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# A Review on the Integrated Islam and Science Teaching Model in Malaysia

## Sorotan Terhadap Integrasi Model Pengajaran Islam dan Sains di Malaysia

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## ABSTRAK

Satu tinjauan terhadap model-model integrasi antara sains dan Islam perlu dikaji untuk melihat aspek-aspek yang penting dalam membina model pengajaran Islam dan sains bersepadu bagi menghadapi era IR 4.0. Empat model telah dipilih untuk kajian ini: Model Sains Tauhidik, Model Saintis Muslim, Model Konstruktivisme Bersepadu, dan Model Ulul Albab. Tiga aspek telah dikaji daripada empat model iaitu: 1) Tujuan pembinaan model 2) sumber rujukan dan 3) aspek kognitif yang terlibat. Penyelidikan ini menggunakan kaedah kualitatif melalui pendekatan menganalisis bahan perpustakaan. Dapatan kajian menunjukkan keempat-empat model itu bertujuan untuk membangunkan akidah melalui pembelajaran saintifik dan al-Quran dianggap sebagai sumber ilmu bagi keempat-empat model tersebut. Kajian ini juga telah mengenal pasti aspek kognitif utama yang diperlukan untuk pendekatan pendidikan yang mengintegrasikan sains dan Islam, iaitu *tadabbur* (kontemplasi), *ibrah* (pelajaran), dan refleksi, di samping aspek kognitif konvensional yang lain, seperti berinovasi dan pemikiran kreatif. Ciri-ciri ini boleh dijadikan sebagai rujukan untuk menghasilkan taksonomi kurikulum Islam dan sains bersepadu yang menyeluruh yang penting untuk pembangunan insan yang holistik pada era baharu ini.

**Kata kunci***:* Model pembelajaran integrasi, Sains dan Islam, Taksonomi Kognitif, Sains Tauhidik, Ulul Albab

## ABSTRACT

*A review of the integration models between science and Islam needs to be studied to see the fundamental aspects that are important in constructing an integrated Islam and science teaching model to face the IR 4.0 era. Four models have been reviewed: the Tawhidic Science Model, the Muslim Scientist Model, the Integrated Constructivism Model, and the Ulul Albab Model. Three aspects will be reviewed from the four models which are: 1) aim for the construction of models 2) source of knowledge and 3) cognitive aspects involved. This research uses a qualitative*

*method of analyzing library material. The findings show that all four models aim to uphold God's belief through scientific learning and al-Qur'an is considered as the source of knowledge for all four models. This study also has identified the key cognitive aspects required for an educational approach that integrates science and Islam, which are tadabbur (contemplation), ibrah(lesson), and reflection, in addition to other conventional cognitive aspects, such as innovating and creative thinking. These characteristics can be suggested to produce a comprehensive integrated Islam and science curriculum taxonomy which is important for the holistic development of human beings in this new era*

***Keywords**: Integrated teaching model, Science and Islam, Cognitive taxonomy, Tawhidic Science, Ulul Albab*

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## INTRODUCTION

According to the Islamic perspective, all bodies of knowledge humans gain are supposed to bring us closer to God and make us realize He is the creator. This is clearly stated in the first surah to be revealed by Prophet Muhammad, Surah al-Alaq, in the Holy Quran. Most of al-Quran's exegesis states that the surah is a manifestation that knowledge only comes from Allah and needs to be connected to Allah (Al-Sya'rawi, 2016; Quraish Shihab, 2002; Sayyid Qutb, 2002). The surah's impact is seen in the lives of religious followers, particularly during the Abbasid Caliphate (750-1258). Scholars and scientists of that time diligently documented their discoveries in various domains of knowledge, spirituality, and religion. The books that were written by prominent scientists of that time, such as Jabir Ibn Hayyan, Abu Raihan Al-Biruni, Ibn Sina, and Ibnu Haytham, show how seamlessly integrated science and the verses of Al-Quran and As-Sunnah that guide the study of science with a good moral and spiritual compass (Alias Azhar, 2017; Fuad, 1995).

However, the emergence of secularization by the West has impacted the disintegration of knowledge, especially between religion and science, in today's Muslim world. Because of that, many Islamic countries, such as Malaysia, have adopted the Western educational system as the mainstream education system (Ibrahim, 2015). Based on this dualism of education, the education system has resulted in Muslims who do not possess the integrated Islamic holistic personality. Secular influence in a nation's educational system produces a gradual loss of the society's Islamic moral and spiritual compass (Anas et al., 2013).

