

THE INTEGRATION OF ISLAMIC CONCEPT OF KNOWLEDGE (EPISTEMOLOGY) IN SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS (STEM) COURSES: WHY AND HOW?

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Abstract

The integration of knowledge in STEM is an urgent need to ensure the advancement of technology contributes to human well-being. Dualism in the education system, especially in higher education, can be seen when spiritual, divine and moral values are marginalized. In order to develop STEM professionals with a balanced personality and competency, there is an urgency for all the curriculum planners and educators in field of STEM to have a comprehensive understanding about the concept of integrated Islamic knowledge. This article attempts to view the concept of integrated Islamic knowledge and its importance. Recommendations are also provided to adopt the concept of integrated Islamic knowledge in teaching STEM courses to achieve the ultimate aim of education which are to recognize and acknowledge Allah as The Creator and also to be His vicegerent in bringing goodness to the world. Through the present work, it is hoped that the integration of Islamic knowledge in the field of STEM especially in higher learning institution will restrict the influence of dualism and secularism from distorting the main aims of education. It is expected that, with the integrated Islamic concept of knowledge, all accomplishment related to STEM will serve human and the environment way better.

Keywords: Islamic epistemology; Integration of knowledge; STEM education;

1.0 INTRODUCTION

It is undeniable that STEM has brought huge benefits in human everyday life. However, due to the Western colonialization on Muslims has caused the system of knowledge especially in the field of STEM in most of Islamic countries to accept dualism and secularism. This resulted to a dichotomous nature of knowledge where religious values and spiritual elements were being removed. The worldview of Islam holds on the concept of Tawhid, while the worldview of the West is in the spirit of dualism and

secularism. The divergence of these two worldviews lies in how the concept and sources of knowledge are being perceived [1, 2].

Unlike the Tawhidic paradigm which views knowledge as the light and guidance for human to find the truth, the dualistic nature of Western scientific knowledge considers knowledge as a tool to obtain power over human and nature to gain material benefits [3, 4, 5].

As STEM is currently being reinforced to be one of the national agenda, the need to address the

integration of divine, religious and spiritual values in STEM education is highly important to produce balanced, well rounded, trained and skilled professional in STEM. Without the assimilation of scientific knowledge with divine values, STEM education is at risk in establishing imbalanced individual and society as well as the destruction of nature [6,7]. Hence, this article attempts to discuss the concept of integrated knowledge and to propose practical ways on how can educators in the field of STEM can offer the integration of Islamic knowledge in their teaching practice.

2.0 ISSUES IN SCIENCE AND TECHNOLOGY EDUCATION

Globalization and a knowledge-based economy has made STEM to be a critical factor to succeed in information-based and highly technological society. Moreover, with the emerging Fourth Industrial Revolution which had brought artificial intelligence, cloud computing and predictive analytics to the workplace, STEM education is becoming more important.

Climate change, poverty, food security, water security and the growing world economy are amongst global issues that require the contribution in solving those problems from competent and high-skilled graduates in STEM [8, 9].

However, due to dualism and secularism, knowledge both and within disciplines have been compartmentalized and fragmented. The lack of integration of Islamic concept of knowledge into STEM courses had shaped STEM students into becoming dualist thinkers who are not capable to integrate various branches of knowledge based on Islamic perspective. Therefore, the skills to make decision and to solve problems especially in differentiating between the truth and the false amongst STEM graduates are not sufficient [10, 11, 12].

Researchers and learners who are influenced by the dualism nature of Western epistemology will be lack of sense to contribute for the benefit of the society. This is due to the marginalization of the humanity, faith and belief in God, spiritual and disconnectedness of every academic and scientific works from the sense of God-consciousness [3, 8].

The dominance of secularistic worldview in academic circles also has developed the scientists and researchers who are eager to gain power and wealth rather than contributing to the goodness of human kind. Many scientific works are misused which have resulted massive destruction, environmental pollution, exploitation of natural resources and extinction of many species [4, 13].

Although the recognition of the importance to integrate Islamic knowledge within STEM curriculum has led some of the curriculum planner to add humanities courses such as Islamic education,

history and civilization, but it is not enough. The courses are still separated from other major courses in STEM [7, 12].

Due to the absence of specific guidelines from the curriculum planner to the lecturers to implement the integration of knowledge, the efforts to integrate Islamic concept of knowledge in STEM courses are limited only to individual levels. Some of lecturers believe that technical courses such as engineering and mathematics have no direct relation with divine and ethical values and its integration are difficult and impossible. Besides, the lack of effort in referring to Islamic sources and having a comprehensive understanding on the Islamic worldview have resulted to the weaknesses of lecturers in comparing the philosophical aspects of courses, especially from the perspective of Islam and the West [7,12, 13].

