

# Implementation of Unity of Science on Ilm Falak's (Islamic Astronomy) Curricula

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**Abstract—** *The aim of this study is to determine the implementation of the Astronomical Science Study Program curriculum at Walisongo State Islamic University in Semarang. The principles of Unity of Sciences (wadat al-ulum) are used to implement the curriculum as a new vision of the university in the formulation of an appropriate graduate profile. A qualitative approach was employed while conducting the research, different literatures were reviewed and some parties were interviewed. And the purpose of this was to obtain a SWOT analysis and a comprehensive data on the curriculum applications in the Astronomy Science Study Program. The results reveal that the framework of Astronomy are in three philosophy of science perspectives which are ontology, epistemology and axiology. Also, this new astronomy curriculum can be the standard used by the University in integrating science and religion. Nevertheless, there are factors that must still be considered in this curriculum, for example the field factors for prospective alumni work so that the curriculum that continues can be utilized by the community.*

**Keywords:** *Unity of Science, Ilm Falak, Islamic Astronomy, Curricula*

## I. INTRODUCTION

Ilm falak or Islamic astronomy was considered to be a minor course and ignored in both Islamic studies and science before 2007. And due to its importance, Astronomy as a science, now has a maximum of 4 credits in every department that offers it in higher education learning at the Faculty of Sharia, IAIN Walisongo, while other majors only have a maximum of 2 credits. A perfect description of astronomy in "mabadi 'al-asyrah" includes learning the Qibla direction, the beginning of prayer time, the beginning of the lunar month and that of the eclipse. But most graduates from the Faculty of Sharia do not have expertise in it due to their lack of mastery and understanding of the course.

Then at the beginning of the 2007 academic year, the Ministry of Religious Affairs collaborated with the Directorate of Education Diniyah and the Faculty of Sharia, IAIN Walisongo, through PBSB (Scholarships Outstanding Santri Achievement) by opening Astronomy Education Concentration Center (KIF) under the Department of al-Ahwal al-Syakhsiyah. From that point, Astronomy has been given a considerable amount of 48 credits from the 148 credits available for all courses and since 2013, the Astronomical Science Concentration has been approved as the first study program in the faculty.

Also, the university started programs at both the Masters and Doctoral levels which according to the Rector of UIN Walisongo, Prof. Dr Muhibbin M.A, are the only Astronomy study programs in the whole Indonesia or may be in the whole world. And according to him, it is an opportunity for universities to contribute to developing the study of Astronomy in a broader sense. And that with time, they will facilitate the development of astronomical studies that can provide a proof which will be based on two methods, namely reckoning (theoretical) and rukyat (observation) and both will be mutually supporting and complementing studies related to astronomy which can also be used as an object for functional determination of worship in Islam.

In Indonesia, there are still differences between the provisions of the Government and some Islamic communities as regards the determination of the hijriyah month, the beginning of Ramadhan, Shawwal and Zuhijjah. This difference also occurs in neighboring countries like Malaysia, Singapore, Brunei Darussalam and other countries with population not as much as Indonesia. The differences that arise from several communities include the An-Nadir Gowa community, South Sulawesi with the tidal sea water rukyat method, the Thariqah Naksabandi community, Pasar Baru, Padang, West Sumatra who use reckoning and so on.

Although efforts towards the unification have long been carried out in determining the beginning of the lunar month in Indonesia, in the Ministry of Religion of Brunei, Indonesia, Malaysia and Singapore (MABIMS) countries, and at international level, there have been no signs of unity yet. Previously there was the formation of the Hisab Rukyat Body, which is now called the Hisab Rukyat Team at the national level facilitated by the Ministry of Religion of the Republic of Indonesia with the responsibility of working out meetings, workshops and so on. Then, there was a regular meeting of MABIMS where they always discussed efforts made in the unification process at the regional level of the Southeast Asia. Notably among those meetings was the one held at the international level on February 18-19, 2013 / 8-9 Rabiul at the end of 1434, tagged "The Preparation Meeting for the International Crescent Observation Conference" in Istanbul, Turkey. Also on June 26, 2013 was another one titled the "5th Conference on Lunar Crescent Visibility and Calendar" by the Institute of Geophysics, University of Tehran, Iran.

