


## Myths, Islamic View, and Science Concepts: The Constructed Education and Knowledge of Solar Eclipse in Indonesia

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### ABSTRACT

This study examines Indonesian students' constructed knowledge of solar eclipse. It investigated the embraced myths, religious view—particularly that of Islam, and science concept that build students' comprehension of the solar eclipse. A survey was done in Bandung (Indonesia), where the solar eclipse took place on March 9, 2016, to 529 students (categorized on age and educational level) and 67 lecturers, and interviews with college students. Results showed that students' belief on mystical stories decreased along with the older of the age and the higher of their educational level. Furthermore, most lecturers have good understanding about the solar-eclipse rituals and myths, in which this supports the student understanding. The interviews revealed that while some myth-based practices were still embraced, students' understanding of the solar eclipse is still dominated by the science concept and the Islamic religious views that they have learned since their elementary education. The literature showed that two of eleven solar-eclipse rituals and myths in Indonesia are relevant to the science and Islamic views. Therefore, the myth, science concept, and Islamic view on the solar eclipse phenomena should be delivered since the elementary education. This study recommends teachers to integrate science with real-life context to enrich students' understanding while clarifying false information.

**Keywords:** Science concept, solar eclipse, myth, islamic view.

### INTRODUCTION

Integrating science with other disciplines, such as socio-cultural and religion, has been widely applied, considering its practical aspects. (Küçüközer & Kocakülah, 2007) The incorporation of socio-cultural knowledge and science is important to maintain the national identity (Parmin, Sajidan, Ashadi, Sutikno, & Maretta, 2016).

Involving both scientific and socio-cultural aspects, solar eclipse is an interesting subject to discuss. Therefore, the understanding on the solar eclipse phenomenon is required, specifically for integrating student's knowledge in science, culture, society, and religion (Kavanagh, Agan, & Sneider, 2005).



During the solar eclipse, the solar disc is blocked by the Moon (Nandiyanto *et al.*, 2016). The color of the sky is changing, the shadow is moving, the shadow bands, the sun's corona, prominences, and chromospheres are observable, and the sun's diamond ring is formed. Moreover, planets and stars suddenly become visible against the darkening sky. Because of its spectacular incident, the ancient people have associated solar eclipse with several myths and legends (Mohapatra, 1991), such as (i) the appearance of the demons, (ii) the symbol of God's anger, disasters, and destruction, (iii) the sun devouring by a giant or dragon, (iv) the battle between the sun and moon (v), etc. The ancient people also believed that some activities must not be performed during the solar eclipse, e.g. the prohibition to eat, travel, stare the sun, and construct a house (Mohapatra, 1991; Hope-Ross, Travers, & Mooney, 1988). Further, they required pregnant women and children to stay indoor and hide under the table (Mujab, 2016). Some of the myths and rituals are carried over until today although less and less people observe them. Some Indian students believe that the eclipse is caused by the devouring of the sun by the demon Rahu (Mohapatra, 1991). In the 1980s, several Javanese people believed in the compulsion to stay indoor during the eclipse (Keeler *et al.*, 1988).

The constructed knowledge is inevitably influenced by what lingers in society. As the world's most populous Muslim country, the knowledge of solar eclipse in Indonesia is built not only upon what is taught in modern science classrooms but also upon what Islam has taught and the pre-Islamic myths, which are passed down through folklores and daily practices. This study, employing an interdisciplinary approach, clarifies how much the pre-Islamic myth, Islamic view, and science concept constructed the students' knowledge.

It has been found that science at schools and universities is taught separately from other disciplines. For example, the textbooks on science for junior high school, published by the National Education Department of Indonesia, contain only brief explanation about solar eclipse from scientific point of view. In fact, introducing myths and rituals to students is also important as an attempt to preserve the local cultural treasure (Kalkan & Kiroglu, 2007; Parmin, Sajidan, Ashadi, Sutikno, & Maretta, 2016). Further, if the relationships between science and other disciplines are not discussed well, there is a condition where some students could ignore ideas that have no scientific value.