Due to the lack of knowledge and creativity, many lecturers focused on delivering merely content knowledge in order to cover all the syllabus within the time provided. Their teaching styles also have high dependency on Western textbooks. They are unable to connect the syllabus with the higher meaning of human existence in accordance to the Islamic worldview [10, 14, 15].

Simultaneously, the urge to fulfill the demand of marketability among STEM graduates in the industry influences the lecturers to mainly focus on preparing competent professional workers and experts in the particular area. Thus, the commitment to instill the divine and ethical values to develop pious and holistic human being is ignored [9, 12].

Therefore, the importance of integrated knowledge in preparing highly-expert STEM graduates with a holistic understanding need to be strengthened. The first and foremost step to achieve it, is to have the understanding about the concept of knowledge from the Islamic perspective. With that, STEM could be very beneficial to gain Allah's pleasure and serve humanity.

3.0 THE CONCEPT OF INTEGRATION IN ISLAMIC EPISTEMOLOGY

Islam regardless of all knowledge either divine revelation or scientific empirical findings are essentially sourced from Allah SWT. The pillar of the integration of all knowledge is based on the concept of Tawhid. Tawhid is the concept of monotheism in Islam and it is defined as unity of God or The Oneness of God. The principle of Tawhid which is also contained in the Muslim testimony of faith (syahadah) directs to true submission to Allah SWT and absolute devotion to His commandments [1,2].

This principle elevates ones' commitment to accept and fulfill the trust and obligatory duties as servant and vicegerent of Allah. The quality of ones' good actions and deeds which are cultivated from the Tawhidic paradigm manifest the Islamic universal

characteristic – *rahmatan lil alamin* (blessing for the whole world and its content). Accordingly, all efforts including in the process of acquiring knowledge and truth through sciences or rational thinking are enormously encouraged to benefit humanity and environment as well as to prevent harms [1, 6].

Unlike Western dualistic worldview, Tawhidic worldview in knowledge unites all essential themes in Islam. Every field of knowledge would blend and harmonize the element of (i) the goal of worldly life and the hereafter, (ii) existence of real and supernatural, (iii) importance of knowledge and action (iv) the role of mind and heart (v) rational thinking and divine inspiration (vi) revelation and intellect, (vii) individual and community development, (viii) knowledge of *fardhu ain* and *fardhu kifayah*, (ix) spiritual and physical development, and (x) scientific method and metaphysical method to accomplish the ultimate purpose which is to know Allah and submit entire life to Him [2, 8, 16].

In such integration, every field of knowledge has its own hierarchy. The highest hierarchy of knowledge is derived from Al-Quran and As-Sunnah, known as religious knowledge or obligatory knowledge (*ilm fardhu ain*). Al-Quran and As-Sunnah contain truth and reality, hence must be believed without a doubt. These two sources are the core of all knowledge which involves the spiritual dimension. For that reason, the level of ones' faith in Allah and His messenger is closely associated with his or her belief in Al-Quran and As-Sunnah [8,9].

On the contrary, the West denies all forms of religious sources because religion is considered to be irrational and not scientific. Religious sources are labelled as non-factual, un-academic and not part of knowledge because the West has narrowed the definition of knowledge to merely the perception of solid fact that can be empirically and physically sensed. The way of knowing must be based on human experience, observation and study using the physical senses. The Western epistemology also is fixed solely in reasoning of the mind and rational thinking which are speculative and hypothetical in nature. Therefore, the spiritual component in human is also being disregarded [17, 18, 19].

In search of knowledge and truth, Islamic epistemology places revelation as a fundamental guidance for man to acquire knowledge. The empirical observation, scientific experiments and human thinking are complementary and interdependent with the revelation for righteous life. The development of acquired knowledge which is directed by the revealed knowledge would enable human to fulfill their roles in this world [20].

The appropriate way of seeking knowledge and discovering the truth guided by the divine revelation enable human to expand and strengthen their faith in these essential concepts which are (i) the concept of God, (ii) human (iii) knowledge (iv)

revelation, (v) universe and existence (vi) reality and truth (vii) morality and values.

The divine revelation provides definitive answers about human existence. The absolute truth derived from the Al-Quran and As-Sunnah make Islam become a complete and perfect religion for a man to gain true happiness. The revelation draws human attention to discover all scientific facts through rational thinking and empirical research, hence the existence of Allah SWT and His Uniqueness who has created all the creatures would be recognized and acknowledged by willing and conscious submission to His commandments [5, 21, 22].

