

Teachers' Concerns, Perception and Acceptance toward Tauhidic Science Education

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I. Introduction

There can never be civilisation if, within the society, the masses are not educated and developed. Discussion on tauhidic science can be conceptual and philosophical. However such discussions have to be translated into the behaviour of not just the scientists themselves but also the masses as well. This means that the discipline of tauhidic science needs to be taught in schools. Hence tauhidic science education is about the implementation of the teaching and learning of tauhidic science in the classroom.

Islamic schools in Malaysia offer a curriculum consisting of religious and regular subjects like languages, science, and humanities. Currently science and religion, whether in Islamic schools or regular schools, have been taught separately. This is due to the tradition of science that recognises only that which is measurable and repeatable. Knowingly or unknowingly, people just accept that science and religion are separate fields. This also includes all institutions within the system of education in Malaysia. However, among the Muslim scientists there have already been discussions philosophically and conceptually on Islamic Science (al Farouqi, Syed Naguib, Othman Bakar).

In Islam, science and religion are linked in an integrated manner. Such ideas have attracted authorities in some private religious institutions who would like to see that the teaching and learning of science and religion is done in an integrated manner and aligned to the holistic understanding of events, phenomena, and outcome. There are Islamic schools at preschool through secondary levels in Malaysia that have started to offer science lessons. Yayasan Pendidikan Takmir, Kajang, Malaysia is one such example. This school has been one of the pioneer schools interested in integrating science and religion. This is to better position ideas, whether religious or scientific, such that they can help enhance the appreciation of science from the perspective of religion and vice versa. How should this be done? In other words, how can tauhidic science education be implemented in the classroom?

Both teachers and pupils from religious schools have already been exposed to the concept of the oneness of God or *tauhid*. In these schools, there are teachers who have

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a background in Islamic knowledge but have been asked to teach science. In the case of Yayasan Takmir, the school has invited experts in science and religion to help enhance the scientific knowledge and understanding of these religious teachers. They have also been asked to explain how science and religion can be integrated and how the understanding of religion can provide a better appreciation of science. It is probably not just for an appreciation of science but also to realise the complementary nature of science and Islamic teaching. In 2007 and 2008 the school invited the author and a few others to deliver talks on science, religion, and education with a focus on integration and approaches for practicing it in the classroom.

These science experts who have been invited to participate in such professional enhancement development efforts have also undertaken the task of developing ideas as to how to implement tauhidic science education in a structured and student-centred manner. It may be possible that tauhidic science is a subject to be taught in schools in the near future. Furthermore, it is possible that there may be some science teachers who may be required to teach tauhidic science in the future. Thus there is a need to understand clearly what tauhidic science and tauhidic science education is all about.

It was this issue that became the concern of those interested in tauhidic science. It is a complex process to bring tauhidic science into the classroom. Teachers need to understand the conceptual framework of tauhidic science and tauhidic science education. They also have to know and understand what tauhidic science education is in operational terms. In other words they need to know what tauhidic science education is in relation to educational matters like educational philosophy, curriculum, methodology and delivery, teacher preparation, teaching and learning environment, research, reference materials and even policies. Scholars and experts in tauhidic science need to give a helping hand to help prepare these teachers and the education system for the implementation of tauhidic science education when the time comes. Above all, the curriculum for tauhidic science needs to be documented and approved by the Malaysian Qualifying Agency.

In order to be better prepared and organised, the author together with a few members decided to formalize the work to be done collectively as a group. Ideas, thoughts and materials on tauhidic science education had to be developed, discussed, assessed, evaluated and refined in a more coordinated, academic and systematic way. The first stage of the work was to conceptualise tauhidic science and then tauhidic science education. Then came the second stage. At this stage there was a need to determine the teachers' perception, acceptance and concerns on tauhidic science education. Only then could the research group determine what further actions are required if tauhidic science education is to be implemented in schools. Through Institute Islam Hadhari some funds (UKM-GUP-JKKBG-08-10-043) were obtained from Universiti Kebangsaan Malaysia. Work as a group on tauhidic science started in October 2008 and in December 2008 the first workshop was conducted.

II. Objectives of the Study

The objectives of the study are as follows:

1. To develop the conceptual framework of tauhidic science and tauhidic science education.
2. To determine teachers' concerns, perception, and acceptance regarding tauhidic science education.
3. To develop a strategic plan of action for the implementation of tauhidic science education.

This paper gives an initial report of selected work carried out in the first two phases by the research group. These are the tauhidic framework, done in the first phase and the findings of the initial exploratory study on teachers' perception, acceptance and concerns regarding tauhidic science and tauhidic science education done in the second phase. Work on phase three has not started yet as it is subject to the findings of the second objective.

III. Conceptual Framework (First Phase)

Tauhidic science education comprises two main concepts: tauhidic science and tauhidic science education. These concepts will be elaborated in the following section. An understanding of these concepts will help teachers to follow discussions relating to the implementation of tauhidic science teaching in the classroom. Otherwise there will be confusion as teachers may have their own individual perceptions, affecting their acceptance and concerns regarding tauhidic science education. It may therefore be problematic if and when they are called upon to teach the subject in the classrooms.

Tauhidic Science

The key concept in tauhidic science is the concept of *tauhid* which is summarized in Al-Ikhlās (112:1-4).

﴿قُلْ هُوَ اللَّهُ أَحَدٌ اللَّهُ الصَّمَدُ لَمْ يَلِدْ وَلَمْ يُولَدْ وَلَمْ يَكُنْ لَهُ كُفُوًا أَحَدٌ﴾

- (Al-Ikhlās: 112:1-4 (tr. Y. Ali)) Say: He is Allah, the One and Only; Allah, the Eternal, Absolute; He begetteth not, nor is He begotten; And there is none like unto Him.

This *surah* affirms the oneness of Allah (Name of the One God worshipped by Muslims, Christians and Jews), who neither gives birth nor was born, and states that there is none comparable to God. Thus Islam rejects any idea that assigns the attributes of Allah to anything other than Allah (Al-Maidah 5: 72 & 73).

﴿اللَّهُ لَا إِلَهَ إِلَّا هُوَ الْحَيُّ الْقَيُّومُ لَا تَأْخُذُهُ سِنَّةٌ وَلَا نَوْمٌ لَهُ مَا فِي السَّمَاوَاتِ وَمَا فِي الْأَرْضِ مَنْ ذَا الَّذِي يَشْفَعُ عِنْدَهُ إِلَّا بِإِذْنِهِ يَعْلَمُ مَا بَيْنَ أَيْدِيهِمْ وَمَا خَلْفَهُمْ وَلَا يُحِيطُونَ بِشَيْءٍ مِّنْ عِلْمِهِ إِلَّا بِمَا شَاءَ وَسِعَ كُرْسِيُّهُ السَّمَاوَاتِ وَالْأَرْضَ وَلَا يَئُودُهُ حِفْظُهُمَا وَهُوَ الْعَلِيُّ الْعَظِيمُ﴾ (2:255)

• (Al-Baqarah 2:255 (tr. Asad)) GOD - there is no deity save Him, the Ever-Living, the Self-Subsistent Fount of All Being. Neither slumber overtakes Him, nor sleep. His is all that is in the Heavens and all that is on Earth. Who is there that could intercede with Him, unless it be by His leave? He knows all that lies open before men and all that is hidden from them, whereas they cannot attain to aught of His knowledge save that which He wills [them to attain]. His eternal power overspreads the Heavens and the Earth, and their upholding wearies Him not. And He alone is truly exalted, tremendous.

﴿لَقَدْ كَفَرَ الَّذِينَ قَالُوا إِنَّ اللَّهَ هُوَ الْمَسِيحُ ابْنُ مَرْيَمَ وَقَالَ الْمَسِيحُ يَا بَنِي إِسْرَائِيلَ اعْبُدُوا اللَّهَ رَبِّي وَرَبَّكُمْ إِنَّهُ مَن يُشْرِكْ بِاللَّهِ فَقَدْ حَرَّمَ اللَّهُ عَلَيْهِ الْجَنَّةَ وَمَأْوَاهُ النَّارُ وَمَا لِلظَّالِمِينَ مِنْ أَنْصَارٍ﴾ (5:72)

﴿لَقَدْ كَفَرَ الَّذِينَ قَالُوا إِنَّ اللَّهَ ثَلَاثُ تَلَاةٍ وَمَا مِنْ إِلَهٍ إِلَّا إِلَهٌ وَاحِدٌ وَإِن لَّمْ يَنْتَهُوا عَمَّا يَقُولُونَ لَيَمَسَّنَّ الَّذِينَ كَفَرُوا مِنْهُمْ عَذَابٌ أَلِيمٌ﴾ (5:73)

(Al-Maidah 5:72 (tr. Y. Ali)) They do blaspheme who say: "(Allah) is Christ the son of Mary." But said Christ: "O Children of Israel! worship Allah, my Lord and your Lord." Whoever joins other gods with Allah,- Allah will forbid him the garden, and the Fire will be his abode. There will for the wrong-doers be no one to help.

