Islam Integration toward Science Education to Improve Students' Science Literacy: Islamic School Stakeholders' Perspectives

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Abstract: The backdrop of this research is the low level of Indonesian Moslem students' science literacy. Studies indicated that one of the reasons is due to the students' lack of interest to scientific study. Whereas, in the middle age Islam had reached to glory of scientific Moslem scholars whose inventories have been being used by many modern scientists and as the foundation for the development of modern science. This research aims to explore Islamic school stakeholders' perspectives toward Islam and science integration to improve students' science literacy. The data were taken from twelve schools in East Java: Malang and Lamongan, through interview, non-participant observation, questionnaire and ethnographic video. The result of the research reveals that (1) Islam integration toward Science education are expected to be implemented in by Islamic schools' stakeholders; (2) the integration of Islam and Science has been addressed in Indonesian National Curriculum 2013, but the implementation has not been optimally applied in the schools; and (3) Islamic education stakeholders agree that Islamic integration toward science education leads to the improvement of students' science literacy in Islamic junior high school in East Java.

1 INTRODUCTION

Science literacy has been being introduced in Indonesia since 1993, yet its development is slightly detained. Since the very first time Indonesia has joined *the Program for International Student Assessment* (PISA) in 2000, the result of students' science achievement has not met the target even fallen into decline. In joining the PISA test, the result shows that Indonesian students' science literacy is constantly in the tenth lowest score under the International score which is 500. Indeed, Indonesia was in the second lowest place from 65 countries following the test with the total score 382 in 2012. Indonesian students' science literacy score had increased 21 points in 2015, yet this is an insignificant improvement since this score still puts Indonesia in the ninth lowest place from 69 participated countries with the total score 403 (OECD, 2016). In the same case, the low level of Indonesian students' science literacy is also shown by the result of a survey conducted by the Trends in International Mathematics and Science Study (TIMSS). From the survey, the result indicates that Indonesian students' science competence is in the 44th place from 47 surveyed countries (TIMMS, 2015). Precisely, this indicates that Indonesian students' science competence still tremendously falls behind the international standard, indeed from the other Asian countries such as Vietnam and Thailand.

Literally science literacy means knowing science, or in Indonesian term, it is called "*Melek Sains"*. However, the definition of science literacy is not that simple (Holbrook & Rannikmae, 2009; Ogunkala, 2013) because each scientist defines the science literacy differently (Ogunkala, 2013). According to Good, et al (2000), the term scientific literacy is difficult to define clearly because "science" itself is constantly changing and growing in understanding the world and its content. However, according to Dragos and Mih (Dragos & Mih, 2015), the definitions put forward by these experts are essentially the same i.e. Referring to the ability of a student or a person to utilize the knowledge he possesses into the real conditions of his daily life. This means that today's science education should not be to prepare learners to become a scientist, but generally more to what Holbrook & Rannikmae (2009) called part of "life skill," which is necessary for every individual as a provision to face the

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challenges of the modern era which is rapidly changing.

In the context of science education in Indonesia, science literacy competence—as recommended by UNESCO should be a goal setting in science education (Fensham, 2008), has been accommodated in the Indonesian national curriculum since 2006 through Education Unit Level Curriculum—or known as KTSP (Anjarsari, 2014). In the KTSP, the achievement of science literacy capability is clearly stated in the graduate competency standard—called SKL, of science subjects which stated that the purpose of science learning is not just to understand the concepts of science, but beyond that, students should be able to apply the learning results in the context of their daily life in their surrounding environment (Betari, et. All, 2016). Along with the change of national curriculum KTSP into Curriculum 2013 (K13), scientific literacy competence at the level of science education achievement is more precisely described (Anjarsari, 2014). In K13, students' graduation competencies are not measured only from the cognitive domain, but from the four core competencies—called KI, i.e. The religious aspects in KI 1, the social aspects in KI 2, the cognitive / knowledge aspects of KI 3 and the aspects of knowledge application in KI 4. In fact, although the aspect of science literacy achievement has been accommodated in the K13, the results of the Indonesian students' science literacy are still low. This indicates that the science education curriculum applied is still not optimally able to improve the competence of students' science literacy.