Later, with the existence of a planetarium observatory owned by UIN Walisongo, there was a strategic opportunity

to contribute to the unity of Hijriyah Calendar in Indonesia. And the Chancellor of UIN Walisongo, Professor Dr Muhibbin, MA, stated that science study programs will be developed specifically which will later become a center of excellence for this institution (read Developing Astronomy Study Program in Master / Postgraduate Program, November 17, 2011, UIN website). The determination was based on various considerations of the availability of human resources experts in the field of Astronomy and their role in various national interests relating to Astronomical science. Even the university was serious about preparing an observatory planetarium which was realized through the Islamic Development Bank assisted fund.

Therefore, the implementation of the Astronomy Study Program curriculum requires adjustment by using the principles of the Unity of Sciences paradigm (*wadat al-ulum*) as a new vision carried out by Walisongo State Islamic University Semarang. The purpose of this study is to determine the implementation of the Unity of Sciences paradigm (*wadat al-ulum*) as a new vision of UIN Walisongo in the Astronomy Science Study Program curriculum.

## II. LITERATURE REVIEW

The study of Astronomy available in various materials did not focus specifically on the Astronomy curriculum. And in general, astronomical research is divided into four, namely the concentration of pure astronomical studies, script studies, collaborative studies with Islamic law and case studies. Pure astronomical research is oriented towards astronomical proof on issues that has to do with signs of the universe in Muslim worship. Research on astronomical manuscripts includes the thoughts of the author of classical astronomy, the method of reckoning, the origin of reckoning, the comparative study of reckoning, influence, accuracy, and the algorithm of the astronomical book of reckoning.

There are some research on the collaboration of astronomy and Islamic law. Research on *rukyat* reckoning which elaborates and interprets the meanings of the arguments (*Al-Quran* and *Al-Hadith*), comprehensively in a scientific objective framework, does not only follow the opinions of the scholars. The interpretation of the meaning of *fiqh* in the matter of *rukyat* reckoning as a whole is very possible in the present because the scientific and theoretical approaches are broader and more capable to be applied in the analysis of the interpretations of the *rukyat* reckoning verses.

Other studies related to case studies that cover the issue of astronomy using anthropological, sociological, and astronomical approaches to analyze the problem pertaining to the direction of the Qibla of ancient Mosques or the study of methods for determining the beginning of the mass organization or institution in the community.

## III. METHOD

This is a descriptive study with the use of critical analysis. The analyzed data describes the scientific knowledge of astronomy in an epistemological manner, traces the development of learning and curriculum, then formulates a curriculum based on the principles of unity of sciences. Both primary and secondary data were used in this research. The primary data was in the form of astronomical scientific study data in the epistemology region, while secondary data was in the form of writings, research, and books that study astronomy

both substantively and in a learning framework using a curriculum.

Then with the use of interview, the author gathered different opinions about learning and the ideal curriculum for the development and learning of Astronomy so as to achieve unity of sciences efforts at the Walisongo State Islamic University

## IV. RESULT

### A. *Ontology, Epistemology, and Axiology of Ilm Falak*

Ontology is from the Greek words, *On / Ontos* = there, and *Logos* = knowledge. Therefore, ontology is an existing science. It discusses what we want to know and how far we want to know it. This theory review can answer several questions which include: 1). What object of knowledge will be studied? 2). What is the essential form of the object? and 3). How is the relationship between the objects with human capture power (like thinking, feeling, and sensing) that can be easily understood? Based on these, ontology is the science that discusses the nature that exists in the form of physical / concrete or spiritual / abstract. From this, we can conclusion that ontology talks about the origin and the existence of science, discussing the inherent problems while also learning to understand the existence of science [1].

In accordance with the definition of Falak Science as given by some scientists discussed earlier, the ontology of Falak science basically discusses the extent of the area and parts to be studied. This section is about the universe and celestial bodies which include stars, planets and satellites and their movements. The universe is every phenomenon that exists around the planet Earth and outside space. Some of the examples are the occurrence of refraction when the sun appears and one moves up or down of a horizon, or when the position of the Moon and Sun is on the same longitude. In a wider view, then every celestial body that results in a phenomenon related to the instructions of worship, studied in Falak science are as follow:

- 1) Stars are objects of celestial bodies consisting of flaming gases like the Sun, especially those that appear at night.
- 2) Planets are celestial bodies (such as Mars, Venus) that do not emit heat or light and move around the Sun constantly.
- 3) Satellites like the moon are celestial bodies circling the Earth, glowing at night because of the reflection of the Sun's rays.