(Al-Maidah 5:73 (tr. Y. Ali)) They do blaspheme who say: Allah is one of three in a Trinity: for there is no god except One Allah. If they desist not from their word (of blasphemy), verily a grievous penalty will befall the blasphemers among them.

The conceptual framework of tauhidic science is summarized in Figure 1.

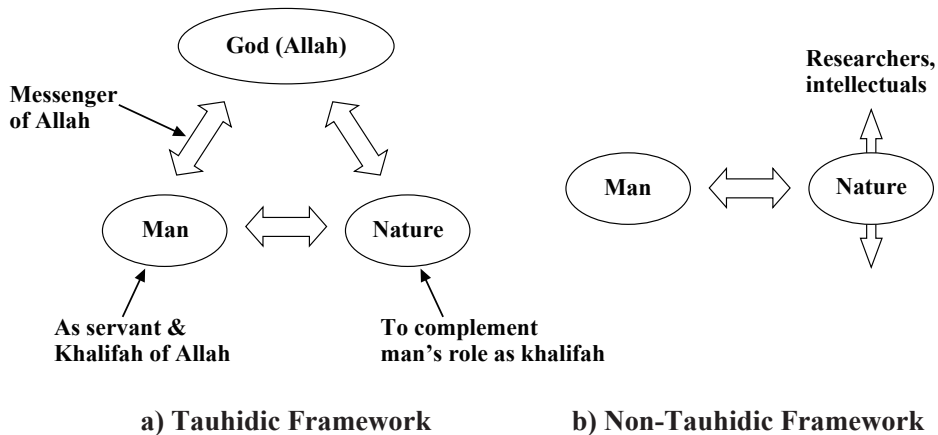


Figure 1. Entities in Tauhidic and Non-Tauhidic Frameworks

There are three basic entities in the Islamic framework or worldview. These are God the Creator, man, and nature. Into this world God sends messengers to mankind. It was

Prophet Muhammad in the case of Islam. Muslims believe that man and nature are creations of God. Figure 2 shows how these elements are interrelated. God has provided mankind with the Quran and the Sunnah by means of the Prophet Muhammad as the guidance for a man to conduct his life, whether regarding everyday living or specialized professional activities such as in science, in this world and to prepare for the Hereafter. Figure 2 also shows the interrelatedness between man, God and nature and the function of man as servant of God and *khalifah* (vicegerent) of God in this earthly world. The Tauhidic framework shows one's relationship with the Creator (as servant), fellow human beings (as *khalifah*), and the environment (also as *khalifah*). Thus man becomes aware of the purpose of existence and hence the rights and responsibilities of living in this earthly world. Islam allows three different modes of knowledge acquisition: revelation through the Quran, rationalisation through the use of the human mind, and empirical work through the study of nature are all sources of knowledge. In the case of non-tauhidic science, the consideration of revelation as a source of knowledge is absent. Thus there are two sources of knowledge: via the human mind through which thoughts and ideas are constructed, and by the empirical method. Revelations are absent by default. Epistemological analysis has to begin with statements of assumptions, axioms, or postulates that are taken to be true until empirical evidence proves otherwise. Hence basic suppositions are used to deductively determine specific contextualised thoughts and ideas.

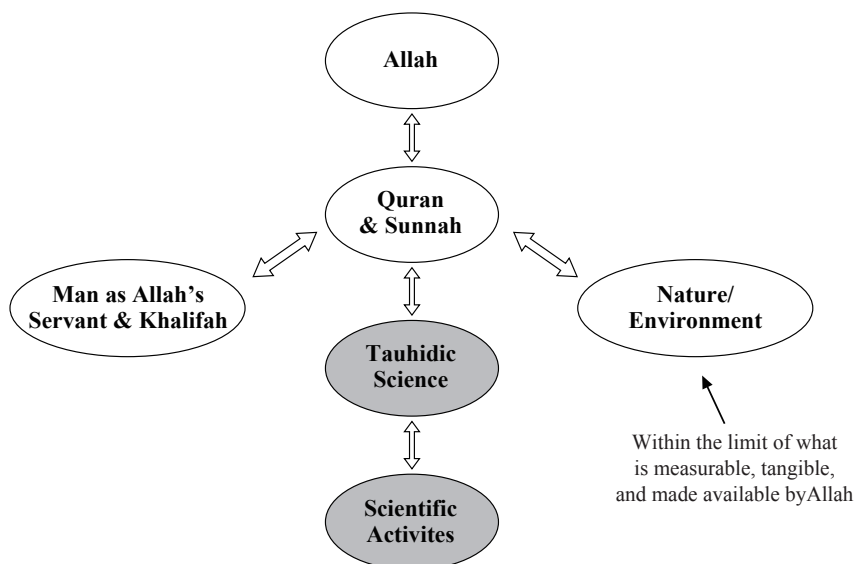


Figure 2. Holistic Integration of Entities in the Tauhidic Framework

A point to note is that interaction between man and the Quran and Sunnah results in man leading a religious life. Man and nature interact with the main aim of wanting to know

and understand nature and this leads man to know and understand the Creator, Allah. Along the way, the growth and development of science takes place. Simultaneously man becomes more aware of God. His faith in God is enhanced. Scientific activities are provided for him as a means to conduct his life as a servant and khalifah of Allah. This is integration between science and religion. When separated from religion, or the entity of God, then man in the context of scientific activities is seen just as a user of nature to fulfill his needs whether for utilitarian or aesthetic purposes. The spiritual purpose is absent.

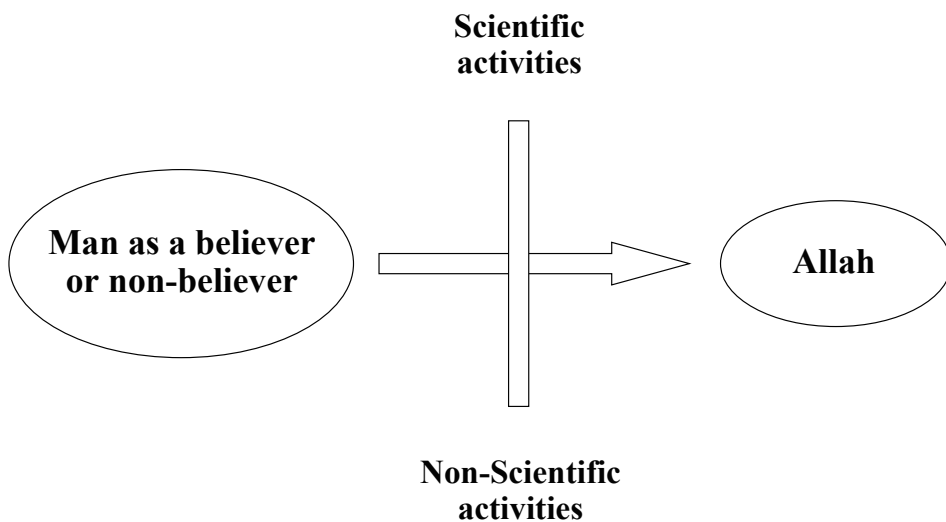


Figure 3. Integration of Entities in Tauhidic Framework

Relationship with God

There are basically two groups of people: believers or non-believers in God. The characteristics of believers are that they believe in the Last Day, the Judgement and hence the need to perform righteous deeds (al-Maidah 5:69), while non-believers believe otherwise. Therefore believers will regard scientific activities as contributing to their well-being in the Hereafter. At the same time there are other non-scientific activities like prayers, fasting, helping others, etc. that will also affect the believers' future state. Whether scientific or non-scientific, believers try as much as possible to act in accordance with the teachings of the *Shariah*.

