INTEGRATING MATHEMATICS AND RELIGIOUS TEACHINGS AND VALUES IN ELEMENTARY AND SECONDARY SCHOOL

Abdussakir
Universitas Islam Negeri Maulana Malik Ibrahim Malang
Jl, Gajayana 50, 65144, Malang
E-mail: sakir@mat.uin-malang.ac.id

Abstract:
National Education has the main objective to educate students to be worshippers of Almighty God and have a noble character. The facts show that the time allocation for religious and character subjects is less than mathematics. The policy to strengthen character education is expected to be a solution with content integration and value internalization. However, it is just still limited to the introduction of value rather than value internalization in schools. Thus, religious knowledge and value cultivation need to be done through mathematics learning. This paper attempts to describe the learning of mathematics integrated with religious teachings and values.

Keywords: *Mathematics Learning, Integration, Internalization, Religious Teachings, Religious Values.*

Education is a conscious and well-planned effort to create an atmosphere and learning process so that learners actively develop their potential for having spiritual power, self-control, personality, intelligence, noble character, and the skills needed by himself/herself, society, and the state. The definition, as stated in basic law (Undang-undang, well-known as UU) no. 20 year 2003 on National Education System, clearly states that the spiritual power, personality, and noble character become the main objective. This is in accordance with article 3 UU no. 20 year 2003 that National Education aims to develop the potential of learners to be believers and pious to Almighty God, to have a noble character, healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens.

That the main objective of National Education is to create a human being who believe and obey the Almighty God and has a noble character, religious and character education has more credits compared to other subjects in primary and secondary education. According to the regulation of Ministry of Education and Culture no. 67 year 2013, time allocation for religious and character education is less than the time allocation for other subjects such as Indonesian language and mathematics, both in primary and

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secondary education. This fact certainly requires the right policy for the main objective of education to be achieved. Education in schools should be able to develop the value and character of each learner through religious values although it must also be harmonized with the progress of science and technology (Maarif, 2015 and Widodo, 2017).

The moral decline and lack of religious values (Arifin, 2012, Wahyudin, 2013, Irawan, 2016, Maryati & Priatna, 2017, and Wewe, 2017) urged the need for reform in education (Rahman, 2016). The community began to feel the lack of religious values and morals taught in school. The parents have choice to send their children to religious education institutions such as *madrasah diniyah* (Religious School) as additional education is difficult because time spent by children in schools is long enough. When the choice is imposed on religious educational institutions separately, the parents worry about their children regarding the mastery of science and technology despite superiority in the religious field. The mastery of science and technology and religion need to be aligned and balanced (Ar, 2017).

The government has tried to pursue a solution by strengthening character education (Pradana, 2016). The Ministry of Education and Culture implemented the strengthening of character education rolled out since 2010 (Bilda, 2016 and Irawan, 2016). The function of character education is to develop the basic potential of a child to have a good heart, good behavior, and good mind (Silahuddin, 2017). The character education aims to form tough, noble, moral, tolerant, and cooperative nation (Yuliasmini, 2018). With the strengthening of character education, in addition to thinking (literacy) National Education programs are encouraged to look back at the heart (ethics and spiritual), sense (aesthetic), as well as sports (kinesthetic) (Rahman, 2016). The facts in the schools show that character education is still limited to the concept and recognition of norms or values and not at the level of internalization and real action in everyday life yet (Pertiwi & Marsigit, 2017).

Basically, there are still two major problems in educational system namely; (1) the need to support the students to be believers, pious and have good characters but the time allocation for religious and character subjects is still very less. And (2) the inculcation of norms and values must reach internalization and real application level but

it is still at the level of concept and introduction. This paper tries to provide alternative solution for these two problems by learning mathematics as a means of conveying religious teachings and values. The religious teachings and the internalization of character are not solely done through religious and character subjects but also mathematics subject.

INTEGRATION OF MATHEMATICS AND RELIGION

Islam does not separate science and religion (Abdussakir & Rosimanidar, 2017) including mathematics and religion. In about the 8th and 9th centuries AD, mathematics and astronomy are the most preferred science by Muslim scientists. Arithmetic is studied by Muslim mathematicians for counting inheritance (*faraidh*) and making Islamic calendars. Astronomy is studied to determine the direction of qibla, the beginning of praying time, and the beginning and end of fasting in Ramadhan, Muslim holy days, and other purposes. Astronomy was also studied to assist the journey in performing the pilgrimage (Mohamed & Hafedh, 2001).

Ontologically, mathematics is viewed as a science derived from Allah the Almighty provided through *kauniyah* (universe) and *qauliyah* verses (al-Quran). Epistemologically, learning mathematics is done holistically through the utilization of the potential of *dzikir* and thought with *burhani, bayani,* and *'irfani* method. The rationalist, empirical, and logical approach (*bayani* and *burhani*) and the intuitive, imaginative, and metaphysical approach (*'irfani*) are used together in studying mathematics. All of these are not separated from religion as described in the Qur'an (Qs. *al-'Alaq*: 1) which means "Read by (naming) the name of your Lord who created". While axiologically, mathematics is learned to be used in order to carry out human tasks as servants (*'abdullah*) as well as *khalifah* (khalifatullah) (Abdussakir & Rosimanidar, 2017).

