muslims to become scientists who conduct research based on the Qur'an (Faszly Rahim et al. 2014). This way, natural phenomena are interpreted based on the Power of Allah S.W.T. as the creator of all beings, not by natural selection or by chance as scientists now believe. By observing and studying, the realization that the creation of this universe is something very complex and cannot happen without the existence of the Wisdom of the Almighty to govern it. This way, the Power and the Wisdom of God can clearly be felt.

Several strategies can be done to apply and integrate the elements of Tawheed in the subject of Biology in particular and Science in general. Among them is by linking the subtopics of learning about various scientific phenomena with the verses of the Qur'an. Second, the integration of Biology with Tawheed can be done by associating each Biological phenomenon with the Power and Wisdom of Allah S.W.T. Next, is giving advice and emphasizing on values other than facts and concepts when teaching science subjects as well as using information and communication technology to strengthen integration. In this module, these strategies are done to integrate the elements of Tawheed with the help of information and communication

technology such as video, games and simulations used to facilitate the delivery of Biology concepts related to Cell Units to students.

i. ADDIE Model

The Tauhidik Science Module in Biological Education (I-Bio) is based on the ADDIE Model, the Theory of Constructivism, ENRICH Tool and the BSCS 5E Teaching and Learning Model. In producing this module, the ADDIE Model (Culatta 2013) is used. The model is a descriptive guideline for building effective training and performance support tools. This model is simple and concise and suitable for novice researchers. This model contains five phases namely: 1) Analysis, 2) Design, 3) Development, 4) Implementation 5) Evaluation. The writing of this article focuses more on the development phase which further explains how the elements of Tawheed are integrated in this module.

ii. Constructivism Theory

Constructivism in general is the theory of how humans learn. Constructivism is a paradigm or view which asserts that learning is an active constructive process. Based on this paradigm, students are information builders who actively construct and make subjective representations of objective realities. This new information is linked to their prior knowledge, hence mental representation is subjective (Learning Theories 2005). In other words, this theory says that humans build understanding and knowledge of the world by experiencing the matter for themselves and then thinking and reflecting on the experience. When faced with something new, this idea should be combined with the prior ideas and experiences, thus either changing the previous beliefs or classifying the new information as irrelevant and rejecting it.

Based on this theory, humans are actively creating their own knowledge. Therefore they must ask questions, explore and evaluate what is known (Educational Broadcasting Corporation 2004). This theory is applied in the classroom in a way that teachers encourage students to use active

techniques such as experimenting and solving real-world related problems to produce more knowledge. Next, students are encouraged to think and discuss what they are doing and how their understanding is changing. In this case, teachers need to bring students to understand the prior concepts and then guide them with activities to strengthen those concepts and build new knowledge.

According to Bodner (1986), Constructivism Theory states that knowledge is built in the minds of students; means students build understanding. Students search for meaning and will try to find the order in world events even without complete information. West (2016) states that according to the theory of constructivism, knowledge is applied by students through the process of adaptation and assimilation. Student experience is the basic material for building new knowledge. Thus, students' existing knowledge of religion and science helps to produce new understandings and knowledge of Tawheedic Science that will guide students to relate the Oneness of God element in their studies.

iii. ENRICH Tools

Saidi Zain et al. (2016) in his study lists six steps to facilitate the process of Islamization of Science textbooks more systematically, called the ENRICH Tools. The steps in ENRICH Tool are Eliminate, Nourish, Readapt, Infuse, Create and Harmonize. The first phase is Eliminate contains the steps to remove non-Islamic concepts that are contrary to Tawheed, al-Qur'an and As-Sunnah; content that glorifies Western scholars, history and civilization, non-Islamic content as well as Western elements. The second step is Nourish, which linked concepts, theories, laws and so on with the Oneness and the Greatness of Allah SWT, include the name of Allah, linking the verses of the Qur'an and Sunnah and emphasising about the Oneness of Allah SWT and rejecting the element of *shirk* (polytheist) and atheists (no Gods).

The third step is Readapt which re-adjusts

the content to be in line with the concept of Tawheed and Islam. The steps are to rename the concept / name with a more universal name as well as replace Western content with Islamic, Asian or local content. Next is the Infuse step, in which contents that glorify Islamic scholars, history and civilization are included. The content related to Islam or values such as morals and prayers and terms related to the Qur'an are included.