﴿إِنَّ الَّذِينَ آمَنُوا وَالَّذِينَ هَادُوا وَالصَّابِئُونَ وَالنَّصَارَىٰ مَنْ آمَنَ بِاللَّهِ وَالْيَوْمِ الْآخِرِ وَعَمِلَ صَالِحًا فَلَا خَوْفٌ عَلَيْهِمْ وَلَا هُمْ يَحْزَنُونَ﴾ (5: 69)

(Al-Maidah 5: 69 (tr. Asad)) For verily, those who have attained to faith as well as those who follow the Jewish faith, and the Sabians, and the Christians - all who believe in God and the Last Day and do righteous deeds - no fear need they have, and neither shall they grieve.

God is the Creator of the Heavens, the Earth, and all that is in between. This therefore includes man. Thus it is from God that we come and unto God that we return. God wants to see who among us are good in our deeds when we are judged on Judgement Day. Al-Fatihah (1:1-7) reminds us of God, the Lord of the Worlds, the Most Gracious and the Most Merciful, the One whom we have to serve and seek for help in guiding us to the straight true path along which the blessings of God are found. Deviating from the true path or being lost is wrong, and invites God's wrath to descend on us.

Al-Fatihah 1:1-7

﴿بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ (1:1) الْحَمْدُ لِلَّهِ رَبِّ الْعَالَمِينَ (1:2) الرَّحْمَنِ الرَّحِيمِ (1:3)
 مَالِكِ يَوْمِ الدِّينِ (1:4) إِيَّاكَ نَعْبُدُ وَإِيَّاكَ نَسْتَعِينُ (1:5) اهْدِنَا الصِّرَاطَ الْمُسْتَقِيمَ (1:6)
 صِرَاطَ الَّذِينَ أَنْعَمْتَ عَلَيْهِمْ غَيْرِ الْمَغْضُوبِ عَلَيْهِمْ وَلَا الضَّالِّينَ (1:7)﴾

(Al-Fatihah 1: 1-7 (tr. Asad))

- 1:1 In the name of God, The Most Gracious, The Dispenser of Grace:
- 1:2 All praise is due to God alone, the Sustainer of all the worlds,
- 1:3 The Most Gracious, the Dispenser of Grace,
- 1:4 Lord of the Day of Judgment!
- 1:5 Thee alone do we worship; and unto Thee alone do we turn for aid.
- 1:6 Guide us the straight way.
- 1:7 The way of those upon whom Thou hast bestowed Thy blessings, not of those who have been condemned [by Thee], nor of those who go astray!

To help mankind to know and understand who God is and to know how to conduct their lives, Muslims believe that God has sent down the Quran. This Holy Book is a manual for reference and guidance. It provides an explanation of history, examples of *Tauhid*, principles or laws for life, good news, and a warning. The Quran was given to the Prophet Muhammad, who God to sent to us in order that we can see and observe, through his actions and words (the sunnah and hadith), the application of the religious teachings in everyday life, whether at an individual level or collective level.

Relationship between Nature and Man

When man interacts with nature it is because he wants to explore, discover and study various types of phenomena be they physical, biological, or human. Man is interested in knowing the properties, structures and the dynamics of these phenomena. Theories are developed to explain various types of phenomema that are both macro and micro. Experiments are conducted to collect data that inductively provides man with the desired information. The work of science has been very systematic. It is based on rationalisation and logic. It is this aspect of science that has allowed scientific activities to generate knowledge about the material and human worlds. This in turn allows man to optimise the beneficial use of material

resources to fulfill man's material needs. Actually, these are made possible due the nature of creation, i.e. everything that God has created is measured, in proportion, ordered, very organised and in accordance with the *Sunnatullah* (the way that God works in His creation), i.e. the predetermined nature of all things created.

Secular based scientific activities do not take into consideration other dimensions of man's life like the spiritual, and the psycho-emotional human. This is not so if science is based on tauhid. Islam invites man to travel, explore, and study nature whether it is at the bottom of the sea, outer space or in between. However Islam teaches us that whoever we are, big or small, rich or poor, powerful or otherwise, we are servants of Allah. Thus even as scientists, we are still the servants of Allah. This means that we are subject to the commands or do's and don'ts of Allah just like any other person. In whatever action we do we are advised not to go beyond the permitted limit, as this would only invite disaster.

﴿فَمَنْ ابْتَغَىٰ وَرَاءَ ذَلِكَ فَأُولَٰئِكَ هُمُ الْعَادُونَ﴾ (23: 7)

(Al-Mu'minin 23:7 (tr. Asad)) whereas such as seek to go beyond that [limit] are truly transgressors;

In the absence of such a consideration, it is by default that the element of God and everything related to Him will not be considered by us whether in our thought, ideas, or the planning and conduct of our scientific activities. What is left in the framework is therefore just man and nature. It is for this reason that man is left with his brain to unravel nature philosophically in a rational and logical way and to study empirically the meaning of life and how to conduct life. Arguments have to start with assumptions or untested beliefs. These are never free from subjective thoughts and ideas. Without revealed guidance men can only speculate as to what and how to interact with nature. It is therefore not the least surprising that the empirical approach toward nature becomes a primary method for knowing the truths. However truth discovered empirically is relative. It is an approximation of the final truth. It is dependent on the context of discovery. Hence the final truth can only be speculated but not confirmed.

The purpose of studying secular science has to be based on the arguments of man and nature. It cannot be related to the Creator or to spirituality. Science then becomes knowledge for knowledge's sake, or science for utilitarian ends, rather than a tool to know the Creator. Tauhidic science on the other hand integrates the activities of science with religion and other human dimensions. We explore and study nature in order to learn about the greatness of the Creator, to understand and appreciate God's attributes such as being the Most Gracious, the Most Merciful. We are very much encouraged to praise the Gracious God, express our *shukr* (thankfulness), become more humble, and enhance our *taqwa* (fearful awareness of God). When we interact with and manage both nature and other men we need to exercise justice

and fairness. Thus here it is seen that in applying tauhidic science, ethics is automatically incorporated. It is this religious factor that reminds those involved with scientific work not to ignore the effect or the consequences of their actions on other people as well as other creatures. Consideration for ethics in Islam is not after the event or disaster, but before it happens. This is the principle of prevention before cure, or stopping undesirable, irreversible effects from happening, e.g. Islam forbids man from drinking alcohol or other intoxicating drinks. There is a reason for this. Through science we know that drinking alcohol can make a person become addicted and cause behavioural, social and health problems, but by the time we reach the stage to empirically understand the effect of alcohol intake, we have already lost a number of people as victims. Sometimes an unborn fetus has had to suffer the consequences for wrong deeds for which they were not responsible.

Pursuing tauhidic science allows a Muslim to simultaneously conduct his role as a servant and vicegerent of Allah. It is tauhidic science that motivates him to understand and carry out the commands of Allah and avoid doing what Allah has prohibited when interacting with other human beings, or creatures of the material, physical or biological world. This explains why ethics is just part and parcel of tauhidic science.

An-Nisa 4: 162

لَكِنِ الرَّاسِخُونَ فِي الْعِلْمِ مِنْهُمْ وَالْمُؤْمِنُونَ يُؤْمِنُونَ بِمَا أُنزِلَ إِلَيْكَ وَمَا أُنزِلَ مِنْ قَبْلِكَ وَالْمُقِيمِينَ
الصَّلَاةَ وَالْمُؤْتُونَ الزَّكَاةَ وَالْمُؤْمِنُونَ بِاللَّهِ وَالْيَوْمِ الْآخِرِ أُولَئِكَ سَنُؤْتِيهِمْ أَجْرًا عَظِيمًا ﴿١٦٢﴾

(An-Nisa 4:162(tr. Y. Ali)) But those among them who are well-grounded in knowledge, and the believers, believe in what hath been revealed to thee and what was revealed before thee: And (especially) those who establish regular prayer and practise regular charity and believe in Allah and in the Last Day: To them shall We soon give a great reward.

Tauhidic science is a science based on the concept of *tauhid*, the oneness of Allah. A conceptual framework of tauhidic science has been developed. It shows the relationship between God, nature, and man. Along with this there is the Quran and the Prophet whose Sunnah provides guidance for man to manage his life as the servant and vicegerent of Allah. The framework developed shows how religion and science are integrated if a scientist conscientiously tries to use religion (via Quran and Sunnah/hadith) to conduct his life including his scientific activities. Similarly a person with a religious background will also try to integrate religion with science once they have better knowledge and understanding of science gained in a formal way through education. This brings our paper to a discussion of tauhidic science education.