Learning mathematics is very important because all areas of life require mathematics. Mathematics is not only necessary for the development of science, technology, and mathematics itself. Other areas of life such as economics, social, psychology, health, politics, art, music, communication, and religious practice also

require mathematics. Once Imam al-Ghazali stated that learning mathematics is an obligation, although classified as *fardlu kifayah* (Abdussakir, 2007).

Mathematics is taught with the ultimate goal of developing skills in problem solving, reasoning, communication, connections and representation to deal with every situation and problem in life (NCTM, 2000). Another important goal is to develop good attitudes and values (Abdussakir, 2007). Mathematics itself contains the values of agreement, freedom, consistency, universality, obedience, honesty, and openness (Suyitno, 2012). While mathematics education contains the value of discipline, honest, hard work, creative, curiosity, independent, communicative, and responsibility (Maryati & Priatna, 2017). These skills and values are essential to present and future life, which are also essential things taught in religion.

INTEGRATION MODEL OF MATHEMATICS AND RELIGION

The integration of mathematics and religion has been widely discussed. Furthermore, concrete implementation in the practice of learning and everyday life is needed. The facts on the ground show that there are still many educators having difficulty in integrating mathematics and religion. The practices found in the schools are just the installation of verses of al-Quran or *hadith* on certain topics since there is no standard model for the implementation of mathematics and religion.

Based on the prior works and deep reflection, Abdussakir & Rosimanidar (2017) formulated four models of integrating mathematics and al-Quran. The four models can be explained as follows.

1. Mathematics from al-Quran

In this integration model, mathematics is studied and developed from al-Quran. The explicit mathematical concepts in al-Quran such as numbers, number relations, number operations, ratios and proportions, sets, and measurements as well as explicit ones such as relations, functions, estimates, statistics, logic and mathematical modeling serve as the initial basis for explaining or developing mathematics. For example, when educators want to teach the concept of multiplication, it begins by reviewing *al-Baqarah* verse 261. The repeated summations of 100 + 100 + 100 + 100 + 100 + 100 + 100 are

brought to the 7 x 100 notation. Further examples can be seen in Abdussakir (2009) and Abdussakir (2014).

2. Mathematics for al-Quran

In this integration model, mathematics is studied and used to carry out or execute commands in al-Quran. For example, mathematics is used for the determination of the two *kulah* (a measure of water), the division of inheritance (*faraidl*), making calendars, determination of the direction of *qibla*, calculation of the time of prayer, determination of *zakat* value, and for other *muamalah* (an action). A more complete example in the fiqh context can be seen in Muniri (2016).

3. Mathematics to Al-Quran.

This integration model is broken down into 3 sub models namely (1) to explore, (2) to explain, and (3) to deliver. Mathematics as tool to explore the al-Quran means that mathematics is used to explore the mathematical wonders contained in the al-Quran, for example, Salim (2007) which examines the nine-point magic of 19 or Aziz & Abdussakir (2006) using mathematics to analyze the al-Quran. Mathematics as tool to explain the al-Quran means that mathematics is used to describe verses of the al-Quran relating to mathematical calculations or other mathematical aspects. For example, mathematics is used to explain the duration of the prophet Noah lived with his people or of *Ashhabul Kahfi* (a group of youth) sleeping in the cave (Abdussakir, 2014). Mathematics as tool to deliver al-Quran means mathematics is used as a means to teach and convey the content of the Qur'an material to the students. For example, in explaining the relation and function are used examples of surah names and number of verses or names of prayers and *raka'at* (Abdussakir & Rosimanidar, 2017).

4. Mathematics with al-Quran

In this integration model, mathematics is linked or based on al-Quran values to develop *al-akhlaq al-karimah* (good moral) which are internalized through the study of mathematics. For example, in mathematics learning, values such as consistent, obedient, honest, open, disciplined, hard work, creative, curiosity, self-reliance, communicative, and responsibility are explained and instilled in students.

For mathematics with al-Quran models, Abdussakir & Rosimanidar (2017) developed four strategies of internalizing the value of the al-Quran in mathematical learning, namely (1) infusion, (2) analogy, (3) narration, and (4) immersion.

a. Infusion, i.e. in the learning of mathematics, the teacher emphasizes on the aspects of al-Quran value either implicitly or explicitly.
b. Analogy, i.e. in the learning of mathematics; teachers do analogous content of al-Quran values.
c. Narration, i.e. in the learning of mathematics, teacher tells the stories related to mathematics or mathematical figures to take both wisdom and exemplary.
d. Immersion, i.e. in the learning of mathematics, teacher shows exemplary behavior related to mathematics values such as honesty, sincerity, accuracy, and obedience. That is, the mathematics teacher is a good example (*uswatun hasanah*) for students.