On top of that, the emergence of the Industrial Revolution Era 4.0 has become a challenge whereby the use of technologies can affect the holistic development of student's education. The current education that is evolving towards the demand of the industrial revolution has focused on the application of technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), and automation (Taufik, 2020). However, concerns are rising throughout educational institutions regarding students' character and spiritual development as this revolution occurs (Anwar et al., 2018; Datuk & Arifin, 2020). At the same time, this advancement in science and technology serves as an opportunity to restore the nature of Islamic education by integrating Islamic knowledge and science (Prastowo & Pambudi, 2021). Islamic education serves as a mechanism for regulating values and guiding societal progress toward a more refined moral and spiritual orientation (Taufik, 2020).

Thus, integrating religion and science is one solution to restore the glory of Muslims and Islamic education that can be aligned with the rapid industrial revolution (Prastowo & Pambudi, 2021). Not only that, this could serve as an opportunity to showcase a better model of education across countries, cultures, and religions and how the model of integrating Islamic knowledge with scientific knowledge can affect the development of a better society that is not only advanced in science and technology but also have a right moral and spiritual compass. Thus, models of reintegrating Islamic knowledge with secular knowledge, especially science, must be better understood.

Many models have been proposed in the Muslim world today that have made efforts to reintegrate scientific knowledge into Islamic roots. These models are proposed by many researchers and institutions across the world to achieve the aim of education according to the Islamic framework perspective. Models such as the Tawhidic Science Model, Muslim Scientist Model, Integrated Constructivism Model, and Ulul Albab Model are some examples that are conceptualized and implemented in Malaysia (Khalijah Salleh, 2011). However, studies that critically analyse the comparison of the features of the integration model and how they are implemented to achieve the goals of integrating science and Islam in terms of methodology and cognitive aspects have yet to be studied. Zainun et al. (2015) only compared the differences between the Ulul Albab and the Tawhidic Science Model. They needed to analyse the implementation and cognitive aspects of the model.

Thus, the main objective is to review the integration models between science and Islam to see the important aspects of constructing an integrated Islam and science teaching model for the IR 4.0 era. The three aspects that will be reviewed are: 1) aim for constructing models, 2) source of knowledge

and 3) cognitive aspects involved. This study hopes to help understand the concept of integrating science and Islam education based on proposed models.

## LITERATURE REVIEW OF INTEGRATED ISLAM AND SCIENCE TEACHING MODEL

The initial notable reform in Malaysia's pre-conference involved the implementation of a new Primary and Integrated Secondary School Curriculum (Baba et al., 2018). The revised curriculum promotes the development of Quranic reading skills and incorporates primary religious education as an additional subject alongside the existing curriculum. Later, in 1996, the National Educational Philosophy (NEP) was announced, calling for an education that further develops the potential of individuals in a holistic and integrated manner. The aim is to cultivate well-rounded, academically, spiritually, emotionally, and physically well-rounded and harmonious individuals in their beliefs and commitment to God (Musa, 2021). Subsequently, numerous schools and institutes of higher education have adopted various approaches that prioritize the integration of knowledge with Islamic principles. However, the integration model of science and Islamic knowledge in Malaysia is a story on its own but was triggered by the same spark by the NEP. These models focus specifically on science and how it can be integrated into Islamic values. This article focuses on four primary integrated science and Islamic knowledge models adopted in Malaysia.

### Integrated Constructivism Model

The Integrated Constructivism Model was created in response to the Integrated Education Model that Tajul Ariffin developed in 1984. The Integrated Education Model was originally a theoretical model that aimed to provide a holistic education to educate people to become God Conscious (Zainun et al., 2015). As a support to this model, Zainab et al. (2014) developed the Integrated Constructivism Model, which aims to integrate science into the Oneness of God. This model was constructed by implementing the 5E Instructional Model (Atkin & Karplus, 1962) with the Integrated Education Model that targets integrating Islamic values such as the Oneness of God with the knowledge of science-specific (Zainun et al., 2015). This model forms a cycle of five phases: engage, explore, explain, elaborate, and evaluate. These five phases in this Integrated Constructivism Model are integrated with Islamic values and principles that align with al-Qur'an and al-Sunnah, as shown in Figure 1.