Tauhidic Science Education

Tauhidic science education refers to education in science that is based upon the concept of *tauhid* or the oneness of God, the Creator. This education is a strategy to develop practitioners of tauhidic science. In Islam the purpose of education is to develop a good man, one who is of benefit to others and from whose hands all men and creatures are safe. Presently a human being is also looked upon as a capital that needs to be invested in order to bring about gain and prosperity to his individual self, society, and the country. Conceptually there is nothing wrong with such ideas. Human capital as a concept can still be Islamic if man is regarded as the servant and *khalifah* of Allah. So if the goal of tauhidic science education is to develop such a man, then tauhidic science education has to be holistic. This means that all the different dimensions of human life; religious, spiritual, physical, human, and intellectual have to be considered and integrated. The product of tauhidic science education is therefore an individual who is able to perform the tasks of science while simultaneously acting as a servant and vicegerent of God. The initial activities in crystallizing tauhidic science education were carried out in two phases. First the development of the materials on tauhidic science education. Second the communication of information to create awareness and promote understanding

Tauhidic science has its own philosophy, hence its own epistemology and goal. Even the sources of knowledge, revelation, human intellect, and nature are well defined. Muslims can derive their knowledge and understanding from the Quran and Sunnah and translate them into social practice or work ethics. These were the basic ideas upon which the members of our research group developed matters related to Islamic (or Tauhidic) Science education. Eight topics were chosen by the group members. These were i) Islamic Science: reflections of the Past and exploring the future, ii) Quran and Sunnah as sources of scientific knowledge, iii) Philosophy of Tauhidic Science Education, iv) Basic principles of laboratory experimental methodology, v) Philosophy of developing a complete man, vi) Tauhidic Science Education, vii) Skills to inculcate interest and commitment to science among young children, and viii) Pedagogical knowledge content and teacher training.

A summary of the basic ideas given by the group members for each topic chosen follows below.

i) Islamic Science: reflections of the past and exploring the future

Science and technology can never be separated from development. The history of civilization tells us that the development of science and technology was rooted in religious, cultural and human values, except for science and technology developed by Western civilization. The science generated by Western civilization has produced confused human beings and paradoxes, since it neglects the factor of humanity. The current development of science and technology lacks human values based on a spiritual and Tauhidic paradigm. Islam has its own version of science and technology.

Islamic science develops and evolves within the Islamic paradigm. Thus Tauhidic science should constitute the basis for the future development of science and technology (Mohd Yusof Hj Othman, 2009).

ii) Quran and Sunnah as sources of scientific knowledge

Quran and the hadith or Sunnah are the two main sources of the *Shariah* for the Muslims. The Quran consists of the *kalimah* (words) of Allah. The basic fundamental principles as codes of living are given by the Quran. The sunnah consists of the Prophet's (p.b.u.h) noble acts, words and convictions. It guides the Muslim *ummah* (community) to implement the Quranic precepts. The hadith as a source for scientific knowledge derived its origin partly from the Quran. Through the guidance of the Quran and hadith, Muslims appreciate the spirit of Islam. It has been shown that Islamic civilization evolved as a result of putting into practice the teachings of the Quran and hadith through scientific endeavors (Jawiah Dakir & Abdul halim Tamuri).

iii) Philosophy of Tauhidic Science Education

The philosophy of tauhidic science education starts with existence or being itself. Because all things that exist are created by God, then the properties of these creatures or the creations of God reflect the attributes of the Creator e.g by their duality and also by the gradation of being, as in high Energy Physics (or particle physics). Hence from one angle, existence from ex-nihilo toward something that is concrete (physical in nature) can be interpreted as the manifestation of Allah's attribute of power. The link between existence-observer-observable gives rise to a knowledge epistemology termed by Ibn Arabi as *wahdah al-wujud* (the unity of all existence). The highest level of existence is in the realm of Godliness while the other realms are lower and need to be studied by man in order to know God, the Creator. There are similarities between the methodology adopted by the Sufis to study the physical world and the unseen world *dzauqi* (experientially) and the reductionist way that the modern physicists have adopted to study nature, i.e using the method of particle collision. The fundamental premise in tauhidic science education is that the Creator creating all that exists in order for man (as His vicegerent and a special creature) to know Him. A complete human being (*insan-al-kamil*) is a man who *recognizes* God as the Creator in each of His creations (Shahidan Radiman)

iv) Basic principles of laboratory experimental methodology

Research activities in science and technology contribute to advancement and a higher

standard of human life. The aim of a scientific experiment is to test a hypothesis about nature's behaviour. The essence of an experiment is in altering the variables in a system (independent variables) and investigating the effect of this variation on other variables (dependent variables). There are three different types of experiment; namely controlled, natural (quasi-experiment) and observations. All scientific experiments must follow a specific set of processes, systematic procedures and ethics, starting from planning, execution, data analysis, discussion, interpretation and dissemination (Muhammad Hafizuddin Jumali, 2009).

v) Philosophy of developing a complete man

Education that is based on an Islamic worldview provides a means to develop the *ummah* (Muslim community) and Islamic civilisation. Such education should result in the development of a Muslim as a man and as a Muslim scientist. This requires that science education be integrated with Islamic education. This in turn requires the need to study nature in a way that is integrated with religion. Such consideration forms the theoretical basis of the development of a Muslim scientist within the context of the national system of education (Nor Hayati Alwi, 2009).

vi) Tauhidic science education

The concepts of tauhidic science and tauhidic science education are relatively new to most people of the present generation, in particular among teachers. It is not new to the *ulama* (Islamic scholars) nor was it new to the communities of the past. In fact, they were more entrenched in tauhidic science. Except for the Muslims of the Islamic golden era like Ibn Sina, present religious scholars may not have the empirical knowledge and skills of science. In the absence of the scientific knowledge content in the case of the religious group, or religious knowledge in the case of scientists or science teachers, it cannot be taken for granted that both groups have an understanding of the mechanics and dynamics of integrating science with religion whether in the practice of science or in education. Thus the understanding of tauhidic science education requires an understanding of tauhidic science. The latter rests on a worldview that comprises three entities, God the Creator, nature and man. Quran and Sunnah are sources of reference that guide man in conducting his role as the servant and *khalifah* of Allah. These basic ideas must be translated into operational terms if tauhidic science education is to be materialised. There is therefore a need to develop a suitable comprehensive educational framework that provides an understanding of the philosophical, methodological, teaching and learning activities required for tauhidic science education. However for the implementation of tauhidic science education, it

is also necessary for teachers to have an understanding of tauhidic science education and so they will require adequate preparation. (Khalijah Mohd Salleh, 2009)

vii) Skills to inculcate interest and commitment to science among young children

Children are natural scientists when they are playing. Given the opportunity children will explore, observe, test, and do experiments. They subsequently expand their thoughts regarding an object or a phenomenon that takes place around them through play or direct experience. They have a high sense of curiosity that comes from within them. This forms their desire to learn something. The inclination and commitment that children show toward science will be formed if educators including parents understand the basic principle of how children learn and if they also consider how children think. The inculcation of tauhidic science concepts can take place among children if and when they are committed toward science in the true sense of the word and when that sense of commitment is not being forced onto them (Mastura Badzis, 2009).

viii) Pedagogical knowledge content and teacher training

The Malaysian curriculum model '*The Integrated Secondary School Curriculum*' is a curriculum which stresses the importance of inculcating noble values across the school subjects. The concept of *Integration* in tauhidic science reflects the integration of revealed and taught knowledge. There has to be an effort toward integrating revealed and taught knowledge in the teaching and learning of tauhidic science. The teaching and learning methods of tauhidic science require both the tauhidic content and a sound pedagogical content knowledge in science be inculcated in an integrated manner. How this can be impregnated into the teaching and learning of regular science needs to be explored. The implication of sound pedagogical content knowledge integrating both revealed and taught knowledge towards the teacher's and student's understanding of the nature of science has to be understood in order to determine its implications toward teacher preparation and training (Lilia Halim, 2009).