In the implementation of science teaching and learning in schools, Sari (2012) mentioned that science is often introduced to students as a well-established product. This means that students are taught the theories, concepts and laws of science by memorizing. At this time, although the curriculum of science education has changed according to the demands of the times, yet science learning is still memorized and taught in the conventional way (Betari, et. All, 2016). Furthermore, Betari et al said that in the learning model the teacher still acts as a central information and the learning activities only serves as a process of transfer of knowledge; science is not / has not been taught contextually and still becomes abstract concepts (Betari, et. All, 2016). Therefore, the lack of utilizing the socio-cultural environment which can be used as a source of learning, and it puts Indonesian in the world's lowest place of scientific literacy competence (Nadhifatuzzahroh, et al., 2015)

Along with the changing demands of the 21st century, according to Gunstone (2013) in an effort to increase the science literacy of students, science education should be based on culture and local wisdom. This approach—better known as Ethno-science, is an approach that integrates local culture to create learning environments and learning experiences in science learning (Sardiyo, 2005). Thus, in the context of science education in Indonesia, where Muslims as the majority of the population, the integration of Islam to science subjects, especially for Islamic schools can be used as an effort to increase the learners' science literacy competence.

This study aims to examine how the integration of Islam to science can help increase the students' literacy of science in Islamic schools. The rationale in conducting this research begins with the result of a preliminary study on the lack of interest of Islamic school students in science and mathematics. *Madrasah* or *pesantren*, often becomes the second choice of the community because it is considered for their incapability to produce prospective scientists in the field of science. Yet when we turn back to the history of Islamic glory in the middle ages, many scientific discoveries, which later became the foundation for the development of modern science, actually produced by Muslim scientists.

The findings of this study should make an important contribution in providing valuable information, especially for the decision maker in the central government. Further, this research outcome can be used as a basic need analysis to develop an integrative science learning which encourages students to learn science contextually and meet the Moslem students' need. Through integrative science learning, students are stimulated to think and rethink what is behind the science—science is not only taught as natural concepts or theories, but it goes beyond, science leads students to have deeper thought of the relation between the structure of science and their God, and the structure of science and their environment. Thus, it may increase students' curiosity toward science. As a result, it may raise students' self-awareness of learning nature and its scientific structure as their basic need as human being living on the earth.

2 METHOD

This is an ethnographic study in educational settings. In this context, the researchers believe that the social situation of the school culture, shapes the schools' stakeholder's point of view toward Islam and science. 12 Islamic schools under the control of the Ministry of Religious Affairs in Malang and Lamongan selected as a place of study. In addition to considering the school quality grade, researchers

used the schools' accreditation result. In considering and determining the location of the study, the researchers selected the schools based on its region and classify them into two different schools; to represent different schools' socio-cultural background between schools located in urban and schools which is in the district.

The study was conducted for four months, starting from January s.d. April 2017. In the data retrieval, the researchers used in-depth structured interview instrument to the students, parents, the principal, as well as to the policy makers, namely Head of *Madrasah* Education Section in the Ministry of Religious Affairs, Head of Curriculum Department of Education Section and Head of Education affair. In addition, the researchers also conducted non-participant class observations to see teachers' efforts to integrate Islamic values to science subjects in the targeted schools. During the class observation, the researchers made a video ethnography to reveal the expression and reaction of both teachers and students, as well as record the voice by using audio recorders to obtain data in the form of statements or reactions of students during the learning process. In addition, classroom observations, researchers also observed schools, to see suggestions and ideas that support science learning, and the possibility of an Islamic integration that has been done by the school. Science curriculum is also studied in order to assess the possibility of a central integration of Islam to science.