Mathematical and al-Quran integration model as well as the strategy of internalizing the values of the al-Quran through mathematical learning can be adapted more generally into the integration of mathematics and religious material and strategy of internalizing religious values through mathematics learning. According to the main purpose of this paper that is to explain the learning of mathematics as a means of conveying religious material and instilling religious values, then the next discussion focused on mathematics as tool to deliver religious materials and mathematics with religious values models.

INTEGRATING MATHEMATICS AND RELIGIOUS TEACHINGS

We give some examples of implementation for integrating mathematics learning with religious teachings. These examples are expected to be an inspiration for the development of integrated mathematics learning with other religious teachings.

Example 1 (Elementary School)

When the teacher teaches the addition of positive integer, questions like "3 + 4 = ..." can be changed to "The result of 3 + 4 is the equal to the order of what surahs in the Qur'an?" Another question is, "How many verses in *al-Kafirun* and *an-Nas*?" Using questions like this, students will learn the addition of numbers as well as learning religious teachings. The numbers pattern can be attributed to the order of the prophet's

name or the order of surahs in the Qur'an, for example by searching for names which are on even order or in order of multiples of 5.

Example 2 (Junior High School)

Normally, teachers explain the mean, median, and mode start by asking the shoe size of some students. The student and his shoe size are written on the board. Having obtained some shoe size data, the teacher begins to explain the mean, median, and mode using the data. This kind of learning can be replaced by asking verses number of short surahs, e.g. from 15 short surahs at the end of the al-Qur'an. From the data of verses number of several short surahs, the teacher begins to explain the mean, median, and mode.

Example 3 (High School)

The relation or function material can be started by writing the names of angels as the first set and the description of their duty as the second set. Furthermore, the relation is done between the name of the angel with his duty. Another way can be done by writing some short surah names as the first set and numbers 1 through 20 as the second set. Relation is done between the names of the surah with the verses number contained therein.

INTEGRATING MATHEMATICS AND RELIGIOUS VALUES

Some people still assume that mathematics is value free and free of culture (Bishop, 1994) whereas mathematical knowledge is loaded with human values and cultural values (Ernest, 1998). Values are an integral part of every mathematics material (Bishop, 2001) but very rarely shown explicitly in mathematics books (Bishop, Seah, & Chin, 2003) and in the classrooms. Therefore, the introduction and cultivation of values needs to be done in a real way in the learning of mathematics in the classroom.

Internalization of values in mathematics learning such as stated earlier can be done in 4 strategies, namely *infusion*, *analogy*, *narratio*n, and *immersion*. The following are examples given for each of these strategies.

a. Infusion

In this strategy, teachers emphasize aspects of religious values that exist in learning or topics. When doing the learning of mathematics with an open-ended approach, at the end of the individual work phase teachers can emphasize the value of

curiosity, responsibility, discipline, hard work, creative, and independent. In the final phase of group work, teachers emphasize tolerance, communicative, democratic, respectful achievement, and peace of mind, environmental care, social care, and responsibility. Similarly, when applying cooperative learning. When teachers or students complete a question on the board, teachers can emphasize the importance of accuracy, clarity, consistency, and persistence.

b. Analogy

In analogy strategy, teacher performs the analogy of the values of the math material taught. For example, value of honesty can be taught through the analogy of multiplicative operation of integers. The following properties

(1) positive × positive = positive

(2) positive × negative = negative

(3) negative × positive = negative

(4) negative × negative = positive

developed into the conclusion of the analogy

(1) saying the truth is true is a positive behavior

(2) saying the truth is wrong is a negative behavior

(3) saying the wrong is true is a negative behavior

(4) saying the wrong is wrong is a positive behavior

Some examples of other analogies can be seen in Abdussakir (2017).

c. Narration

Narration strategy is also called story strategy. In this strategy the teacher tells the stories of a mathematician or public figure to be an example in terms of his/her kindness or wisdom. For example, the story of a little Gauss who is able to answer the sum of 50 first natural numbers quickly and unexpectedly by his teacher. From this story taken positive values related to the versatility and passion in learning.

d. Immersion

This strategy is also called *uswah hasanah* (good model) strategy. Here, teachers demonstrate exemplary behavior related to religious values such as honesty, sincerity, accuracy and discipline. Teachers are idol figures for students who sometimes exceed

their own parents. By this strategy, teachers teach the virtues of goodness and exemplifies the actual practice to the students.

CONCLUSION

The learning of religious topics and the internalization of religious values is not solely done through the subjects of religion and character, but it can also in mathematics learning. The integration model of *mathematics to deliver religious teachings* and *mathematics with religious values* can be applied as a way out to achieve the goal of National Education. Internalization of religious values in learning mathematics can be pursued through infusion, analogy, narration, and immersion strategy. The challenge faced with this integration model is that teachers are required not only understand the mathematics topics but also understand religious topics and become the role model for the students

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