IV. Testing Teachers' Response to Experts' Ideas on Tauhidic Science Education (Second Phase)

Once developed, these ideas were to be introduced to school teachers at the levels of preschool, primary and secondary. To what extent are these ideas are being accepted by the teachers? What would be the concern of teachers if science *tauhid* were to be taught in schools? Exploring these questions is important if we are to seriously introduce tauhidic science education within the system. However teachers may have their own views of what tauhidic science education is all about. They should also know whether or not a tauhidic science curriculum can be implemented. Thus they can suggest changes that need

to be introduced into the curriculum and into the methodology of teaching. Knowing and understanding teachers' perceptions of tauhidic science education can help the research group to foresee future possible problems, and hence find solutions if and when tauhidic science is taught in schools. To achieve these aims, the group then conducted seminars and workshops to communicate the ideas developed to the teachers. In return teachers gave their feedback through questionnaires.

This paper gives a preliminary report on teachers' concerns, perceptions, and acceptance concerns regarding tauhidic science education. What are their concerns? What is it that teachers are uneasy about? What is it about tauhidic science that troubles them? One way to find out the teachers' concerns is to get their views before the beginning of the experts' presentation. What is their perception of tauhidic science and tauhidic science education? This information can be gained through their responses to the objectives of tauhidic science education and how they have benefited or gained from the seminar workshop. Acceptance refers to whether they are in favour or not of tauhidic science education. This can be derived from their suggestions for changes in the curriculum and matters related to it.

Instrument

Based on the research questions, there were two parts to the instrument, questions before and after the presentation of experts' ideas. Its purpose was to seek the teachers' initial perception and concerns regarding tauhidic science. The second part of the instrument was to determine the impact of the presentation on the teachers' perception and acceptance toward tauhidic science education. The exploratory nature of the study requires that these questions be open ended. This allowed the soliciting of views that came directly from the teachers rather than externally induced views.

The instrument is as follows:

1. Before the presentation session:
 - a. Write down two questions that immediately come to your mind as soon as you hear the phrase 'Tauhidic Science Education'.
2. After the presentation session:
 - a. For me, the objectives of learning Tauhidic science at the primary level are:
 - b. For me, the objectives of learning Tauhidic science at the secondary level are:
 - c. By participating in the workshop what benefit did you get? Why?
 - d. What did you gain from the workshop?
 - e. What changes are needed to enhance meaningful teaching?
 - f. What changes would you propose for curriculum development and teacher preparation?

Sample

A total of 245 teachers participated in the workshops and seminars. For the first seminar workshop, participants were mainly religious school teachers who had to teach science whether or not they had a science background. The second, third and fourth seminars were attended by regular and religious teachers and the majority of them taught science in their respective schools. Details of their backgrounds are given in the latter part of the paper.

Data Collection

The seminars were conducted at four different zones in West Malaysia from Dec. 2008 – June 2009; Central (A: Sepang), South (B: Malacca Town), North (C: Bukit Mertajam) and East Coast (D: Kota Bharu) zones of West Malaysia (Figure 4.).

Materials on tauhidic science were developed by members of the research group who are taken to be the experts. Their ideas and thoughts were presented to teachers. This provided teachers with the intervention by experts i.e. communication of information on tauhidic science, tauhidic science education and other related topics. Teachers were also introduced to practical experimental activities using modules developed by undergraduate students. For data collection, questionnaires and surveys were handed out before and after the seminar for the participants to obtain their feedback. There were also discussions and group presentations.



Figure 4: Map showing sites of seminar and Workshop

Study sample

A total of 245 participants from 4 zones (Figure 4) in the Peninsular of Malaysia participated in the seminar-cum-workshop (Table 1). However only 215 of the participants provided feedback to the researchers. The participant parameters include sex, age, qualification, specialization, and the subject taught.

Table 1: Demography of Sample

	Zone	Middle (Sepang) (14-17 Dec 08)	South (Melaka) (14-16 March 09)	North (Bukit Mertajam) (06-08 June 09)	East coast (Kota Bharu) (10-12 June 09)	Total
Variables	Category	Frequency (%)				
Sex/Primary	Male	3(11.5)	1(50.0)	4(15.4)	6(23.1)	26(100)
	Female	24(25.5)	31(33.0)	18(19.1)	21(22.3)	94(100)
Secondary	Male	0	15(51.7)	3(10.3)	11(37.9)	29(100)
	Female	0	34(57.6)	14(23.7)	11(18.6)	59(100)
	Total	27	100	39	49	215
Age (years)	20-30	19(25.0)	36(47.4)	12(15.8)	9(11.8)	76(100)
	31-40	7(7.9)	50(56.2)	17(19.1)	15(16.9)	89(100)
	41-50	1(2.4)	7(17.0)	9(22.0)	24(58.5)	41(100)
	51-60	0	7(77.8)	1(11.1)	1(11.1)	9(100)
	Total	27	100	39	49	215
Qualification	MCE	0	2(22.2)	2(22.2)	5(55.6)	9(100)
	HSC	0	2(25.0)	3(37.5)	3(37.5)	8(100)
	Certificate	0	1(33.3)	1(33.3)	1(33.3)	3(100)
	DIPLOMA	21(26.9)	40(51.3)	8(10.3)	9(11.5)	78(100)
	Degree	6(5.1)	55(47.0)	25(21.4)	31(26.5)	117(100)
	Total	27	100	39	49	215
Specialisation	Science	12(12.4)	50(51.5)	30(30.9)	5(5.0)	97(100)
	Religion	11(27.5)	28(70.0)	1(2.5)	0	40(100)
	Science & Religion	0	15(78.9)	4(21.1)	0	19(100)
	Others	4(18.2)	7(31.8)	4(18.2)	7(31.8)	22(100)
	Total	27	100	39	49	215
Subject Taught	Science	22(15.7)	40(28.6)	30(21.0)	4(34.0)	140(100)
	Religion	2(7.6)	21(80.7)	2(8.0)	1(4.0)	26(100)
	Science & Religion	2(4.8)	35(83.0)	5(12.0)	0	42(100)
	Others	1(14.0)	4(57.0)	2(29.0)	0	7(100)
	Total	27	100	39	49	215

Table 1 shows that the participants comprised 120 primary teachers 26 of whom were males and 94 females. 88 were secondary school teachers, 29 of whom were males and 59 females. It is interesting to note that there were more female than male teachers who participated in the seminar-workshop. This is expected as the teacher population in the country has more female than male teachers.

As for the age distribution of teachers, the sample is skewed toward the lower age group with 76 in the 20–30 age bracket and 89 in the 31–40 age bracket. There were about 25% in the over 41 age bracket. The majority, 117 were degree holders and there were 78 diploma holders and 20 lower than diploma. Their teaching backgrounds were 97 science, 40 religion, 19 science with religion, and 22 other subjects. Thus religious teachers constituted about 25%

of the group. It is also interesting to note that there were almost 25% others. However as far as teaching is concerned, analysis showed that 140 of the participants were teaching science, 26 with a religious background taught science, 42 taught science and religion and 7 taught other subjects. Thus almost all the teachers taught either religion or science or both. This should be an interesting group to observe as they can represent how teachers with a religious background respond to tauhidic science.

Analysis, Findings and Discussion

The data collected on the forms was keyed into the computer. Qualitative analysis of the content of the answers was done to determine the concerns, perceptions, and acceptance of teachers to the concept of tauhidic science and tauhidic science education. Concerns were derived from the teachers' two questions as requested by the researchers. Perception and acceptance were determined from the teachers' answers to six open ended questions on i) the objectives of learning Tauhidic science at the a) lower and b) upper primary levels, ii) the benefits they got from the workshop, iii) the changes that teachers felt were needed to enhance meaningful teaching, iv) their propositions for changes in the curriculum and v) hopes of teachers. As the work at this stage is initial and exploratory in nature, statistical analysis that focuses on frequency distribution and cross tabulations is not reported in this paper. What matters are the range of concerns, views, and issues from which the researchers can inductively determine what further actions are needed to present concepts of *tauhid* acceptable to the teachers, the nature of the curriculum, possible obstacles to teachers' effective role in the implementation of tauhidic science, the nature of the teaching materials required, and what other policy and organizational actions need to be considered and attended to.

Concerns of teachers

The questions that the teachers wrote were categorized into several subtopics: Justification for attending the seminar, epistemology, method, curriculum, and implementation. The following section of the paper gives the lists of questions that the teachers gave.

List of Questions 1: Justification for attending the seminar

- The teachers were interested to find out why science teachers but not religious teachers were asked to attend the workshop.
- The phrase 'tauhidic science' had not been heard. What is the methodology? What is expected of the teachers? How to impart information to the pupils?
- Why raise again the issue of science and religion?
- Who is the organiser?
- Failure to understand the objective of the workshop.