The Create step on the other hand emphasizes on the integration of elements of *dhikr* (remembrance), *fikr* (thinking), *Shukr* (gratitude) or called DFS Box (*Dhikr; Fikr; Shukr*). The last step is Harmonize is to ensure harmonious content from the theoretical and application aspects as well as holistic. It also needs to be harmonious in terms of content arrangement and format. In general, the ENRICH tool provides organized and systematic steps to facilitate the process of integration on any subject.

iv. 5E Inquiry Instructional Model

Instructional Model is important to produce teaching methods based on learning theory by providing the steps that need to be followed by educators when delivering lessons (Nor Mazliana 2016). In producing the I-Bio Module, researchers used the BSCS 5E Instructional Model by Bybee et al. (2006). This model contains five phases, namely engagement, exploration, explanation, explanation and evaluation. This model helps to build learning skills in stages which in turn is able to encourage thinking skills in students. This is important so that the belief in God can be applied deeply in students and indirectly cultivate students' interest in Biology subjects.

Methodology

The I-Bio module for Cell Units was developed

using Microsoft Power Point software. This module contains four topics. All these topics are explained based on the five steps in the 5E Inquiry Model, namely Engage, Explore, Explain, Elaborate and Evaluate. This module also applies elements of information and communication technology (ICT) by including videos, games and simulations to explain the concept. The element of integration is incorporated by inserting Qur'anic verses as well as statements and questions so that students can relate the Biological concepts they learned to the Majesty of Allah S.W.T. as the Creator.

The completed module were be tested for implementation in schools for three weeks. A total of 24 Form 4 pure science students at a State Religious Secondary School (SMAN) in Temerloh district were involved as the study sample. The study sample was chosen through purposive sampling. The sample of students was selected because it meets the conditions determined by the researcher such as having a foundation in religious learning, is a student of pure science class and has studied the chapters used in this module. Students are given a hardcopy copy of the module to read. In addition, a softcopy in pdf format is also given to students through the Whatsapp application. Students' views on the integration of this module are obtained through open-ended questions. Student responses are arranged according to text and analyzed according to keywords to form a theme.

Results and Discussion

A. I-Bio Module

This module contains four topics from the Cell Unit from the Form 4 Biology syllabus. The topics contained in this module are described in Table 1.

Table 1: Titles in I-Bio Module

No.	Cell Unit
Topic 1	Cell Structure and Organization
Topic 2	Movement of Materials Across Plasma Membranes

Topic 3 Chemical Composition of Cells

Topic 4 Pembahagian Sel

Topic 1 Struktur dan Organisasi Sel

This module contains 64 pages including the cover and developed in Malay language using Microsoft PowerPoint software. Figure 1 shows the module front cover photo and module

indicators. The module indicators contain several icons to make it easier for students to understand the content and make the module more interesting and interactive.



Figure 1: Front cover and I-Bio Module indicators

This article focuses on how elements of integration are included in this module based on the first topic that is the cell structure and organization. Two objectives are presented for this topic, namely: 1) Learning about cells, organelles and their functions, and 2) Associating the diversity of organelles and cells with the Power of ALLAH SWT in creating His creatures. Its content is divided into five phases based on the BSCS 5E Model (Bybee et al. 2006).

i. Engage

The Engage phase is done with the aim of attracting students, accessing prior knowledge,

connecting new topics with the prior knowledge as well as setting focus parameters and stimulating students to link ideas (Bybee et al. 2006). In this phase, students' knowledge is stimulated by questioning students' general knowledge of cell size. This question is answered by providing information related to the largest cells as well as the smallest cells. The element of integration is incorporated a little through the mosque icon which invites students to realize the greatness of Allah S.W.T who makes cells in various forms. This phase ends with the question of what is in the cell and how it helps the cell to carry out the life process (Figure 2).