Applying such an approach, the study enriches the scholarly conversations, considering the limited studies of how Muslims respond to solar eclipse through the religious perspective. This study will inspire teachers to deal with and teach the diverse perspectives in culture, religion, and science to their students (Bayraktar, 2009; Kalkan & Kiroglu, 2007; Kavanagh, Agan, & Sneider, 2005; Lederman, 1992; Mugaloglu & Bayram, 2009; Parmin, Sajidan, Ashadi, Sutikno, & Maretta, 2016). Elsewhere, we have conducted researches from scientific point of view, for example investigation of some meteorological parameters (i.e. solar light intensity and radiation (Paramitha, Zaen, & Nandiyanto, 2017), atmospheric pressure (Riza *et al.*, 2016), photovoltaic system (Nandiyanto, Rusli, Purnamasari, Abdullah, & Riza, 2017), temperature (Paramitha, Zaen, & Nandiyanto, 2017), humidity (Paramitha, Zaen, & Nandiyanto, 2017), and wind condition (Paramitha, Zaen, & Nandiyanto, 2017; Riza *et al.*, 2016)) and photodecomposition profile of organic material (Nandiyanto *et al.*, 2016) during the solar eclipse. Incorporating the social science's point of view, this study identified the constructed knowledge of solar-eclipse in Indonesia. We investigated students' belief on several mythical stories, understanding of Islamic view, and the science concept relating to the solar eclipse. The study employed a mixed method, combining a survey to students and teachers and interviews with college students. Bandung was selected as a study area because it experienced a partial solar eclipse of March 9, 2016 (Figure 1 and Table 1).



**Figure 1.** Path of the total solar eclipse over Indonesia on March 9, 2016. The field site was located at Universitas Pendidikan Indonesia, Bandung, about 550 km from the central axis of the eclipse totality, and experienced a 88,76 % eclipse at 07:21 local time (LT) (00:21 Universal Time). The path of solar eclipse was adopted from BMKG Indonesia (source: <http://hangnadim.kepri.bmkg.go.id/berita/berita/33/GERHANA-MATAHARI-TOTAL-9-MARET-2016.html>; retrieved on March 2016).

**Table 1.** Data of solar eclipse timing at several places in Indonesia. Data was obtained from Badan Meteorologi, Klimatologi dan Geofisika (BMKG) Indonesia

Site	Latitude	Longitude	Elevation, meters above sea level (m)	Time of first contact (LT)	Time of maximum eclipse (LT)	Time of fourth contact (LT)	Maximum obscuration of solar disk (%)
Padang	0.95°S	100.35°E	6	06:21	07:20	08:27	95,41
Bandung	6.91°S	107.60°E	728	06:19	07:21	08:32	88,76
Jakarta	6.18°S	106.83°E	8	06:19	07:21	08:31	88,76
Surabaya	7.24°S	112.74°E	5	06:21	07:25	08:39	83,08
Denpasar	8.65°S	115.22°E	33	07:22	08:27	09:42	76,53
Kupang	10°19'S	123°39'E	101	07:28	08:37	09:55	65,49
Pontianak	0.02°S	109.34°E	3	06:23	07:27	08:40	90,95
Banjarmasin	3.33°S	114.59°E	8	07:33	08:30	09:27	98,17
Makassar	5.14°S	119.41°E	8	07:25	08:34	09:54	88,54
Manado	01°29'N	124°51'E	10	07:34	08:29	10:15	96,66
Ambon	03°43'S	128°12'E	9	08:33	09:29	11:16	86,91