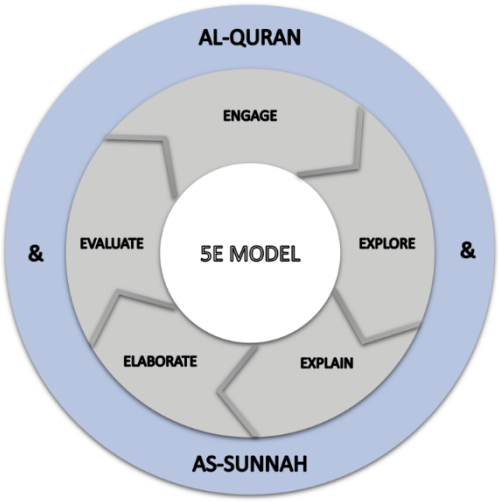


**Figure 1**: Integrated Constructivism Model by Zainab et al., (2014) adaptation from the 5E Instructional Model (Atkin & Karplus, 1962)

The module on the topic of nutrients has been incorporated into a secondary school science curriculum (Zainab et al., 2014). This instructional module emphasizes adopting all five phases of the 5E instructional model to teach the chapter on nutrients. Table 1 explains how the 5E Instructional Model and the Integrated Constructivism Model were initially implemented, as suggested by Zainab et al (2014). From Table 1, the concept of integration between Islam and science knowledge in the Integrated Constructivism Model can be seen by integrating al-Qur'an and al-Hadis sources into the topic of the syllabus in the school. Regarding the cognitive features in this model, students are encouraged to actively engage in activities and discussions, particularly during the investigating and explaining phase, which augments cognitive thinking abilities. However, the key element that stands out is reflecting and pondering over the verses of al-Qur'an, an added feature of a cognitive component that differentiates the 5E Instructional Model and the Integrated Constructivism Model.

Table 1: Application of the 5E Instructional Model in the Integrated Constructivism Model

| **Phases** | **5E Instructional Model** (Atkin & Karplus, 1962) | **Integrated Constructivism Model based on chapter Nutrition** (Zainab et al., 2014) |
|---|---|---|
| 1. Engage | A motivational period that can create curiosity and the desire to learn more. Teachers need to assess students' prior knowledge and/or identify misconceptions among students if any. | The teacher shows a video regarding a balanced diet of eating and a verse of al-Qur'an that is related to the topic such as in surah al-Baqarah verse 60. The teacher asks about the lessons the student can learn from the verse. |
| 2. Explore | Provide students with a common, concrete learning experience through inquiry-based activity or experience which encourages students to develop skills and concepts. | Students are divided into groups to have a discussion among themselves regarding questions regarding the video they just saw and the lessons from the verse of al-Qur'an. |
| 3. Explain | Enables students to describe their understanding and give questions about the concepts they have been exploring | Students in different groups discuss different questions given by the teacher and a representative from each group shares the answers with the entire class. Each answer given by the students is appreciated and corrected by the teacher if necessary. Afterward, the teacher recites and reflects on the lessons from the Quranic verse |
| 4. Elaborate | Encourage students to apply their new understanding of concepts while reinforcing new skills that develop deeper and broader understandings of the concept. | The teacher further elaborates the topic and conducts a game base learning to reinforce the understanding of the students regarding the topic. The teacher also elaborated the sunnah of the Prophet regarding manners of eating. |

| | | |
|---|---|---|
| 5. Evaluate | Teachers make assessments by observing the students as they apply new concepts and skills and looking at evidence that the students have changed or modified their thinking skills. | Teachers make a summary about the topic with the students and give a quiz to test the understanding of the students regarding the topic. Assessments are made based on the quiz that tests both understanding and appreciation towards the topic. |

## Muslim Scientist Model

This model was developed over philosophy and model called Insan Kamil, which refers to a person who achieves the ideal, perfect, and holistic form of a human and is also well-knowledgeable (Nor Hayati, 2011). This model (Figure 2a) shows some critical features of someone described as Insan Kamil, which centres around a Muslim (M). This Muslim needs to have knowledge (Il), Faith (Im), and Action (Am). By having these qualities, they portray having good manners (Ak). The arrows indicate that the process is reciprocal from the inside out, which means that a Muslim with good manners will enhance a Muslim to improve his knowledge, faith, and actions continuously.

From this philosophy model of Insan Kamil, Nor Hayati (2011) devised a specific model to answer the need to integrate Islam and scientific knowledge, termed the Muslim Scientist Model, as represented in Figure 2b. This model aims to produce students who study the phenomena of the universe and integrate them with the understanding of Allah's creation (Nor Hayati, 2011). Two additional circle layers representing Islamic Science Process Skills (K.P.S.I) and Innovation (In) have been incorporated into the original *Insan Kamil* model. According to the model, the pinnacle of achievement for a Muslim Scientist is reached when they can create new ideas and inventions while adhering to the principles of Islam, possessing accurate information, strong faith, and righteous acts in accordance with the Islamic worldview. The inward-outward arrows signify the reciprocal nature of the innovation undertaken by devout Muslims, which should strengthen their commitment to Islam and elevate their understanding, belief, and conduct.