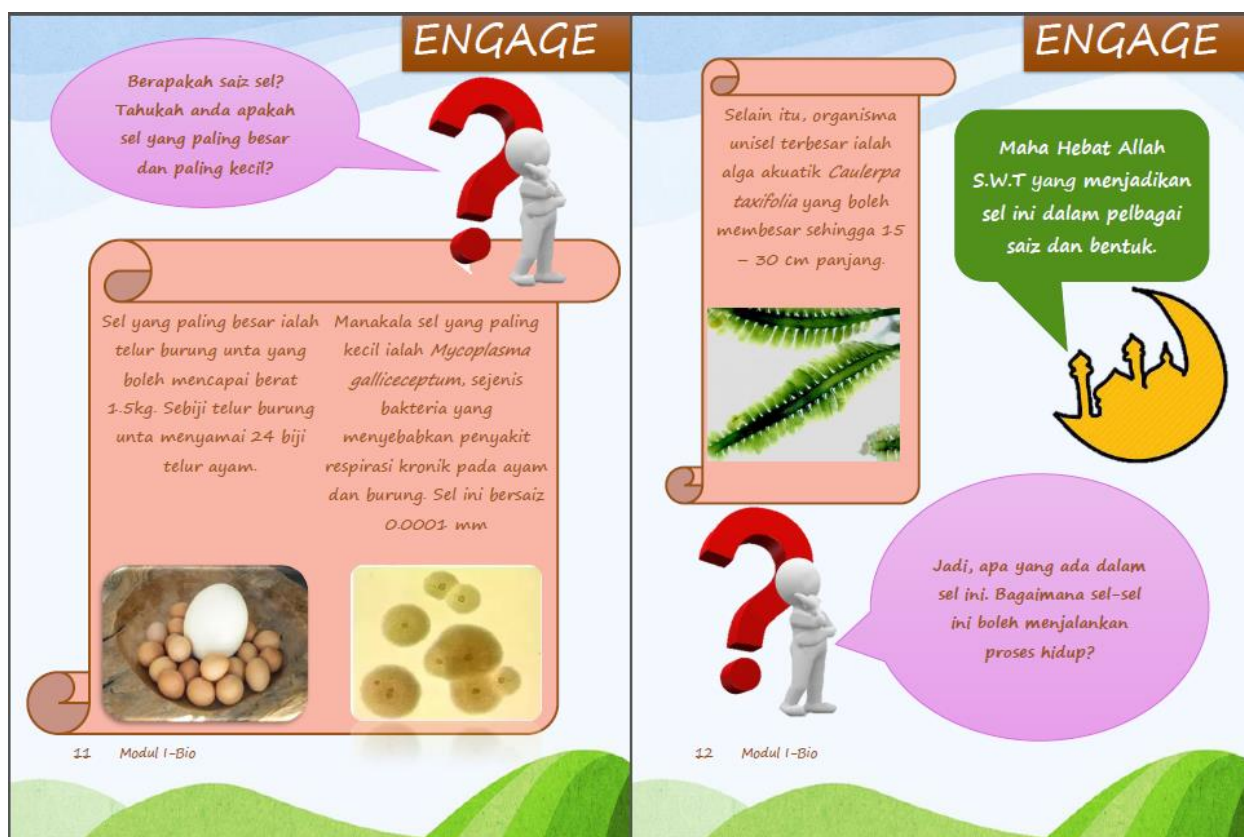


Figure 2: Engage Phase

ii. Explore

To answer the question in the Engage Phase, some information is provided through an icons about a mini-organs called the organelles in a cell. Then, students were asked to list the organelles in the cell they knew in the circle map provided (Figure 3). Next, a computer game is introduced to allow students to learn about organelles in cells in a more interactive way that can be accessed by simply clicking on the PDF version of the Module or copying the specified URL. In this game, some missions have to be done by the students. The first activity is to shoot the organelles to get information and answer some questions about the organelles in the cell. The purpose of this mission

is to obtain information to defeat Dr. Vial, the villain in this game. Scores are also given for quiz questions that are answered accurately. For the second mission, students are asked to shoot the correct organelles based on the instructions given. At the end of this mission, students are asked to go to the 'base' to allow their rockets to be taken out of the cell by 'exocytosis' (to be studied in the next topic). Through this activity, students can learn knowledge related to organelles in a more interactive and interesting way. At the end of this activity, students are asked to submit their successful marks. This way, teachers can access student achievement.

Rajah 3: Fasa *Explore*

According to Bybee et al. (2006), the explore phase aims to provide the experience of exploring new concepts and skills, asking and investigating students' experiences, evaluating their thoughts as well as creating relationships and understanding. The game activity allows students to explore knowledge related to organelles in a more interactive and interesting way. The purpose of this game is to provide students with a deep knowledge and understanding related to cells and organelles to enable them to think and relate themselves to the majesty of God the Almighty Creator in creating organelles in cells.

iii. *Explain*

Next, the Explain Phase aims to connect prior knowledge with new discoveries, convey new understandings as well as link the use of informal language to formal language (Bybee et al. 2006). In this phase, students' knowledge of cells is

further developed by explaining how a groups of cells combine to form tissues, organs, systems, and then form a complete organism. Here, a few elements of analogy are included by describing the cell as a factory and the organelles in the cell are likened to the equipment in this factory. This analogy will be seen more clearly by students in Topic 3: Chemical Composition in Cells, specifically related to the production of extracellular enzymes.

This section is accompanied by a video explaining the cell organization (Figure 4). This video also gives an analogy that the human body is likened to a city. To produce buildings in a city, millions of bricks are used to build buildings. In this context, cells can be likened to bricks. This analogy is able to relate abstract knowledge to something concrete that they can imagine that are bricks and buildings.