## THE CULTURAL, ISLAMIC, AND SCIENCE VIEWS ON THE SOLAR ECLIPSE

### a) The Myths of the Solar Eclipse

The rituals pertaining to the solar eclipse vary among places in Indonesia. The ancient people traditionally believe that the solar eclipse is a dangerous phenomenon, which takes place due to the anger of a supernatural power. This makes solar eclipse phenomenon in Indonesia to be attractive for not only to students and local society but also tourists from abroad (Haristiani *et al.*, 2016). Thus, in observance of the March 9, 2016 solar eclipse, the Indonesian Postal Service launched a special edition stamp (Figure 2). The picture illustrates that the Sun is gradually eaten and then released by an atrocious ogre, named Batara Kala, the God of darkness. It is appreciated as an attempt to preserve the local cultural treasure; however, it was also critiqued to deliver false information that may mislead people to

ignorance. Such a myth has been long lived among Javanese people, and thus, solar eclipse—particularly total solar eclipse—is widely considered an extraordinary event, during which people observe several taboos (Wiramihardja, 2014; Keeler, 1988; Kleden-Probonegoro, 2008). They believed that pregnant women and children should stay indoor to avoid Batara Kala's anger. They also believed that several activities, some of which are eating, looking at the sun, constructing a house/building, and celebrating a marriage, should not be done. Moreover, they were recommended to take a bath and purify their house and heirlooms.



**Figure 2.** The special edition stamp issued by the Indonesian Postal Service in observance of the 2016 solar eclipse (source: <http://www.posindonesia.co.id/index.php/berita/154-penerbitan-prangko-seri-gerhana-matahari-total-2016>; retrieved on June 2016).

The pre-Islamic Sundanese myth believed that the sun and the moon were lovers, who were separated (Wiramihardja, 2014). The solar eclipse happened when they met each other; therefore, people on the Earth must beat rice mortar with pestles to make noise to annoy and separate them again (Mujab, 2016). These stories also lingered among the pre-Islamic Sumaterans. To avoid the demons, they masked children's face with charcoals. The pre-Islamic Bugineses in Sulawesi believed that they must do certain rituals and make charity to the gods to prevent the king and the kingdom from any calamity (Pabbajah, 2012). The Dayak Tribe of Kalimantan did some rituals during the solar eclipse (Sillander, 2006). The rituals are: (i) covering their head to prevent gray hair, (ii) shaking the tree to ask for harvesting, and (iii) washing the heirlooms.

As Islam entered the archipelago in the 13<sup>th</sup> century, the rituals incrementally change. Today, more than 80% Indonesians are Muslims. As recommended by Islam, most Muslims perform an eclipse prayer at the mosque during the solar eclipse.

### **b) The Islamic View on the Solar Eclipse**

In contrast to the traditional myths, Islam emphasizes on the virtue of worshipping during the solar eclipse. Several *hadiths* (the Prophet's exemplariness) assert that the natural phenomenon has nothing to do with someone's death (Dawud, 1984; Bukhâri, 1997). Detailed information is shown in the following:

Narrated Al-Mughira bin Shu'ba:

*"The Sun eclipsed in the life-time of Allah's Messenger on the day when (his son) Ibrahim died. So the people said that the Sun had eclipsed because of the death of Ibrahim. Allah's Messenger said, "The Sun and the Moon do not eclipse because of the death or life (i.e. birth) of someone. When you see the eclipse offer Shalat (prayer) and invoke Allah."*

(Bukhari, Book: 16; Hadith: 1043)

Narrated Abu Bakr (RA):

*We were with Allah's Messenger when the Sun eclipsed. Allah's Messenger stood up dragging his cloak till he entered the Mosque. He led us in a two-Rak'a prayer till the Sun (eclipse) had cleared. Then the Prophet (p.b.u.h) said, "The Sun and the Moon do not eclipse because of someone's death. So whenever you see these eclipses offer Shalat and invoke (Allah) till the eclipse has cleared"*

(Bukhari, Book: 16; Hadith: 1040)

Aishah narrated that

*The Prophet (p.b.u.h) said: "The Sun and the Moon do not eclipse due to the life (birth) or death of anyone. So when you witness it (an eclipse), supplicate to Allah, the Mighty & Sublime, say the Takbir and give charity."*

(Sunan Abu Dawud, Book of The Prayer for Rain; Hadith: 1191)

Asma narrated:

*"The Prophet (p.b.u.h) would command that slaves be freed during the eclipse prayer."*

Instead of imposing prohibition, the *hadiths* assert that the solar eclipse phenomenon is a reminder from God of the Day of Judgment. Therefore, Muslims are recommended to offer worships, such as: (i) praying (*Shalat*), (ii) giving charity (*Shadaqa*), (iii) freeing slaves, and (iv) asking the God for forgiveness from the torments of the grave.