Al-Quran advocates the inductive methodology which emphasizes empirical observation and deep contemplation with the correct argument and evidence. Islam denounces blind imitations and assumptive thoughts without proper and legitimate knowledge. In addition, reasoning remains necessary to comprehend the knowledge in the revelation. Reasoning and empirical research are also useful as the proof for the truth of revelation. By researching and studying the signs of Allah which are mentioned in Al-Quran, the faith in Allah SWT will grow and [8,14].

At the same time, ones' understanding of revelation are relative because the depth of knowledge varies in one another. The relativeness of knowledge is due to the limitation of human mind as well as the variety of understanding levels and interpretation towards physical phenomenon that being pointed out in Al-Quran. With the guidance of the revelation and the proper way of thinking, the unseen aspects could be accepted by logical reasoning as the truth [1,9].

Islamic concept of knowledge is more than a collection of facts, skills or personal beliefs. Knowledge is an intuitive truth which is one of the spiritual capabilities of human bestowed by Allah [1, 14, 18].

Therefore, Islamic concept of STEM education should prioritize the integration of various scientific knowledge and the revelation. Besides, the integration in the aspect of sources of knowledge, Tawhidic paradigm also has brought the integration in the sense of the purpose of seeking knowledge and learning.

The purpose of seeking knowledge are not confined to the development of individuals but also to the society and nation at large. Individuals who are nurtured with Islamic values would spread the contentment and happiness within his or her community [1, 2, 16].

With the comprehensiveness of knowledge, the ultimate objectives of Islam which consisting of protection of religion, life, offspring, intellect and wealth could be accomplished. Then, the blessings of Islam would be appreciated not only by Muslims but also the whole world [20, 22].

Knowledge in Islam is classified into two categories which are knowledge of *fardhu ain* and *fardhu kifayah*. At a glance, they seem to be separated but both of them are integrated. The knowledge of *fardhu ain* must be pursued by every Muslim in the entire life and does not limited to only the obligatory deeds in Islam. It comprises the pillar of Islam which are Iman, Islam and Ihsan. Tawhid or Islamic creed is the highest and the first knowledge that must be learnt by every Muslim. It provides the understanding of Allah and His attributes. Muslim is rewarded for the acts of worship and noble character based upon his or her strong belief in this knowledge [1, 9].

Additionally, every field of knowledge is needed in performing ones' duties and responsibilities towards him or herself, families and society perfectly considered as the knowledge of *fardhu ain*. It should be understood that this category of knowledge expands along ones' maturity and responsibility throughout his or her life [18].

In the other hand, knowledge of *fardhu kifayah* is very crucial to empower the religious knowledge and faith. Knowledge of *fardhu kifayah* is required to facilitate the people in performing the duties as the vicegerent of Allah SWT which are to prosper the earth and to safeguard the people to follow the commands of Allah SWT [9].

The knowledge of *fardhu kifayah* is very wide. Muslims need to organize the education system so that every field of knowledge has its own group of experts who are master in this category of knowledge according to their interests and tendencies. Through this knowledge, noble values in Islam could be disseminated and Islamic teachings could be strengthened [16, 17]. The integration concept discussed is illustrated in Figure 1.

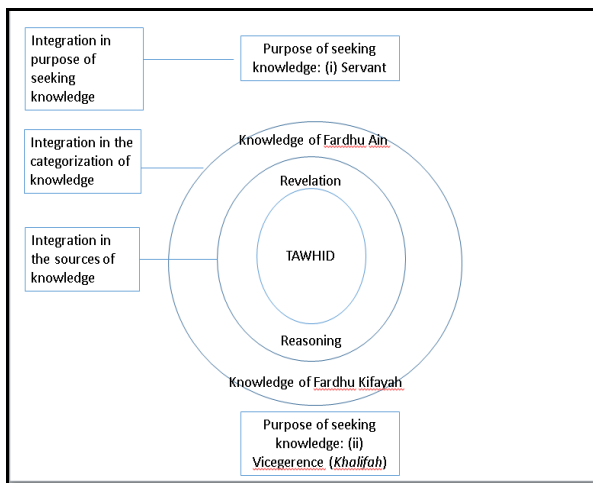


Figure 1: The concept of integrated knowledge in Islamic Epistemology

4.0 THE IMPLEMENTATION OF INTEGRATED KNOWLEDGE IN STEM COURSES

In order to achieve the effective integration of Islamic values in STEM-education, the efforts from the educator is very much required. Although there are some of educators are inclined to integrate religious knowledge in their teaching practice, they are facing lack of confidence, hindrance of knowledge, limited reference materials, unsure of the suitable strategy and too much worry towards students' respond in the integration [7, 12, 23].