Names of participants were given to the organiser by the respective school representatives. It is possible that teachers who attended the seminar were requested to do so, and thus were wondering about the justification for having to attend and participate in the seminar workshop. Acceptance that science and religion are separated. Some participants were used to the idea that science and religion are separated and that there was no need to question the status quo.

List of Questions 2: Epistemology

Questions related to epistemology given by the participants are as follows:

- What is the definition and what does it mean?
- What is the goal and the direction?
- What is the importance and the need for it?
- Why should it be introduced?
- What are the objectives?
- What is the link between science and *tauhid*?
- What is the link between tauhidic science and education?
- Can one actually confirm the oneness of God/Allah through science education?
- When all science is linked to tauhid, is it not more about religion?
- Can you use science to confirm *tauhid*?
- Who is a scientist and who is a religious practitioner?
- Science has been taught separately before this.
- Science involves manipulative skills and scientific process.

Based on the listing of epistemological questions, it can be said that teachers were concerned about the clarity of concepts and the conceptual framework. They wanted to know the definition, goal, importance, and objective link between science and tauhid, and the way to use science to strengthen and confirm tauhid. They were also rather skeptical of the nature of tauhidic science when they raised the question that regular science has its practical aspect but what about tauhidic science.

List of Questions 3: Method

Questions on methodology are as follows:

- How can religion be shown to be linked to science?
- How can secular science be overcome as it has been embedded in our science education for a long time?
- How can interest toward science be inculcated?
- How can *tauhid/aqidah* (belief system) be strengthened?

- How can it be explained to the pupils?
- How can elements of religion be included in science?
- Can tauhidic science be introduced at primary level?
- How can religion and science be integrated?
- How can concepts of science and religion be aligned?
- Can one change another's mind?
- Can it be applied?
- What kind of methods can be used to teach tauhidic science?
- How can the subject be taught to non-Muslim pupils and teachers?

As far as methodology is concerned, the concerns of the teachers are on how to show the link, the alignment, and integration between science and religion, and how it can enhance faith and *aqidah* (correct belief). These are pertinent questions as they are directly related to the operational aspect of tauhidic science in the classroom. Teachers are to perform their tasks and the pedagogical aspects of teaching and learning have to be known and understood by the teachers if they are expected to play their roles effectively. Their concerns are justified.

List of Questions 4: Curriculum

The following questions are those related to curriculum:

- What is the content?
- How serious is the curriculum? Appreciation?
- How about the inculcation of noble values?
- What are prerequisites in religion to understand tauhidic science?
- What are the suitable topics?
- Is a new curriculum needed?
- Is it suitable with the present science syllabus?
- Is religion and science suitable for primary school?
- What is the connection of tauhidic science at the primary level?
- How is religion embedded in science?
- 2 period/week for mathematics.
- 5-6 periods for science in regular schools.
- Civics in religious subjects?
- Return home: 2.30 – 3.00 ptg?
- Amoeba – how can discussion be controlled so that it is within the topic?
- Quran as a motivation to learn. Are Science's laws God's laws in nature?
- Is Quran to be used as a source for verification?

- What about assessment, is it toward the inculcation of values?
- Lack of a support system and teaching aids.
- To what extent can science be impregnated into religion?

Again the concerns relate to what is actually to be taught in terms of content, values, objectives, the suitability of such a course at primary level, the link and integration between religion and science, time allocation, and assessment. Concerns for these will in the end affect teachers' confidence and ability to deliver the subject. What if the content is completely new to them? They may not have the right knowledge and skills to be able to talk about tauhidic science. Such concerns reflect teachers' preparedness to teach. It is good that they raise these concerns as it can be interpreted that these teachers exercise professionalism in conducting their jobs. This finding also suggests that a new science curriculum is needed which is oriented towards tauhidic science. It also suggests that modes of integrating of science and religion need to be considered seriously.

List of Questions 5: Implementation

Then there are questions related to implementation:

- Tauhidic science education should be lifelong, i.e. from pre-school to the end of life.
- What are the target groups?
- Can the Ministry implement it?
- What about the national system of education?
- Can it change the present science?
- How will it be accepted by the teachers and pupils who are non-Muslims?
- How can the course be taught to a class consisting of Muslim and non-Muslim pupils?
- Will the teaching of science and mathematics in English separate science from religion?
- Are religious teachers also involved?
- Can a science teacher become a religious teacher?
- Teachers need to be exposed to tauhidic science.
- Do teachers have to look up a Quranic *surah*?
- How can teachers emphasise excellence when there is no example? They are stuck with noble values, but unable to search for a Quranic *ayah* (verse) and to link it with science. Who can help teachers?
- Time constraint, is it enough with only 30 minutes
- More time is needed to teach tauhidic science

- Time constraint is even more in religious schools – need to take 18-20 subjects
- Lack of teaching aid resources.
- There are some *ustaz* (teachers) who do not believe that man has reached the moon.

Implementation concerns centred around teacher preparation and support. Teachers need to be exposed to be better informed on tauhidic science whether or not they come from the science or religious background. Teachers from both groups see science and religion separately. They may be strong in one but not the other. Both groups need to know tauhidic science. At least they can understand the basic conceptual framework after which they have to strengthen the part of knowledge that they are lacking in. So this can help address the concern about what happens in the case of a religious teacher who teaches science is sceptical about achievements of science. At this initial stage those teachers with a science background may not be able to find the appropriate Quranic *ayahs* related to their science lesson on their own. Thus there needs to be a compilation of relevant Quranic verses that tauhidic science teachers can make use of to teach the subject. The other issue is the presence of non-Muslim pupils and teachers. This is something that needs to be discussed and resolved, since Malaysia is a multi-cultural, multi-ethnic and multi-religious society. As for the constraint of time due to the preconceived idea that there will be too much content, we need to be open about it. There is nothing extraordinary about such a concern. It always happens when curriculum changes are to be made. When the time comes there needs to be further discussion on how to select the content for the syllabus. Adjustment has to be made. Can tauhidic science education impact change? Well it has to be given a chance to be implemented. Only then can we empirically determine its impact for certain.

Knowing the concerns of teachers is one way to determine what further actions need to be taken if tauhidic science education is to be implemented successfully. Issues need to be explored and understood so that strategies can be determined and appropriate actions can be taken before tauhidic science is actually being taught in the classroom.

Teachers' Feedback regarding *Tauhidic Science Education*

After listening to presentations and clarifications by the experts, teachers gave their feedback regarding tauhidic science education. This section gives the feedback by teachers on the objectives of education at the lower and upper primary levels, the required and needed changes, and their hopes. Based on this feedback the authors could decipher the teachers' perception and acceptance of tauhidic science education.

i) Objectives of Tauhidic Science Education

Participants perceived the objectives of tauhidic science as follows:

a) At level one (primary 1-3)

- To provide pupils with initial exposure to tauhidic science
- To know Allah as the Creator
- To know and to observe God's creation around them.
- To know the Creator, to know the attributes of nature and to understand themselves.
- To know nature and the creatures and then see the link with God as the Creator
- To find evidences of Allah's power through science
- To learn tauhidic science and to get nearer to Allah
- To guide pupils to link what is learnt with godliness
- To instill a sense of curiosity in the learning of science and the relationship of nature to *tauhid*.
- To develop interest in tauhidic science.
- To develop students who can understand science that is based on *tauhid* and apply it in everyday living.
- To form the ideas and attitudes of pupils.
- To know the world of science and its beauty in a way that stimulates one to be a faithful servant of God.
- To produce students who can master science with tauhid through a teacher's guidance.

Teachers were of the view that since the primary level is a basic level, then tauhidic science will just be an introduction to tauhidic science for the pupils. At this introductory stage, pupils will learn that God is the Creator of the Heavens and the Earth and that everything is under His control. It also introduces the pupils to the Islamic perspective of nature and matter to create the awareness that revealed knowledge can be used as a basis to study science. Pupils learn about the Creator, nature and the self and how these are interrelated.