In its application, Falak is often identical in the direction with the Qibla, the making of the prayer time schedule, in determining the beginning of the Hijri month and eclipse events. However, this Science has an object of study that can be developed into other sciences which include: cosmogony, cosmography, astromechanical astrometrics, and astrophysics [2]. In Muslim literatures, it is called the Science of Reckoning, *Ilm al-Rashd*, or *Ilm Miqat* [2].

Epistemology is a branch of philosophy that deals with the origin, method, structure and validity or truth of knowledge

[3]. And in relation to science, the epistemological foundation questions how the process results to form knowledge, how the procedure is, what things must be considered so that we get the right knowledge and how to know the right techniques or tools that can help us to gain knowledge. From the science of Falak, epistemology can be seen as the study of the trajectories of celestial bodies, such as the Sun, Moon, Stars and other celestial bodies. It helps to determine the position of these celestial bodies and the positions of other objects in the sky with certain methods. And the method for achieving this truth of the nature is the scientific method, by applying the knowledge gotten from astronomy, physics, and geography [4].

The epistemological foundation of Falak science is reflected operationally in the scientific method which is the way to obtain and compile knowledge based on:

- 1) A logical framework of thinking with arguments that are consistent with prior knowledge that has been successfully compiled.
- 2) Description of the hypothesis which is a deduction from the framework
- 3) Verification of the hypothesis so as to factually test the truth of the statement [5].

Therefore, we can conveniently say that Falak science is compiled with scientific arguments based on previous knowledge that has been successfully compiled such as geocentric and heliocentric theory. The heliocentric theory has to do with the calculation of the position of celestial bodies by using the Sun as the reference center of the solar system. Then, verification of the position of the celestial body in the viewpoint of observers is on the surface of the Earth and this is an example of Falak science with scientific methods. And the nature of this scientific method, firstly, is systematic and controlled because it is based on two reasons namely: deduction and induction. Deduction is the use of conceptual and theoretical means in explaining symptoms while induction is the *rashdul* phenomenon that is taking many cases and symptoms that exist, then concluded in general. Secondly, it is empirical which requires validation of all one's subjective beliefs. That is, observation of a phenomenon is carried out in restrained and controlled manner, without any subjective element of someone. For example, to find out the beauty factor of dawn, a number of control variables were collected for the events studied. And thirdly, has a self-correcting nature, which is a systematic and controlled procedure that allows a person to avoid significant errors when using it to solve life problems [6].

Then, the science of axiology has to do with the usefulness or function of knowledge. Axiology discusses the use value or purpose of knowledge and its relation to moral order [7]. Its science includes the value of normative benefits in giving meaning to the results of epistemological studies or truths that we encounter in everyday life. And its meaning can be teleological and ethical. Teleological in the sense that it is a science intended for a purpose: truth, forecasting, controlling, and explaining; then ethical, in the sense that it can increase human dignity and integrity, and also involving the structure and culture of a society [8]. The usefulness of this science is

to produce knowledge that can be used for a purpose which includes:

- 1) Proving a truth.
- 2) Finding a knowledge.
- 3) Gaining an understanding of phenomenon.
- 4) Giving an explanation.
- 5) Forecasting.
- 6) Controlling
- 7) Applying [9].

Considering the uses above, the purpose of science is more than one, and it was developed by scientists to achieve truth or gain knowledge. It can provide humans with the understanding about the natural world and all the elements within it.

In relations to Falak science, axiology has the benefit of practical applications in determining the direction of the Qibla, prayer times, the beginning of the Islamic month, and the Islamic calendar. However, Falak science should also be able to provide order and comfort for Muslims in carrying out worship and clear the issue of getting stuck with the difference criteria in knowing the beginning of the Hijriyah month. Also, to provide an established Islamic calendar so as to mark the past and then predict the future. The value of Falak science is not only limited to the issue of worship, but also as the work of Muslims in advancing science and technology, in providing comfort for places of worship, for example, Falak knowledge is needed in order to perfect the direction of the Qibla, enter the prayer time and the time to fast accurately.