The assessment of science literacy refers to four domains proposed by PISA, which include: context domain, knowledge domain, competency domain and attitude domain, each described as follows:

Table 1: PISA 2015 Framework

Domain	PISA 2015 Framework
Context Domain	- Life and health - Earth and Environment - Technology
Knowledge Domain	- Content - Procedural
Competence Domain	- Interpret data and Scientific evidences - Describe scientific phenomena - Evaluate and design scientific investigation
Attitude Domain	- Interest toward knowledge and technology - Environment awareness - Assess scientific approach for core questions to construct scientific literacy

3 RESULTS

Islam and science have become long-running debate among scientist, even among Moslem scholars. Even though many Moslems are still questioning whether it is important to integrate Islam toward science, this research results indicate that generally all stakeholders of Islamic school education are aware of the importance of religion and science integration. They mostly argue that Science and Islam go hand in hand and do not contradict each other. It is, as stated by one of the school principal "Indeed, science teaching should be integrated with Islam". To emphasize this, one of the school teacher respondents also agree that it is likely that science and religion are integrated since science is related to natural phenomena which is often mentioned in Al-Qur'an".

These opinions are also supported by one of the integration experts, stating that:

> "I think that between religion and science may have a reciprocal relationship. Science can provide legitimacy toward religious texts and can be one of the ways to interpret text, in turn religious text can also contribute to science in providing new interpretative offers for science in the future "

In the context of science education in Indonesia, the spirit of integration of science and religion in the science subjects is clearly stated in the curriculum of 2013, which is reflected in the Core Competence (KI) 1 which covers the aspect of spirituality. In KI 1, it is stated that by studying science, students are expected to be able to appreciate and apply the teachings of their religion into their daily life. Of this core competence, then it is elaborated into more detail basic competencies as follows, students can (1) admire the orderliness and the complexity of God's creation either through physical or chemical aspects, life in the ecosystem, and the role of human in the environment and realize it into the practice of religious teachings, and (2) increasingly build religious faith by realizing the relationship of order and the complexity of nature and the universe to the greatness of God who created it. This shows that the integration of science and religion in science subjects at the secondary school level has become a necessity and not being contradictory to the spirit of the implemented national curriculum.

However, in the implementation of K13 in schools—where the integration of Islam and science should be the spirit of the implementation of learning activities in the classroom cannot be fully applied. This can be seen from the results of documentation studies conducted on teaching documents; syllabus, lesson plan and books owned by teachers in the schools where this research was

conducted. From the document study it shows that the integration of Islam and science in science teaching has not been addressed clearly either in the teacher's syllabus and lesson plan—known as RPP, and the teaching materials used. According to the teacher, the main reason is because of the limited teacher's knowledge of religious material which is in relation to science teaching.

Based on the result of the interviews with one of the school principal and science teachers, Islamic values are only applied through daily habituation programs, such as *dhuha* prayer program, Islamic radio broadcasting, students' inspirational lecture given every Friday after dhuha prayer, recitation of al - Qur'an alternately every day after dhuha prayer, *sholawat* recitation program which is conducted alternately with student's inspirational speech—2 weeks are *sholawat* recitation and two other weeks are inspirational speech, and reading *Yasin* Surah together every Thursday. For building students' morals and discipline, some students joining with an intra school organization called OSIS accompanied by teachers on duty welcome and greet the students in front of the school gate. All students greet and shake the teachers' hand, while the OSIS students bring the paper containing motivational words for their friends to learn for the whole day.

In relation to the integration of Islam and science, one of science teacher stated that during the class time they have often integrated Islam into the material, but they do not realize that what is being done is a part of the effort to integrate Islamic values into science. Furthermore, science teachers at one of the targeted schools agreed that the integration of Islam into science can be used as lighters of students' spirit in studying science further. In addition, the integration of Islamic values into science subjects also has an effect on the behavioral patterns or attitudes of children.