Thus objectives at level one are for pupils to learn that through science one learns to observe God's creation and His attributes and apply this knowledge to everyday life. They learn about the beauty of God's creation to understand and appreciate God's power, become closer to God, and be stimulated to express shukr (gratitude to God). Thus science is seen as a mechanism that can help pupils get to know God and be closer to God.

b) At level two (primary 4-6)

- To strengthen the tauhidic science process after level 1.
- To understand concepts of tauhidic science.
- To be able to apply the topic with godliness and think about phenomena from the concrete simple to abstract.
- To have a sense of curiosity about what happens in the environment.
- To go deeper into understanding tauhidic science.
- To think and conduct study regarding the phenomenological process.
- To know that nature is related to the Creator.
- To be able to use Quran and sunnah in order to know both horizontally and vertically about nature.
- To understand scientific concepts and their relationship to the Creator.
- To encourage pupils to think that each creation of Allah has its usefulness.
- To be able to relate that each phenomena has its definite cause and returns to Allah.
- To relate science to the greatness and glory of Allah and apply it in everyday living.
- To explore nature that is full of the creations of Allah and connect them with His greatness and glory, and express *shukr*.
- To realise that there is no limit to Allah's power as shown by His creations.
- To strengthen the conviction that Allah is always with them in times of hardship or comfort and that Allah has power over all things.
- To understand, acknowledge and be able to express the greatness of Allah through science.
- To explain tauhidic science that can stimulate pupils to be servants of God and express *shukr*.
- To develop human beings with knowledge of science, who are faithful and Muslims of quality.
- To develop an excellent man who cares for the self and the environment.
- To strengthen the faith and develop a balanced pupil academically and religiously.

Objectives at level two are related to the learning of tauhidic science, getting to know more about the Creator, and the development of character. It is hoped that by learning tauhidic science students will understand more about it and be able to develop and understand its concepts, to realise that Quran is a source of knowledge about nature, to realise that each created thing has its purpose, to realise and recognise the greatness of Allah and His unlimited power, to know that His presence is unbounded by time, to appreciate science as a way of knowing Allah, to be an excellent, balanced individual, faithful, of quality, to be a good servant of Allah and

express *shukr*.

While the remarks after this workshop appear the same, it is felt that the presentations had enhanced the participants' consciousness of God. This is seen through comments like:

- To inculcate the value that there exists a Creator underlying all creations.
- To understand nature and the concept of creation.
- To know the foundations of science and the relationship with Allah.
- To expose to pupils that learning science can be a link to God.

There is an indication of an expansion of thought on the objectives of tauhidic science education e.g. to get to know Allah the Creator and to discipline pupils at an early stage, to produce individuals who have knowledge of science and have faith and can express a sense of *shukur*, to develop a sense of identity toward goodness, and study science for the sake of Allah. Thus at this exploratory stage, teachers are of the view that tauhidic science is not just learning about nature but a means of getting to know the Creator. There are beliefs that tauhidic science has an impact on character or personality development. Such views are rarely found in the learning of current secular science.

There are many who felt that it is suitable to educate and nurture children from an early age to get to know the Creator but there is also viewpoint against this as it is felt that it is not suitable.

Teachers perceived that at the primary level it is the inculcation of science integrated with *tauhid* and noble values. It is an introduction to promote interest and understanding toward tauhidic science. It is the beginning of using science to get to know God, both as the Creator of the universe and linked with everyday life, thus providing the foundation to develop a man who always remembers and thinks of God.

ii) Benefits of the workshop

- Can understand a different form of science.
- Science as knowledge based on *tauhid*.
- Heard the concepts of tauhidic science and was taught the method of linking it with *tauhid* and the Creator.
- Learnt that knowledge in Islam used scientific methods earlier compared to the West.
- All knowledge of science is obtained from the Quran and there is a need to explore it through tauhidic science.
- Learnt about an experimental method which had never been done before the workshop (most likely by religious teachers).

- Meaningful knowledge gained.
- Workshop gave a lot of ideas on how to do experiments using cheap and easily available materials.
- Had new experience on tauhidic science which had not been taught or made compulsory in schools.
- Had an understanding of how phenomena surface or happen through science.
- Happy that the workshop gave ideas on how to teach and learn science.
- Had ideas on how to link science with Quran, the sunnah, and nature.
- Understood what is tauhidic, using various activities in teaching and learning
- Enhanced knowledge.
- Opens up the mind, and gives the understanding that science knowledge and godliness are interrelated.
- Enhanced confidence to teach science.
- Opened up a space in the mind that the knowledge of science is strongly related to *aqidah*.
- Whatever we do is based on God.
- Gained knowledge, deepening it and self-assessment.
- Experimental activities helped enhance understanding, curiosity and realisation of the greatness and glory of God.
- Able to overcome various experimental activities, easily available materials that be applied in teaching and learning.
- Opened up the mind to teach science without having to separate it from the Creator.
- Had exposure on how to use tauhidic science teaching in the classroom.
- Received input about an integrated teaching curriculum of science and its connection with Quran and the Sunnah.
- Workshop gave the idea that the scope of science is very broad.
- Teaching that rests on pleasure of God.
- New syllabus complete with module on how to teach, kit/materials for related activities, reference materials.

The seminar and workshop had given opportunities to the teachers to learn about tauhidic science and to experience doing science experiments. The teachers were exposed to new knowledge about science and *tauhid*, given new ideas regarding tauhidic science, methods of teaching the subject, and Quran as a source of science knowledge. Their minds were opened. They had new experiences, realising the Greatness of God through science, learning the experimental methods of science, the

use of cheap easily available materials for science experiments, hence learning many things. They understood the link between science and Quran.

It is to be noted that the participants in this seminar-cum-workshop were all Muslims. Based on their feedback, Islam appears close to their hearts. It is possible that this factor has made them rather receptive to the communication of information by the experts.

iii) Required Changes

- Integrate *tauhid* with science.
- Inculcation of Islamic values and noble values in teaching and learning.
- Modify curriculum to align it with the objectives of tauhidic science.
- That there be a new syllabus on tauhidic science.
- Curriculum that is tauhidic based as opposed to earthly science.
- Reconstruct syllabus that suits and inculcates Islamic elements.
- Change the syllabus prepared by the Ministry of Education.
- Curriculum must match pupils' IQ.
- Refine curriculum by introducing tauhidic elements and removing excess.
- Exposure of *tauhid* in the ministry's curriculum /syllabus.
- Design curriculum suitable to pupils' thinking level such that delivery is effective.
- To provide teachers with deep preparation before introducing the curriculum in schools.
- Conduct workshops or courses for teachers to enhance the quality of teaching.
- Conduct workshops or courses for teachers to expose teachers to tauhidic science.
- Teachers should be given an opportunity to develop the curriculum.
- Teachers should be grounded in *tauhid*.
- Teachers need preparation.
- Each teaching and learning process has to be linked to *tauhid*.
- Improve teaching style.
- Teachers need suitable training to apply it in the classroom.
- Teachers need teaching aids to ensure the teaching and learning process is attractive and interesting.
- Provide suitable OVA.
- Research and methodology of science should be linked to the spiritual world and not just metaphysics.
- Need more research and application in everyday living.
- Increase curricular modules by increasing science knowledge integrated with *tauhid*.

Teachers proposed that *tauhid* be integrated with science, the inculcation of Islamic and noble values. This requires that the curriculum and the syllabus be so designed to accommodate *tauhid* and hence need to be changed as elaborated above. Adjustments to the curriculum content need to be made such that it matches the students' IQ and is of the right quantum. The teaching and learning methodology has to be appropriate implying the need to prepare teachers via workshops and training. To ensure that teachers can actually conduct the teaching and learning activities they need reference materials. These need to be developed and research and developmental activities to support such effort are required.

iv) Needed Changes

- Need change within oneself to improve teaching and learning.
- Change must begin within oneself, understood and then conveyed to others.
- Review science concepts that are suitable for the pupils.
- Increase teachers' knowledge on tauhidic science.
- Continuous exposure to tauhidic science.
- To keep up with growth and development of science and *tauhid* to be inculcated in teaching and learning.
- By relating to God during teaching and learning, pupils not only become skillful in science but become excellent humans and can contribute toward others' well-being.
- Provide a methodology of science based on the tauhidic concept.
- Reference materials and experiments for each topic to improve students' understanding.
- Increase reading and study on learning topics to gain new meaningful learning experiences.
- Variety of teaching and learning activities and conduct experiments.
- Use experiments and materials available.
- Increase practical applications to make learning process clearer.
- Change of attitude and exposure through courses, seminar or study.
- Special tauhidic science course for teachers.
- Make courses compulsory for all science teachers.
- Attend related courses from time to time.
- Follow up courses to increase knowledge.
- Workshops should be complemented with practical applications so that teachers have a variety of experiments, indirectly improve teaching methods and learn from mistakes.