It should be noted that axiology is said to be successful if its knowledge can be useful for human life. And since astronomy is a concept and guideline for humans in knowing the direction and time so that the worship of Muslims can be carried out properly. It is therefore related to astronomy. Thus, one of the other benefits of this knowledge is to rebuild the civilization of Islamic science that once triumphed in the 15th century. We will find many discoveries of Falak scholars in finding practical tools that are used to determine the direction of the Qibla, the coordinates of a place, prayer times and simple tools about the *pranamatangsa* calendar cycle based on the position of the Sun.

#### *B. Formulation of Unity of Science-Based on Falak Science Curriculum*

The concept of curriculum built based on unity of science, which is also called *wahdah al-'ulum*, is designed with the principle of unification between religious science and science. Unity of science is the integration of religious science and science that needs to be applied through the course curriculum.

And the one developed by UIN unified all branches of science by providing a revelation foundation as a binding of the unification. More so, the unification involves the *al-qur'an* which combines the methodology of the natural sciences with that of humanities. This concept is very appropriate when associated with the Falak Science Study Program. Astronomical scholarship is based and bound by revelations in the form of verses of *al-quran* and the instructions of the

Prophet and the knowledge of celestial objects is studied by involving revelation with a noble purpose to perfect worship.

Considering the explanation above, the meaning of unity of knowledge for Walisongo Islamic State University is very typical because it is a paradigm adopted by the institution. And this emphasizes that all knowledge is dialogue with each other and leads to one goal that is to bring the learners to get to know and get closer to Allah, the Most True (al-Haqq).

The principles of the Unity of Sciences paradigm (wadat al-ulum) are explained as follows:

- 1) Believing that the building of all knowledge as an interconnected entity all derives from the verses of Allah, both those obtained through the Prophets, the exploration of reason, and the exploration of nature.
- 2) Combining the universal values of Islam with modern science to improve the quality of life and human civilization.
- 3) Conducting intense dialogue between sciences rooted in revelations (revealed sciences), modern sciences, and local wisdom.
- 4) Producing new knowledge that is more humanistic and ethical which is beneficial for the development of the dignity and quality of the nature and its preservation.
- 5) Knowing the plurality of reality, methods and approaches in all scientific activities. The Unity of Sciences paradigm uses the theo-anthropocentric approach that is a perspective that the reality of divinity and humanity is a unified and inseparable unity. For that reason, in being knowledgeable, humans cannot escape from divine values.

The strategy for implementing the unity of science in the curriculum is formulated as follows:

- 1) Humanization of Islamic sciences, which has to do with reconstructing the sciences so that they can touch and provide solutions to the real problems of human lives in Indonesia. It includes all efforts to integrate the universal value of Islam with modern science in order to improve the quality of life and human civilization.
- 2) Spiritual science, which has to do with the spiritualization, is to provide a foundation based on divine values and ethics towards secular sciences to ensure that basically all knowledge is oriented towards increasing or sustaining human life and the universe, and not for defamation or destruction. It includes all efforts to build new knowledge based on awareness of knowledge derived from the verses of God words obtained through the Prophet and also through reason and natural explorations.

To compile a curriculum formula consisting of graduate profiles, learning outcomes and curriculum structure, there is a need for the SWOT analysis of the Study Program curriculum that has been used. The findings from this SWOT analysis are as follows:

#### 1) Strength

- a) Curriculum is prepared based on the needs of stakeholders / users and the number of alumni involved in the work is not in small measure. This shows that the curriculum used so far is of high quality.
- b) The curriculum used provided the alumni with the ability to serve in the Pesantren, as well as continue with their studies (higher education).
- c) The curriculum is prepared based on the special characteristics of Falak science and involved stakeholders, like the Indonesian Falak Lecturer Association (ADFI) for the perfection of the curriculum.
- d) Lecturers who teach have relevant academic qualifications in their fields and teach according to their ability in that field.

#### 2) Weakness

- a) The Falak Study Program curriculum is still unable to compete with similar study curriculum outside the universities, mainly at the ASEAN level.
- b) The Falak Study Program curriculum has not been maximized in providing personal skills, in the form of a course structure that changes in a certain period and there are courses that have not been arranged in stages.
- c) The Falak Science Study Program has not been maximal in implementing the Quality Management System in controlling the teaching and learning process
- d) The use and function of the Falak Science Laboratory is not maximized, especially the optical devices.