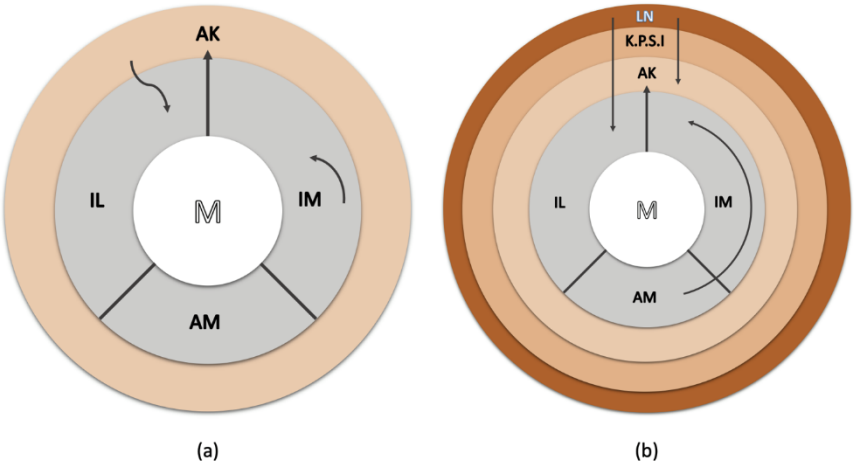


Figure 2: (a) Insan Kamil Model (b) Muslim Scientist Model

Nor Hayati (2011) comprehensively explains the methods for attaining the Muslim Scientist model in her work. An essential component is the instructional module on Islamic natural scientific disciplines. The teacher must teach students three Islamic Natural Science Teaching modules: Knowledge and Faith, Creative and Innovative, and Global (Nor Hayati, 2011). Knowledge and Faith emphasize teaching the students correct thinking skills that align with the remembrance of God and scientific process skills. The application in educating this module is based on integrating *aqli* knowledge and *naqli* knowledge and is guided by revelation as the primary source. Every learner is required to progress through the stages in this module, which includes Witness Tawhid (ST), Know Tawhid (KT), Understand Tawhid (FT), and Believe Tawheed (YT).

Second, the Creative and Innovative module aims to instil creative and innovative skills to solve problems in humankind and the Islamic ummah or community specifically. This skill is taught gradually by going through these phases in the module, beginning with Realizing Inner Potential, Realize Problems, Information Gathering, Inner Faith, and Problem Solving. This module comes after Islamic Natural Science Teaching–Knowledge and Faith because students will be taught to be critical, analytical, creative, and innovative, guided by God's revelation (Nor Hayati, 2011).

Third, Global is a module that uses a teaching method to master conventional (*aqli)* knowledge based on revealed (*naqli)* knowledge. The module integrates skills and knowledge taught in the Knowledge and Faith

module and the Creative and Innovative module in Islamic Natural Science Teaching. This ensures that faith in God can be instilled in the students' hearts while enhancing the thinking skills that combine remembrance (zikr) and the ability to innovate to solve humankind's problems(Nor Hayati, 2011).

Besides the teaching modules, other aspects that can help accomplish the model framework include the education system. The education system to develop Muslim scientists requires a teacher who can guide students in this module (Pn) (Nor Hayati, 2011). These students are prepared to seek the truth (X), teaching strategies that nurture a balanced human being (S1- S10), and the presence of a support system such as the school institution(S), family (K), community (Ms) and the country (N) at large that support this framework model. The whole concept of the education system is shown in Figure 3.

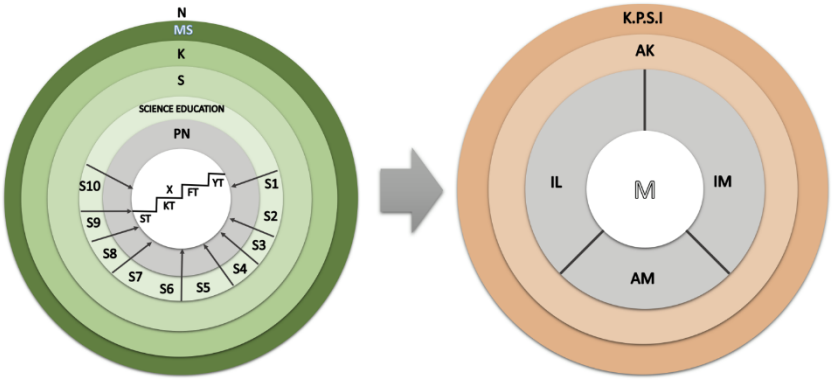


Figure 3: The Muslim Scientist Model Curriculum

The Muslim Scientist Model offers a promising approach to educating students in developing a comprehensive cognitive framework that integrates Islamic principles with scientific knowledge. Unfortunately, this teaching method is still theoretical and hasn't been implemented in educational institutions or schools. The methodology proposed in this module by Nor Hayati (2011) shows how cognitive aspects are used in the method, with an added feature that emphasizes tawhid first before learning scientific thinking skills. The ability to innovate is considered the highest level of cognitive aspect achieved in this model. However, the innovation referred to in this model must be aligned with the Islamic perspective and can strengthen one's knowledge, faith, and characteristics.