- Courses to strengthen and enliven tauhidic science each time there is new discovery that shows the power and greatness of Allah.
- Continuous related workshops/courses twice a year.
- Multifaceted techniques and creative teaching aids to make teaching and learning more interesting.
- Teaching and learning environment needs to be based on *shariah* leading to effort to know the oneness of God, enhancing of faith and *akhlaq* (good behaviour).

Needed changes are more in terms of teacher preparation through change in attitude, increase in knowledge and understanding about science and *tauhid*, linking integrating science and *tauhid*. Teachers appear appreciative of experimental work and use of available materials. Teachers proposed the need to continuously exercise reading, attending courses and to prepare teaching learning materials creatively. However the learning environment needs to be conducive to impact upon the character development of students.

v) Hopes of the teachers

- Understanding of tauhidic science can help students apply science in their lives and link it with the Creator.
- Tauhidic science can be applied in school to help develop pupils balanced in the earthly and the afterlife.
- Ideas and knowledge obtained can be applied in schools.
- Can inculcate tauhidic concept in teaching and learning.
- Tauhidic science can be taught in schools.
- Tauhidic science can be introduced at primary level.
- Tauhidic science is taught to pupils using the available science facilities.
- To generate ideas that I can implement during the teaching and learning session and link it up with tauhidic science concepts.
- It creates awareness and understanding.
- That this workshop be continued from time to time to strengthen knowledge and understanding especially among religious teachers who have been requested to teach science and to link it up with revealed knowledge.
- It gives great benefit to non-science option teachers.
- That this course be continued for science teachers and that the methodology be continuously learnt and practiced, from the view that I am not a science option teacher. Motivate non-science option teachers to become interested in further study and to be able to accept science.

- I am very interested in the course. It should not just stop here as there is a lot more to learn if the objectives of tauhidic science are to be achieved.
- I hope more of my colleagues will get an opportunity like this.
- To a conduct workshop for non-science option teachers.
- I hope to get more exposure regarding the method of doing tauhidic science.
- Expose multi workshops/courses on science tauhidic to all teachers.
- This workshop be available to teachers, institutions of higher learning and the Ministry.
- A module for curricular syllabus needs to be developed and improved.
- Application of what has been learnt and inculcation of values on the oneness of Allah and evidences.
- Improve teaching and learning process.
- Opens up the minds of teachers not to just idolise western scholars but to also realise that there have been great Muslim scholars.
- Teachers more motivated to observe and do the experiments themselves.
- Teaching and learning become more meaningful.
- To be practised in society.

Whatever knowledge that teachers had gained should be communicated to and applied by the pupils so that the pupils become balanced individuals who link science with God. Teachers hoped that the subject be introduced even at primary level. Teachers felt that there should be more of such courses and that all teachers whether science option or otherwise should be given the opportunity to attend. They have found science to be interesting and that the teaching and learning of science becomes meaningful when it is related to *tauhid*. There are teachers who believed that tauhidic science should be practiced in society.

A Summary of Observations

A summary of observations regarding teachers' concerns, perception and acceptance are give below.

Concerns

Questions that teachers gave reflect their concerns. These concerns can be categorised into matters concerning the impact of the workshop, basically the presentation of ideas on tauhidic science education, epistemology, method, implementation and curriculum.

Several actions need to be carried out for the teachers. Researchers need to develop and then introduce the framework on tauhidic science education. This would include knowledge

and understanding of the philosophical basis of tauhidic science, Quran and Sunnah as resources of scientific knowledge, the teaching and learning pedagogy, reference materials on the teaching and learning of tauhidic science.

Other matters that need to be understood and responded to are; the perception, acceptance, readiness and concerns of teachers to teach tauhidic science in the classroom. Potential activity will be the production of the teaching and learning resources.

Perception

Doubts, skepticism and concerns initially, and how the workshop had brought about a change in perception at least. Analysis of data regarding the perception and acceptance by teachers of the ideas of tauhidic science and their concerns if the subject is to be taught in schools showed that this seminar workshop had a positive impact on the teacher participants. Their minds were opened up. The inclusion of a religious dimension made their teaching and learning meaningful, and had an impact on their character. They found it interesting. While it is not sure whether it has completely eradicated their skepticism, at least they left the seminar and workshop having some gains that not only contributed to their professional life but also to their spiritual enhancement.

Teachers need to have an understanding of what tauhidic science is and they need to develop both the scientific and pedagogical skills to teach tauhidic science. Simultaneously teachers need to review, revise and update their knowledge and understanding of what science is from the perspective of *tauhid*.

After hearing what tauhidic science is all about, teachers realized how science provides a way of getting to know the Creator, and its influence on character development, rather than just learning about nature. Religious teachers found science experiments exciting and science teachers realized how nature and the Creator cannot be separated. Epistemological understanding of tauhidic science is a prerequisite — it gives a sense of direction and appreciation of the objectives

Acceptance

Teachers are at the implementation stage. Experts are at the knowledge stage. There is a spillover of knowledge from the experts to the teachers. Teachers have better knowledge and understanding of the classroom set up and the mechanics and dynamics of classroom activities. They do not have clear ideas about what tauhidic science is all about, or what the objectives, the curriculum support and reference materials are.

For successful implementation of a tauhidic science curriculum, the curriculum has to be designed and developed, teachers need to be competent, and the support system effective. Teachers were initially skeptical but after hearing, discussing and knowing

more about tauhidic science, they appeared supportive and quite ready to participate in the implementation.

Research and development need to be carried out in order to address all the issues and problems of implementation raised by the teachers. Particularly with respect to curriculum materials, especially those that involve reference to the Quran, how to approach integration, and how to manage students and teachers of different religions (policy issue). The content has to be decided upon. How can it be decided? What has to be thrown out and what has to be added? How is the decision made, designed, and tested? Financial support and resources are needed. Support from the ministry is required.

V. Conclusion

Based on teachers' feedback through the questions that they raised and the responses that they gave, their concerns, perceptions, and acceptance of the ideas on tauhidic science have been determined and reported in this paper. The questions that teachers gave at the beginning seemed to show that teachers were rather skeptical about tauhidic science and tauhidic science education, to the point of being rather antagonistic. Based on the feedback that teachers gave afterwards, it appeared quite clearly that the presentation of ideas by the experts, the practical activities that they did and discussions that took place had a positive influence on the teachers. Their perception of tauhidic science changed. This is very encouraging especially after learning from their questions about their skepticism regarding tauhidic science. Hence it can be concluded that the initial concerns of teachers were justifiable due to their lack of knowledge and understanding of what tauhidic science is all about. Once the teachers had been exposed and had a better understanding of tauhidic science they seemed appreciative of it. In fact they appeared to perceive tauhidic science as a means of character building and of bringing one closer to God. Thus the teachers perceived the spiritual dimension of science when it was based on the concept of tauhid. It appears that this factor has made them more interested in science.

Linking religion and science made a very personal impact on individuals. Religion is meaningful to these teachers. Integrating religion with science is a worthwhile job to undertake not just in the context of performing one's task as a *khalifah* of Allah but also to enhance one's position as a servant of Allah. Seeking for Allah's pleasure in whatever one does is what one hopes for. So if tauhidic science teaching can help teachers realise that hope, then tauhidic science teaching is a worthwhile and meaningful job to do. It benefits not only the pupils but also the teachers, not just for the life in this world but also as an investment for the Next world.

They appear to be acceptable to the idea of having tauhidic science education through their suggestions that more courses be conducted and that if possible all teachers be given

opportunities to attend such courses. However they would like to get the support that they need in particular with regard to the provision of the necessary materials that they need for teaching and learning. This includes having access to the relevant science related Quranic *ayahs*.

Work carried out by the research group can be seen as an intellectual entrepreneurial activity that ends with product development in the form of a new curriculum, reference materials, and modules on tauhidic science education. The extent that tauhidic science can be implemented will depend on the policy makers and whether or not the curriculum is accepted by the Malaysian Qualifying Agency of the Ministry of Education. Other than that it will depend on the question of assessment and evaluation that has not been touched upon at this stage by the research group. This can probably be taken up as the extension of the present project. Future works may focus on research and development of the curriculum and a complete package or training module, after which it will be made available for those who are interested in tauhidic science, be it within the home state or overseas.

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