During the March 9, 2016 solar eclipse, many Indonesian mosques conducted an eclipse prayer. Different from that of the June 11, 1983, in which people were strictly recommended to stay indoor, the March 2016 eclipse prayer was held either indoor or outdoor. Many worshippers even brought eclipse glasses with them and observed the eclipse process while attending preach after the prayer.

### c) The Scientific View of the Solar Eclipse

Solar eclipse is a natural phenomenon when a solar disc is masked by the Moon for few minutes and happens at least twice a year (Littmann, Espenak, & Willcox, 2008). This occurs only when the Moon is positioned between the Earth and the Sun. Total solar eclipse happens when the Moon covers the Sun completely. Meanwhile, partial solar eclipse happens when the Moon covers the Sun partially (Nandiyanto *et al.*, 2016). In addition, some meteorological parameters, such as temperature, pressure, wind speed, gravity, humidity, geomagnetic field, ionospheric electron content, and radiation, were reported to change during the solar eclipse (Paramitha *et al.*, 2017; Nandiyanto, Rusli, Purnamasari, Abdullah, & Riza, 2017; Riza *et al.*, 2016). Several researchers also reported the changes in chemical properties in the atmosphere, such as the ozone concentration, and gas composition (Nandiyanto *et al.*, 2016).

Although solar eclipse influences some organic material reactions (Nandiyanto *et al.*, 2016), the solar eclipse has almost no impact to humans, except when they look at the solar eclipse by naked eyes. Solar retinopathy is a well-recognized clinical entity of macular damage, which is caused by viewing the Sun (Ben, Laabidi, Maalej, Rannen, & Gabsi, 2008).

Solar retinopathy is divided into two groups: (i) True retinal burns, which happens to the person who gazes the Sun through gathering optics, such as the telescope or binoculars, and (ii) photoretinitis, which happens to the person who looks at the Sun directly and gets excessive blue light and the few short-wavelength UV photons to the retina. The impact of the solar eclipse on the eyes has been reported. Hundreds of people in Java in 1983 were diagnosed to be blind and two or three people lost their sight for several days after looking directly at the solar eclipse (Keeler, 1988).

## **METHODOLOGY**

### **a) Sample**

A survey was conducted to the students in Bandung to know their belief in the solar eclipse rituals and myths. The students were grouped based on the ages and the educational levels into 12-15 (junior secondary students; group I), 16-19 (senior secondary students, group II), and 20-25 years (undergraduate students, group III). Number of students in group I, II, and III were 77, 157, and 295 students, respectively. For a comparison, we also took a survey to the 67 lecturers.

We also interviewed college students who took actions during the partial solar eclipse in March 2016. We asked their knowledge of the solar eclipse that they learned from their family and schools and the acts they undertook during the March 2016 solar eclipse.

### **b) Instrument**

In the survey, the student completed a short questionnaire about the solar-eclipse rituals and myths consisting of 11 questions on a three-point Likert scale, which was developed from a previous study (Mohapatra, 1991) and adapted to the Indonesian local culture (Table 2). The results were analyzed using SPSS software to get a precise trend about the respondent's belief on the solar-eclipse rituals and myths. Formulated based on the survey results, the interviews were guided by a list of questions on what kind of knowledge and understandings that the students obtained from their parents, extended family, teachers at school, community, and religious teachers. The questions were formulated based on the survey results.