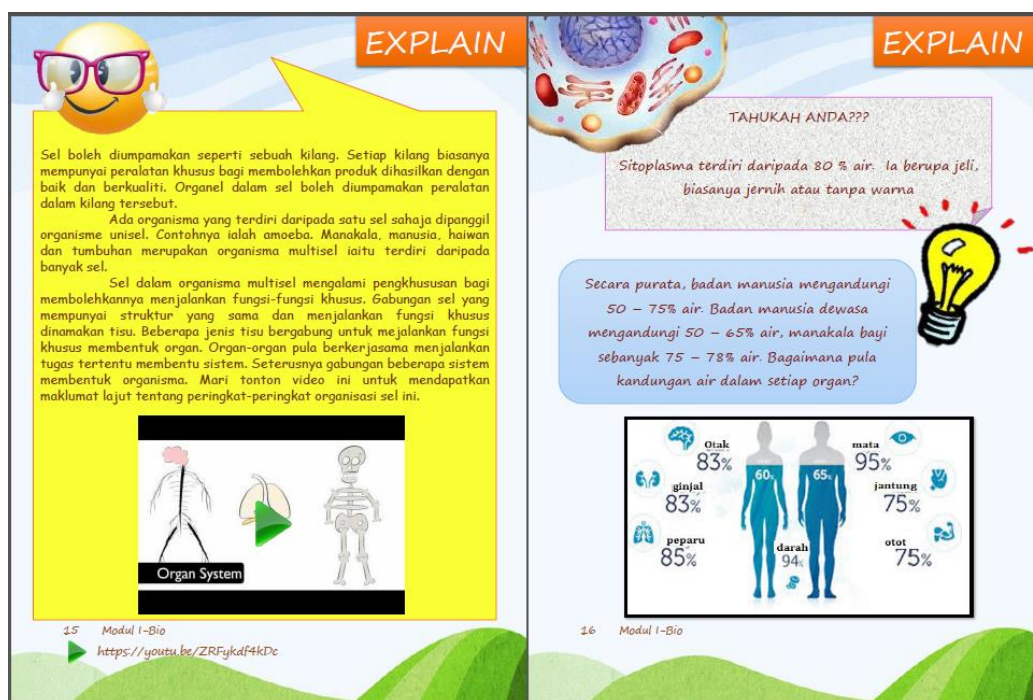


Figure 4: Engage Phase

The next part informs about the jelly-shaped cytoplasm consisting of 80% water. The human body also contains 50 - 75% water. An infographic is included to explain the composition of water in each organ (Figure 4). This information is to link with information that there is a verse of the Qur'an which states that Allah created life from water. Allah S.W.T stated in Surah Al-Anbiya verse 30 which means:

*"Have those who disbelieved not considered that the heavens and the earth were a joined entity, and We separated them and **made from water every living thing**? Then will they not believe??"*

Qur'an (21:30)

This is something amazing because how the Qur'an that was revealed more than 1400 years ago can explain various facts of modern science. This proves the truth of the Qur'an and glorifies Allah S.W.T as the creator. This way, the element of integration can be applied in students.

iv. Elaborate

The Elaborate phase aims to enable students to apply new learning to new or similar situations, explain concepts explored and impart new knowledge in formal language (Bybee et al., 2006). In this phase, students are given a computer simulation to see the comparison of size from coffee beans to atoms (Figure 5). This way, students can think and imagine the size differences between cells and organelles in them. This can indirectly lead to the realization that Allah S.W.T not only created cells and organelles that have such a complex function, but also in such a small size. The element of integration is included with the question of who created these complex cells and organelles. Students are also asked questions about what will happen if one of the organelles they learned through the game activity is damaged or unexist. Can the cells function properly? Therefore, it is hoped that this integration can bring at least the value of gratitude because they were created by Allah S.W.T in a very perfect state.



Figure 5: Elaborate Phase

v. Evaluate

According to Bybee et al. (2006), Evaluate Phase aims to assess understanding (students, peers, and teachers), demonstrate understanding of new concepts through observation or open response, apply in problem situations as well as show evidence of achievement. Through this module, student understanding is accessed through crossword puzzles. The questions in this crossword puzzle are related to the topics that have been studied (Figure 6).

At the end of this section, a little conclusion is provided. Students are reminded that while in lower secondary, they have learned that cells

contain only the cytoplasm, nucleus and plasma membrane. In form 4, they learned that in the cytoplasm, there are many more organelles that perform important functions in the cell. Therefore, the more they learn about cells, the deeper their knowledge of the complex processes that take place in cells. Indirectly, this can make them realize that this all shows how great ALLAH SWT created His creatures. From the largest stars and planets to the smallest atoms, each of these things was carefully created by ALLAH SWT. Thus, students can realize that their knowledge can be enhanced by studying and seeing His power over His created beings and in turn increase their faith in ALLAH SWT.