## Tawhidic Science Model

The Tawhidic science model (figure 4) is a model that focuses on science that is centered on the concepts of Tawhid and God as the Creator. Thus, all scientific activities done by people should abide by Islamic law (Khalijah Salleh & Othman, 2009). This is done by making al-Qur'an and Sunnah the primary sources of knowledge for guiding the correct worldview in science (Hazwani et al., 2017). According to Othman (2014), Tawhidic Science refers to the knowledge of science that explains the phenomena of nature around us and the values and meaning of the phenomena of nature we observe. Tawhidic Science will give values and meaning to the relationship between nature and the Creator so that human beings develop a sense of responsibility in administrating and caring for God's creation.

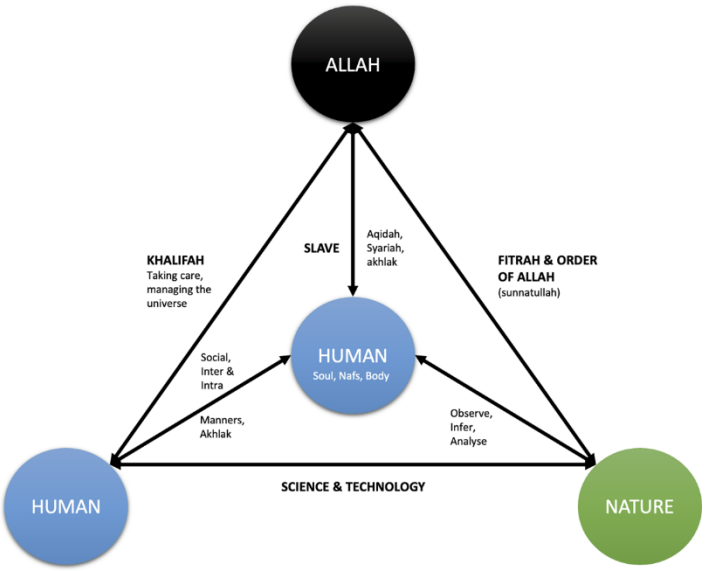


Figure 4: Tawhidic Science Model

The conceptual framework model of Tawhidic Science was first proposed in 2009 by Yusuf Othman and Khalijah Salleh to integrate scientific knowledge into the Islamic worldview. Based on Khalijah Salleh (2011), what differentiates the paradigm of Tawhidic science and secular science is that Tawhidic Science acknowledges three entities: God as the creator, the universe, and human beings as His creation, while secular science only acknowledges humans and the universe alone. The acknowledgment of God in the science framework differentiates the

paradigm of Tawhidic Science and secular science, which can be shown more clearly in Figure 5.

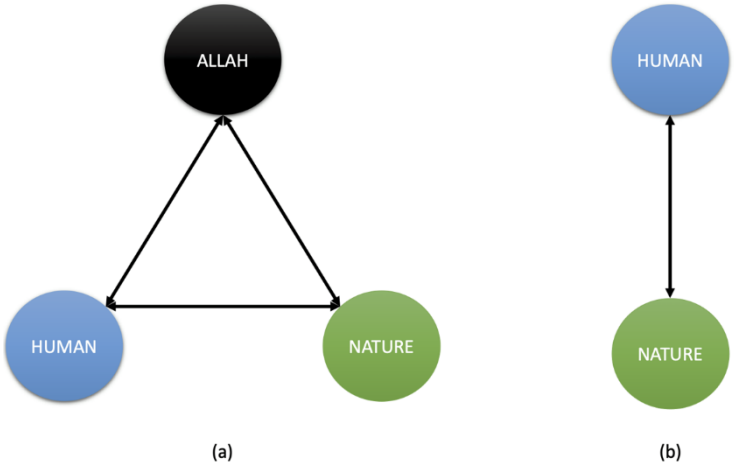


Figure 5: (a) Tawhidic Paradigm (b) Secular Science paradigm

Through this paradigm conceptualization of Tawhidic Science, a model consists of the three entities mentioned: God, humans, and nature. From these three entities, four relations can be deducted based on the model, namely (i) God with men, (ii) human beings with nature, (iii) nature with God, and (iv) human beings with human beings, that can be illustrated in Figure 5. The relationship between God and human beings is that human beings act as servants of God. However, humans act as successors (Khalifah) to God when referring to nature. As servants of God, human beings should obey every order and command of Allah (Othman, 2014). Meanwhile, as the successor of God, human beings are responsible for administrating all the affairs so that the system governing life will be balanced and just towards all humankind and other creations of God (Khalijah Salleh, 2011).