Therefore, the followings recommendations are suggested for the educators especially in the field of STEM to implement the integrated Islamic knowledge concept in the classes.

(i) Relate the content of the courses through discussion that encourage the internalization of Tawhid and attaining faith in Allah SWT. Every content could creatively taught towards indicating the greatness and elegance of Allah SWT. The sense of God-consciousness through the discussion will be the basis for invention and innovation in STEM.

(ii) Refer and discuss the course contents based on the Quran and As-Sunnah by reading and discussing related Qur'anic verses and Hadiths before embarking any research. Muslim researchers of the past believed that the wisdom of Allah is reflected in the universe. STEM should be framed within the Islamic worldview that considers Allah as The Creator and Sustainer.

(iii) Incorporate the discussion about knowledge of *fardhu ain* such as Islamic creed, syariah and morality with the content to develop positive attitude and character. This can remind students the fundamental aspects of religion especially in preserving the faith in Allah SWT and encourage them to do good deeds as the preparation for the hereafter life.

(iv) Examine the content thoroughly and extract the Western worldview contained in textbooks and reference books, in particularly the aspect of spiritual and spiritual marginalization in the lesson.

(v) Instill good values and Islamic ethics in the student. The assimilation of good values in the courses is not only related with academic regulation and general ethics, but also based on the highest moral values of Islam, namely ihsan. Ihsan involves the individual consciousness on the presence of Allah SWT at all times.

(vi) Infuse the values of honesty, just, trust, sincerity and diligence by being the model for the student and through constantly advice the students. Western modern science promotes value-free in science, whereas Islam views every knowledge as value-laden. The metaphysical aspect of the universe should be taken into educators' concern that leads

to the accountability and integrity at all stages of doing scientific works.

(vi) Remind students for having correct and proper intention of seeking knowledge or doing research. The purpose of human creation as slaves and vicegerent of Allah must be inculcated. Scientific invention and research are not merely for short-term goals to obtain material and power, but what is more important is helping to solve community problems and nurturing nature. Appropriate intention in doing STEM research and learning would free human mind and behavior from slavery of non-Islamic ideologies.

(vii) Protect the demands of the Islamic law in conducting scientific work by keeping the permissible and illegal laws limit set.

(viii) Remind students about the element of dhikr or remembrance of Allah during classes. Practices such as reading Al-Fatihah, *istighfar* and prayer at the beginning of teaching and experiments can be done with students. This is to clarify that the virtue of acquiring true knowledge must be initiated with spiritual preparation that cleanses the heart by straightening the intentions and pleading for forgiveness to Allah, in accordance with physical preparation.

(ix) Conduct research work and studying on the spirit of contributing to the well-being of human life, whether individually or in society with the theme of bringing blessings to the universe.

(x) Highlight the Prophet Muhammad as the model and source of inspiration in conducting research and creation through the spirit of goodness and competing to do good deeds.

(xi) Incorporate the stories of Muslim leaders and scholars in the past to imitate the secrets of their excellence in conducting their research that today's generation are still benefitting from their work.

(xii) Relate each class lesson with student's everyday life so that's student can get the real meaning in understanding about themselves and Allah SWT. This is the basis for students to be able to make informed decisions in their lives.

(xiii) Embrace the attitude of viewing the knowledge and every information received as an integrated, balanced and harmonized with the concept of Tawhid.

(xiv) Have sense of responsibility for the survival of the environment and the universe by holding up human principles as the vicegerent of Allah SWT who are responsible for prospering the earth.

(xv) Encourage students to contemplate and reflect on the things happening around the world and foster the attitude of not accepting any ideas, especially those that are in contrast with religious values brought by Prophet Muhammad SAW.

(xvi) Conduct research with the ummatic orientation which involves solving not only individual problems within the country but also abroad.

These steps and recommendations are focusing on making the teaching of STEM courses positively

affects the mind and the heart of the students with its integrated elements of divine, spiritual and ethics that centered upon Tawhidic paradigm. Therefore, graduates of STEM education system with high principle of Islamic morality who are able to contribute for peace and harmony to the world can be produced.

5.0 CONCLUSION

The integration of knowledge requires clarity of worldview in all parties respectively educators and curriculum planners. This articles is an attempt to make a shift in the general outlook on science and technology, specifically in STEM education. Science and technology are tools that supposed to serve human in their role as vicegerent of Allah.

The desire and willingness to integrate religious and spiritual element in STEM field of knowledge will provide huge benefits in producing balanced and holistic individuals and in the society at large. Plus, having integrated knowledge which imbued by the worldview of Islam directs towards the goodness of the STEM education development and ultimately contribute to the happiness and excellence of each individuals in the country and ummah.

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