#### 3) Opportunity

- a) Trust and collaboration with the Ministry of Religion in accepting outstanding students into the Santri Scholarship Program (PBSB) with a concentration of Falak Science.
- b) University facilities support the development of the Falak Science Study curriculum.
- c) The Chancellor affirmed that UIN Walisongo will establish a Falak science study program which will be developed to specifically become a center of excellence for various institutions.
- d) There is a plan to make an observatory planetarium from the funds given in the form of assistance by the Islamic Development Bank.

#### 4) Threat

- a) A similar study program curriculum that is in line with international standards has been designed in Malaysia.

- b) There could be changes to government regulations with regards to curriculum standards due to changes in policy holders.

Considering the principles and strategies of the unity of science implemented in the curriculum as well as the results of the SWOT analysis above, the authors provide an alternative offer as a model in formulating the Falak Science Study Program curriculum which is purely science as in other university namely ITB. This is a balance option because it has Falak science with a portion of fiqh.

Falak science based on unity of sciences is translated into graduate profiles as shown below:

- 1) Falak scientist and practitioner
- 2) Falak teaching staff in Islamic boarding schools.

The profile of these graduates must have specific learning outcomes on specific knowledge and skills as follows:

- 1) Graduates of the Falak Bachelor of Science Program must have special knowledge as follows:
  - a) Having knowledge related to how to express scientific ideas orally and in writing in Indonesian by using good and correct language in the development of both the academic and the non-academic world.
  - b) Understanding of Arabic and English texts to support the knowledge with regards to astronomy;
  - c) Having knowledge of Islamic basics as rahmatan lil 'alamin based on unity of sciences for humanity and civilization;
  - d) Understanding the knowledge of the Qur'an and the Hadith;
  - e) Mastering the basic theory of fiqh science;
  - f) Mastering the theories and methods of Islamic law;
  - g) Mastering legal science theory and material and formal law sources;
  - h) Mastering the basics of celestial science;
  - i) Mastering the development of celestial science;
  - j) Mastering the basic theory of astronomy-based fiqh science;
  - k) Understanding istimbath methods of Islamic law based on astronomy;
  - l) Mastering the arguments of the Qur'an and Alhadits that are related to the study of astronomy;
  - m) Mastering the theories of reckoning;
  - n) Understanding foreign language literature in both classical and modern languages;
  - o) Mastering astronomical theory of astronomy;
  - p) Mastering the basic theory of scientific methods;
  - q) Understanding conflict resolution

- 2) Graduates of the Falak Bachelor of Science Program must have the following special skills:
  - a) Skilled in completing lawsuits;
  - b) Skilled in doing research;
  - c) Skilled using classic and modern astronomy;
  - d) Skilled in compiling calendars, prayer times and determining the direction of the Qibla;
  - e) Skilled in observatory planetarium;
  - f) Skilled in the world of justice.

## V. CONCLUSION

Based on the previously described, two conclusions can be drawn. First, Falak Science can be viewed from an ontological point of view or its material objects, which are mainly the celestial bodies like Sun, Moon, Star, and Earth. And in terms of epistemology, the theory that builds knowledge in astronomy is the science which includes mathematics and geometry (courses in the Faculty of Science) and jurisprudence as well as the ushul fiqh (courses in the Faculty of Sharia). Then the axiological form of astronomy is for the benefit of Muslims' worship. And conclusively, the Falak Science Study Program stands on two scientific feet which are interrelated: science and jurisprudence.

The unity of sciences-based study program curriculum formed is a curriculum with a balanced design of fiqh and science. This balance is found in the curriculum concept which consists of competencies, graduate profiles and course composition. The competence of graduates from the unity of sciences-based curriculum is to have special knowledge and skills in science. The profile of graduates is to become a scientist and practitioner of Falak science or teaching staff in Islamic Boarding Schools. And the composition of the subject is fiqh and science which are included in the basic subjects of personality, knowledge, work skills, attitudes and working behavior and subjects in any community life.

This research is a concept of Falak Science Study curriculum based on unity of science that should be used as a developmental model for Study Programs in other Universities with the principle of unifying the science of fiqh and other science by exploring the ontology, epistemology and axiology of Falak science with the sole aim of perfecting worship among the Muslims.

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