The Tawhidic Science Model has been implemented in several ways. For example, one of the institutes of higher learning in Malaysia has implemented this model as a science subject course students can enrol in. It covers several topics, such as society's view towards contemporary science, why the world needs Tawhidic Science, and the interaction between al-Quranic energy and material (Rahman et al., 2012). The model portrays a holistic view of how Islam perceives nature by identifying the roles of three main entities: Allah, human beings, and nature. This holistic approach differentiates the Islamic perspective from the conventional Western

perspective. Like this model, science built upon the principle of Tawhid needs to have a holistic way of thinking and not a segmented way of thinking (Khalijah Salleh, 2011). The model successfully developed many forms of programs and university courses with positive feedback assessment among participants (Abdul Rahman et al., 2012; Mustafa & Yakob, 2020; Sharina Hanifah et al., 2017). All the types of forms that this model manifests are consistent in that it would refer to al-Qur'an and Sunnah as the primary source of Islamic knowledge when integrating it with scientific knowledge. There are also features of cognitive aspects that are highlighted in the implementation of this model. For example, a few cognitive aspects are emphasized in this model, such as reflection on al-Qur'an, observation, analysis, and inferring.

## Ulul Albab Model

The model of Ulul Albab is based on al-Qur'an, where the word Ulul Albab has been repeated 16 times in al-Qur'an. One related to the observation of nature is from Surah Ali Imran, verses 190-194. Ulul Albab is generally defined by experts of Quranic exegesis as someone who is well-mannered and has clear intellect, allowing them to discern between good and wrong (Hamka, 2015; Ibn Kathir, 2017). The concept of Ulul Albab was a transformational idea in the Malaysian education system that was suggested by Idris Jusoh in 1996. He defines Ulul Albab as an individual who can reflect on whatever they observe with a strong Quran foundation and faith in Allah (Jasmi et al., 2022). Thus, al-Qur'an becomes the central pillar of developing the generation of Ulul Albab.

A model regarding the concept of Ulul Albab was developed by Hassan, (2010) that is based on the idea of Ulul Albab in al-Qur'an and integrates what he calls the 'Book of Nature' with the 'Book of Revelation' (Zainun et al., 2015) The model is designed to build a generation with the qualities of an Ulul Albab, as mentioned 16 times in al-Qur'an, and has been thematically divided into 9 themes (Zainun et al., 2015). This model is suggested to be applied in the education system that puts al-Qur'an as the primary reference source to understand a natural phenomenon in the universe (Faszly Rahim et al., 2015).

Three main components are required to develop an Ulul Albab generation based on the model shown in Figure 6, namely, (i) Quranic, (ii) Ijtihadic, and (iii) Encyclopaedic. Quranic refers to memorizing the whole Quran and understanding its meaning. This is based on the BIFFAS concept, which refers to reading (*baca*), remembering (*ingat*), understanding (*faham*), pondering (*fikir*), action (*amal*), and spreading (*sebar*). Ijtihadic refers to the ability to give opinions in solving a problem and maximizing

high order thinking skills innovatively and creatively. At the same time, encyclopaedic refers to the ability to master different bodies of knowledge (multi-discipline) and languages (multi-lingual) that can be a source of reference to people around them Nik Md Saiful Azizi & Rabi'atul Athirah, 2020).

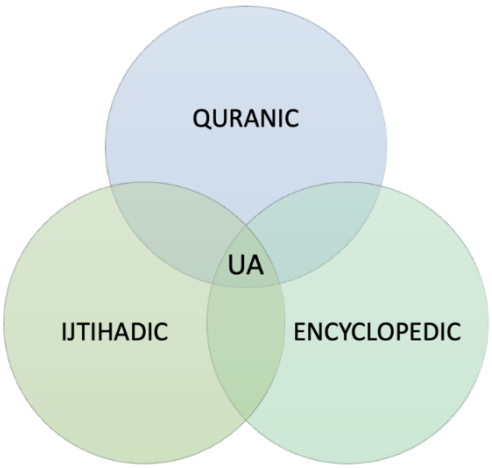


Figure 6: Ulul Albab (UA) Model

Jasmi et al. (2022) further elaborates on the characteristics of the Ulul Albab generation, which consist of reflection (*tadabbur*), revival (*ihya'*), and taking lessons (*ibrah).* An Ulul Albab generation is a generation that has the habit of always doing *tadabbur* and acting toward the verses of al-Qur'an. Meanwhile*, ihya'* means that the students are exposed to the body of knowledge revived by the past Islamic scientist scholars that are the unsung heroes of the body of knowledge in the current conventional syllabus the students are learning. *Ibrah*, on the other hand, refers to taking lessons from stories and events mentioned in al-Qur'an and linking them to the student's personal life.