### **c) Data Collection**

The data was collected during nine days prior to the solar eclipse of March 9, 2016 (from February 25 to March 4, 2016). The instrument was distributed to students upon permission. The participants were informed about the study objectives and the instructions that they had to follow while completing the instruments, which took 15 minutes to complete. We held group interviews, consisting of 2 (two) students, to allow us to confirm the other student's experience. Each of these took 45 minutes.

**Table 2.** *Students and teachers/lecturers' responses to the questionnaire (%)*

Rituals/myths	Believe				Not believe				Not know			
	I	II	III	T	I	II	III	T	I	II	III	T
1 Solar eclipse is related to the appearance of the demon Batara Kala	6	19	3	15	55	51	82	66	39	31	15	19
2 Eating during solar eclipse causes indigestion	7	0	2	1	51	87	77	81	42	13	20	18
3 Looking the Sun during solar eclipse causes eye damage	87	64	66	72	7	24	24	19	6	10	13	9
4 Constructing a house during solar eclipse causes the collapsion	10	9	4	10	46	64	71	73	44	27	25	26
5 Should not celebrate a marriage during solar eclipse	5	21	9	13	50	62	69	73	45	17	29	13
6 Pregnant women should hide under the table during the solar eclipse	5	31	2	12	50	55	74	72	45	14	23	16
7 Children should stay indoor during the solar eclipse	17	13	15	10	41	59	62	70	42	27	23	18
8 Should go to the worship places during solar eclipse	46	51	56	61	16	29	28	28	38	20	16	10
9 Should give charity during solar eclipse	17	24	25	33	31	40	39	25	52	36	36	42
10 Should take a bath after solar eclipse	6	27	4	10	30	44	71	70	64	29	25	19
11 Should purify the house and heirlooms (if any) after solar eclipse	5	4	4	6	31	56	63	64	66	40	34	30

Note: Group I, II, and III correspond to 12-15, 16-19, 20-25 years of student, respectively. Group T is the teacher/lecturer

#### d) Data Analysis

Data obtained from the survey was analyzed using SPSS software in two steps. First, the percentage of responses in each question was calculated to identify the student and lecturer's perception on solar eclipse myths and rituals. Second, the correlation coefficient over students' responses, compared to that of the lecturers, was calculated to find out the relation between students-lecturers' perceptions. The interview data was analyzed qualitatively to support the quantitative survey data. It also serves to confirm the survey data.

## RESULTS

As shown in Table 2, more than 50% of students of group I, II, and III did not believe in the relation of the solar eclipse to the appearance of the demon Batara Kala, as told in the Javanese myth. Most of students of group I, II, and III did not believe in these following rituals: (i) eating during solar eclipse (more than 50%), (ii) constructing a house (more than 40%), (iii) celebrating a marriage (more than 50%), (iv) staying indoor for pregnant women and children (more than 40%), and (v) purifying the body, house, and heirlooms after the solar eclipse (more than 30%). However, most of students have known and believed that looking solar eclipse by naked eye causes eye damage (more than 60%). In line with these results, the percentage of the belief in praying rituals during the solar eclipse was relatively high (more than 40%), while some students did not know about the giving charity ritual (more than 30%).

The correlation coefficient (Table 3) shows the relation between students and lecturers' responses. The type of response for respondents who "believe" is more than 0.90, whereas that for respondents "not believe" is more than 0.80. The type of response in the "not know" is more than 0.50.