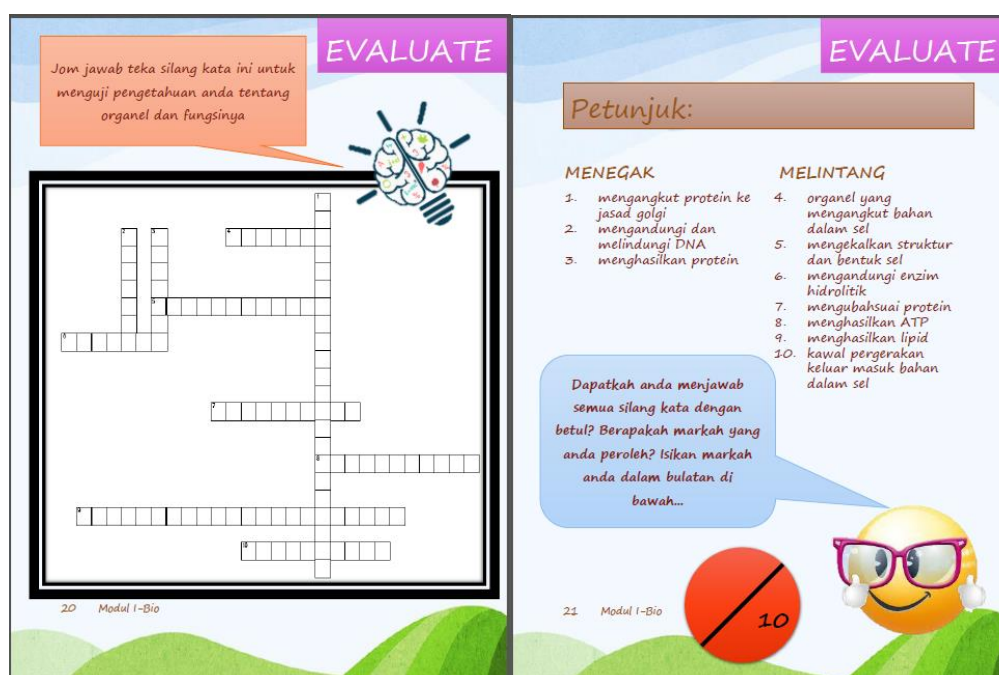


Figure 6: Crossword puzzles that are included in the Evaluate phase

B. Student Views

Students generally like if the teacher relates the element of Tawheed to the topic being taught. They like if the teacher associates the power of Allah S.W.T., inserts the verses of the Qur'an or Hadith as well as the moral values such as gratitude while teaching. They also feel that learning will be more meaningful, their interest in the subject of Biology also increases besides making it easier for them to understand the concept of Biology. This finding is in line with the findings (Normaya Md Zamri, & Iksan 2016) that teachers agree the application of the element of Tawheed provides benefits in teaching science in schools.

The findings from open-ended questions found that respondents agreed with the integration of the elements of Tawheed with Biology. They stated that this integration is interesting, fun and unique as stated by P14 respondents; "The integration of monotheistic elements in Biological Education is a fun thing because this is not carried out by any teacher". This matter is supported by respondents P1, P12 and P19. Moreover, they feel that this integration will make it easier for them to understand the concepts of Biology and religion at the same time. Furthermore, the respondents also

stated that this integration will educate them spiritually, increase their faith and piety and bring them closer to Allah S.W.T. who created this universe and gave birth to gratitude in themselves. Respondents also stated that through this integration, they will appreciate the power of God and understand the contents of the Qur'an as stated by the P10 respondent; "The integration of the elements of Tawheed in Biology education is very important because students can understand about the power of God and the truth of the Qur'an". All of this feedback shows that students give a positive response to the development of a module that integrates the elements of Tawheed in Biology.

Conclusion

The development of this module is an effort to help teachers and students in integrating the elements of Tawheed, especially in Biology Education as well as to improve the attitudes and practices of students' Tawheedic science and strengthen their belief in matters of faith. The implication of this study is that the use of Tawheedic Science Module is able to attract students in learning Biology as well as make Biology learning more meaningful. Therefore, the

learning of Science that integrates Tawheed needs to be further developed so that all Muslim students can benefit.

ACKNOWLEDGEMENTS

This research was partially supported by Faculty of Education, Universiti Kebangsaan Malaysia Fund under the project FRGS-APRS/1/2017/SS109/UKM/03

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