## RESEARCH METHODOLOGY

This article adopts qualitative methods by first utilizing library materials such as books, journals, articles and other relevant sources relevant to its objectives. The library materials are then analysed and critically reviewed to

observe the comparison between proposed and implemented models. This methodology is chosen as it allows for a critical and comprehensive assessment of the integration of science and Islam models.

This study focuses only on four samples of integration models from Malaysia because many models and implementations related to integrating science knowledge and Islam are emerging and most established in this country compared to neighbouring countries. Thus, all documents relating to the four models are analysed for critical review.

## FINDINGS & DISCUSSION

All four models possess numerous shared characteristics that could serve as the foundational principles for developing a unified framework that integrates Islamic teachings with scientific comprehension in this industrial revolution 4.0. A critical review of the comparison between the four models on the four aspects as tabled in Table 2 is discussed.

Table 2: Comparison of The Models That Integrate Science and Islam

| Model/Aspects | Aim/Goal | Source of Knowledge | Cognitive aspects |
|---|---|---|---|
| Integrated Constructivism Model | Integrate science to the Oneness of God | Al-Quran and Sunnah | • *Tadabbur*<br>• Explaining<br>• Exploring<br>• Evaluating<br>• Elaborate |
| Muslim Scientist Model | Integrates the phenomena of the universe with the creation of Allah | Al-Quran | • Innovation<br>• Problem solving<br>• Critical Analysis<br>• Creative |
| Tawhidic Science Model | Subject of science that is centred on the concepts of Tawhid and God as the Creator | Al-Quran and Sunnah | • *Tadabbur*<br>• Critical thinking<br>• Creative<br>• Innovative<br>• Summarize<br>• Reflecting |

| | | | |
|---|---|---|---|
| Ulul Albab Model | Building a generation that has the qualities of an Ulul Albab as mentioned in al-Qur'an | Al-Quran | • *Tadabbur*<br>• *Ihya'*<br>• *Ibrah*<br>• Problem Solving<br>• Innovating<br>• *Tadabbur* |

## Aim of Models

The models share a common aim in constructing the model, which is to uphold God's belief through scientific learning. Integrating science and Islam through these models aims to glorify Allah by acquiring knowledge and comprehending the scientific phenomena surrounding us. Although the aim of the Ulul Albab Model does not clearly state the Oneness of Allah through science, one of the characteristics of an Ulul Albab generation is those who remember Allah while observing the creations of Allah as stated in surah Ali Imran verses 190 and 191. The principle of upholding tawhid is fundamental to Islamic understanding when integrating scientific knowledge and Islamic knowledge, as noted by Mehdi Ghouzlani. He emphasized that the study of nature should be recommended to find God's patterns in the universe and utilize them for the realization of the benefit of humanity (Prastowo & Pambudi, 2021). Thus, basing the integration model towards tawhid will close the gap of dualism education and use scientific knowledge to introduce the concept of tawhid as proposed by each model. Table 2 presents a concise overview of each model's key features of combining Islam and scientific knowledge in model development.

## Source of Knowledge

al-Qur'an is the source of guidance in building the integration model between science and Islam. The cognitive process involved in approaching al-Qur'an through these models is to reflect (*tadabbur)* deeply, especially towards the verses of al-Qur'an, and see how the verses give values and guidance in observing, studying, and analyzing nature around. Past Islamic scholars such as Ibn 'Atiyyah, Al-Zamakhsyari, and Ibn Kathir define *tadabbur* as a process of understanding, examining, observing, and appreciating the meanings of the Quranic verse and contemplating the signs in it from the depth of the heart (Manaf et al., 2017). Observing nature while reflecting on the verses of al-Qur'an can enhance one's appreciation of God. The cognitive aspect is commonly utilized in integration approaches, including nature camp modules incorporating a positive feedback

assessment to foster an appreciation for tawhid (Zanaton et al., 2015). In a way, the reflection of al-Qur'an is a cognitive aspect crucial in educating students on the integration between Islam and scientific knowledge.