**Table 3.** The correlation coefficient over students' response compared to the teachers/lecturers

Types of response	Correlation coefficient between group of students and teachers preferring the same response (%)		
	Group I and T	Group II and T	Group III and T
Believe	0.920	0.914	0.979
Not believe	0.829	0.852	0.946
Not know	0.570	0.772	0.784

Note: Group I, II, and III correspond to 12-15, 16-19, 20-25 years of student, respectively. Group T is the teacher/lecturer

## DISCUSSION

Most of students did not believe in the rituals and the myths pertaining to the solar eclipse. Generally, the percentage of students who believed in the rituals and myths in group I were higher than group II and III. The students' mystical belief decreased along with the older of the age and the higher educational level, confirming that age has correlation to a better logical, rational, and abstract thinking. (Barlia, 2016) Furthermore, almost all lecturers (group T) had good understanding about the solar-eclipse phenomena in the scientific view, which encourage them to deliver it in the classroom. Indeed, lecturers' understanding on the nature of science relates to students' conception. (Lederman, 1992; Bayraktar, 2009; Çoban, 2011; Sariodlan & Kucikozer, 2015)

### a) The understanding of the solar eclipse phenomenon

More than 50% of respondents did not believe that solar eclipse has a relation to the appearance of the demon Batara Kala (Table 2). This is due to the scientific knowledge they received at school. They understood that the solar eclipse occurred due to the orbit of the Moon and the Earth.

The higher percentage of students of 20-25 years of age proved their higher critical thinking ability. This result agrees with Piaget's theory that students at the upper primary stage develop a better logical, rational, and abstract thinking than those at the under stage (Simatwa, 2010). The disbelief in the mystical stories might be affected by their good understanding on Islam, which sees this phenomenon as a remembrance from God.



A number of interviewed students recalled their parents or grandparents' stories of the solar eclipse. Tira (pseudonym, 18) said, old people told him prior to his elementary school years that the eclipse happened because a giant creature ate the Sun. When he heard the story, Tira bought it and believed in it. But, as he entered elementary school and learned about the scientific view of the eclipse, he learned that the phenomenon occurred due to the Sun and the Moon's movement in the solar system. As the oldies' story gradually disappeared and was no longer told, Tira learned that the scientific perspective is logical and well-explained the natural event.

#### **b) The prohibition of eating food**

About 50% of respondents did not believe in the prohibition of eating food during the solar eclipse. Although several people believed that consuming foods during solar eclipse causes indigestion due to the possible increases in the number of germs and viruses during the solar eclipse (Mohapatra, 1991), there is no scientific study proving that solar eclipse can be harmful to the food. Moreover, there is no Islamic prohibition of eating food during the solar eclipse; instead, as a Muslim, it is recommended to offer prayer. The prohibition of eating food was in fact not very popular among students. The interviewed students never heard of this, let alone believed in it. Those who embraced Islam religiously also never heard of any recommendations to fast during the solar eclipse.

#### **c) The prohibition of celebrating a marriage and constructing a house**

Although the ancient people believed that constructing house during the solar eclipse could cause the house to collapse, most of the respondents (more than 40%) did not believe in it. Students' disbelief in this mystical story might be caused by the science perceptions that were delivered by the teachers/lecturers at schools. This is also confirmed by the percentage of lecturers' disbelief as much as 73% (Table 2). Most students did not recognize the prohibition of celebrating a marriage and constructing a house. They even could not grasp the logical connection between this prohibition and the solar eclipse.

#### **d) The prohibition of looking at the Sun**

Different from the above results, most of respondents (more than 60%) believed in about the possible blindness that might be caused by looking the sun (Table 2). The students told us that they obeyed the prohibition, either scientifically or mythically, due to their fear of blindness caused by looking at the sun using naked eyes. Amin (18, pseudonym) said that as he grew up, he looked for a scientific reason of the prohibition and learned that the sun's ray intensity during the eclipse could not be accommodated by the naked eyes and thus might cause blindness.

Relating to these statements, several researches have proven that looking solar eclipse with naked eyes causes some damages on the eyes (Dhir, Gupta, & Jain, 1981; Michaelides, Rajendram, Marshall, & Keightley, 2001; Codenotti, Patelli, & Brancato, 2003; Hope-Ross, Travers, & Mooney, 1988; Schatz & Mendelblatt, 1973; MacFaul, 1969; Keeler, 1988; Ben, Laabidi, Maalej, Rannen, & Gabsi, 2008). Indeed, this information has been delivered well to the students during their study by the teacher or the lecturer.