Integrating Islam and science knowledge by instilling faith in Allah can happen in many models of integration that have been discussed by previous researchers, such as Fogarty (1991) and Gumiandari & Hasanah (2019). The four models reviewed in this study apply the integrated model as a method of integration. The integrated model is a model that presents an interdisciplinary topic that rearranges overlapping topics and gives rise to new patterns and designs (Gumiandari & Hasanah, 2019). These four models abide by the definition of relation. For example, the Integrated Constructivism Model suggests that al-Qur'an and sunnah should be integrated alongside the study of science (Zainab et al., 2014). At the same time, the Muslim Scientist Model instils belief and has a strong conviction in Tawhid by integrating aqli and *naqli* knowledge. For Tawhidic Science, most implementation is executed by integrating science and Islam simultaneously (Zolkofli et al., 2014). Meanwhile, Ulul Albab Model, as shown in Figure 7, Quranic aspects are infused in the knowledge and skills to become a generation of Ulul Albab. Thus, all models of integration between science and Islam suggest a model that infuses the learning of science and Islam from the beginning through the integration model of relation.

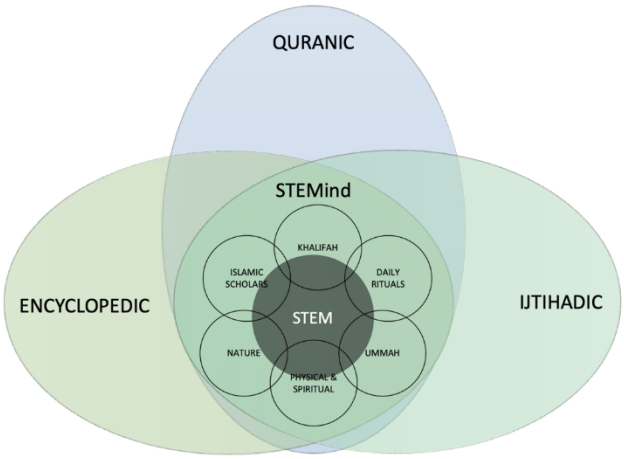


Figure 7: Module STEMind by Faszly Rahim et al. (2015)

## Cognitive Aspects

Regarding the cognitive aspects involved in the study of integration between Islam and science, this study can summarize that a few emerging cognitive aspects need to be nurtured if a model of integrating scientific knowledge and Islam wants to be applied based on the four models that have been studied. Among them is the cognitive ability to reflect deeply on al-Qur'an. This involves relating verses of al-Qur'an to any scientific knowledge and extracting guidance from it (Manaf et al., 2017). *Ibrah,* or taking lessons, is also an emerging cognitive aspect. *Ibrah* is taking a verse from al-Qur'an by reflecting on understanding it and linking it with one's life experience (Jasmi et al., 2022). Reflection through journaling was also a critical emerging cognitive aspect that helped the Observe Nature Camp participants better understand the integration between scientific knowledge and Islam (Zanaton et al., 2015). Besides these three emerging cognitive aspects, conventional cognitive aspects such as explaining, elaborating, innovating, creative thinking, critical thinking, summarizing, and problem-solving are also involved in integrating scientific knowledge and Islam. However, these cognitive aspects are seen repeatedly adapted and integrated, which is suitable in the Islamic perspective in applying those cognitive aspects (Faszly Rahim et al., 2015; Nik Md Saiful Azizi & Rabi'atul Athirah, 2020; Nor Hayati, 2011). However, these models do not show the taxonomical arrangements for these cognitive aspects in learning the integration of scientific knowledge and Islam from low-order to high-order thinking skills. These cognitive aspects are unique and can be designed to construct a taxonomy level of cognitive aspects, particularly regarding integrating Islam and science knowledge based on these four models reviewed in this study.

## CONCLUSION

The review shows that efforts have been made in the past since the secularization of knowledge in numerous ways, especially regarding the integration between Islam and science. Different models have been proposed and executed in educational institutions, modules, programs, and course subjects. The characteristics of a model that integrates Islam and science knowledge differ from those of a secular and conservative understanding of science. This is shown by having a clear objective that wants to benefit science and help it appreciate the Oneness of God better and by taking al-Qur'an and sunnah as the primary sources of guidance in understanding science. Regarding the cognitive aspects, the models portray a distinct characteristic of cognitive implementation compared to secular science

teaching. Three emerging cognitive aspects were identified: *tadabbur, ibrah,* and reflection.

In contrast, conventional cognitive aspects such as innovating, creative thinking, and problem-solving have been adapted to suit the Islamic perspective. These features extracted from the four models can be a guideline for building a better educational curriculum in the advancement of science and technology of the current industrial revolution while holding on to the correct principles, values, and moral compass from religion. Improvements and further implementation of the models on a larger scale need to be made to narrow the gap in the effort to secularize the knowledge of science to Islam. One improvement that can be suggested is the design of a cognitive taxonomy level specifically for studying the integration between Islam and science.

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## CONFLICT OF INTEREST STATEMENT

The researchers hereby declare that there are no conflicts of interest in relation to this research or the writing of this article. All data, findings, and interpretations presented are free from any external influence, including financial, personal, or professional, that could compromise the integrity and objectivity of the research outcomes.

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