#### **e) Recommendation to stay indoor and hide**

The percentage of students' disbelief on the compulsion to staying indoor and hiding for pregnant woman was relatively high (more than 40%) (Table 2). The students were warned by their parents to stay indoor during the solar eclipse. Like other students, Indria (19, pseudonym) and Amin were excited to witness their first experience encountering the solar eclipse in March 2016 but as their parents insisted that they stayed at home, they decided not

to join the observations that were held by many groups in the city. Instead, they watched the broadcasts in the televisions. Their parents were afraid of any harm that could happen to them caused by the solar eclipse.

The interviewees showed that the students have never heard of the recommendation to hide for pregnant women. To this end, there is no medical evidence which relates between solar eclipse and pregnancy condition. Indeed, psychological condition of pregnant women must be considered. The eclipse phenomenon should not make pregnant women stressed out that cause the baby born prematurely (Peacock, Bland, & Anderson, 1995; Glynn, Schetter, Hobel, & Sandman, 2008).

#### **f) The recommendation to pray**

Most respondents (more than 40%) believed that offering prayers and making a charity during the solar eclipse were recommended (Table 2). The recommendation to pray has been well known among Muslim students since they were in their elementary school years, taught by their religion teachers. Tira said that although the March 2016 was his first experience of encountering the solar eclipse, he has always performed lunar eclipse prayers before. When he was young, he believed that the prayers would help the Sun to get free from the giant creature that ate it but as he grows older and comprehended the scientific concept of why and how the solar eclipse occurred, he believed that offering a prayer was his way of asking for God's protection and of expressing his gratefulness for God's favors. Many college students chose to stay in the mosque to listen to Islamic sermons. On the day of the solar eclipse, they found that the day was felt serene due to the *takbir*, a repetitive recitation praising God's greatness, heard from mosques. The students' actions might be affected by their understanding on Islam since they were young. The high responses to offering the prayer and making a charity showed that Islamic values have been a culture in society.

#### **g) The recommendation to purify the body, house, and heirlooms**

About 30% of the respondents did not believe that after the solar eclipse, people were supposed to purify their body, house, and heirlooms (Table 2). The interviewed students acknowledged that they were not familiar with such a recommendation as well. This ritual has no scientific base but still alive in some ancient tribes in Indonesia, such as Dayak Tribe.

Based on the above results, most students and lecturers did not believe in mystical stories relating to solar eclipse, which were irrelevant to the scientific and Islamic views. This indicates that both students and lecturers have had integrative understanding about this topic. (Kucuk & Çepny, 2015). The students' belief on some mystical stories decreased along with the higher class level, which proved higher logical thinking ability. In addition, high number of correlation coefficient also indicates that there is relation between student-lecturer's perceptions. Lecturers' knowledge and attitude toward science will affect their students (Lederman, 1992; Mugaloglu & Bayram, 2009). The results also showed that there were a number of students' errors in perception about solar eclipse myths which was carried over until today. Therefore, in this case, the role of lecturers is very important to clarify false information that may mislead student to ignorance. It is recommended for the teacher, especially for Muslims, to relate science concept of solar eclipse with socio-culture and Islamic views to enrich students' understanding of science (Bayraktar, 2009; Kilinc *et al.*, 2014). Further, enhancing students' understanding of the nature of science is the main objective in the science education (Lederman, 1992).

## CONCLUSION

We conclude that some cultural rituals are relevant to the science and the Islamic views, such as the prohibition to look at the sun directly and to offer a prayer during the solar eclipse, whereas other rituals are irrelevant. Based on the survey results, the students' belief in some mystical stories decreased along with the older of age and the higher educational level. Almost all lecturers have good understanding about the solar-eclipse rituals and myths; this supports students' comprehension. The interview results are also in a good agreement with the survey result. While some myth-based practices were still embraced, students' understanding of the solar eclipse was still dominated by the science concept and the Islamic religious views that they have learned since their elementary education.

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