In science integrated with Islamic values teaching, the main problem which is often experienced by the teacher is the limited knowledge of Islam, so that teachers feel unsure and unconfident in conveying materials related to Islamic values. Nevertheless, there is a tone of enthusiasm and optimism both from teachers and parents towards the integration of Islam to science education. This effort is believed not only to have an impact on the increased literacy of science students, but also as an effort to prove to the children that between science and religion are not contradictory and everything that is taught by Islam is true and can be proven scientifically.

From interviews with some education stakeholders, the majority of them agreed with the integration of Islam and science, and agreed that the integration of Islam and science will trigger students' passion and interest toward science which ultimately can increase students' science literacy in schools. However, another point that cannot be ignored is the existence of a clear framework or concept of the integration of Islam and science so that its teaching can be well organized and cover all material. However, in applying Islamic integration toward science, the students' background should also be a major consideration because they come from families with a different religious background.

While in some other schools as an effort to shape Islamic character, the school provides material for Islamic moral lessons as an independent subject which is conducted as the beginning of the lesson at 06.40-07.20 starting from Monday-Thursday. The Islamic moral lesson material contains daily prayer teachings. To support this, there is a book written by the chairman of the school foundation. On Friday, the school also provides an Islamic Dzikr recitation for students, which are guided directly by the chairman of the foundation. While Saturday is the time to learn to recite Al-Qur'an to increase students' Al-Qur'an literacy.

Dealing with Islamic integration toward science subject, one of the school principal stated that although the Islamic integration of the general lesson has been applied in the 2013 curriculum, all is returned to science teacher readiness, whether they have a willingness to look for Islamic values or knowledge related to science topics or not. This is considering the unavailability of science teaching materials or guidelines which have been integrated with Islamic values. Teachers is a major milestone in classroom learning, and it is likely to be one of the obstacles for teachers to integrate Islamic values into science lessons because not all teachers understand the science of Islam especially those related to science subject.

Teachers' educational background is also another aspect that can be a hindrance to integrate Islamic values into science teaching, especially for those whose educational backgrounds are from general institutions—not Islamic university. One of the example is in one of the schools whose teachers' educational background is different. In this school, the teacher who teaches Biology states that he has linked some material with Islamic values in accordance with what is known since he is graduating from Islamic university. In response to his teaching, he stated that students tend to be more interested when Biology lessons are associated with Islam, and can be used as a stimulus for students to think more about the universe. However, the efforts of Islamic integration have not yet emerged in his lesson plan—RPP—. The integration is only conducted spontaneously when he directly

remembers the Islamic issue related to science topic he delivers in the classroom.

While the other teacher who has teaching specification on Physics stated that he has never linked the material taught with Islamic values because of limited knowledge about Islam, especially which is related to science. Therefore, it will be a new challenge for him if science subject should be taught and integrated with Islamic values. Interestingly, even though most of the teachers have limited knowledge of Islam, teachers are very optimistic and welcome when there is a policy of Islamic integration on science subject. Some teachers agree that science and Islam has a linkage and the integration of it should be regulate through the school policy because *Madrasah* is Islamic schools, thus the science subject taught should be different with other regular school.

This is also supported by the chairman of some private school foundations. They strongly support the integration of Islam and Science. If the integration of Islam and science applied in the school, it will be in line with the vision of the school mission, and also become part of school development. But what remains a constraint is the limitations of the laboratory and the ability of existing science teachers. Thus, to implement the integration of Islam and science, it is necessary to rethink about laboratories and resources of existing teachers and concepts. The teachers need to be trained before the integration of Islam and science is applied in the school because they are who carry out the activities in the classroom.

The efforts of integrating Islam and science also get a positive response from the parents. They stated that the integration of Islam and science will open the horizon of students' thinking and they will be able to learn from the history that many Moslem scientists had discovered scientific inventory and that is still inclined to be covered. By doing so, it will increase their proud to be Moslem as well as they have a good role model and inspire them to be a Moslem scientist.

Furthermore, one of the parents also stated that the curriculum currently has a target so that children can master only a skill, yet without being equipped with the reason why the child should be able to master the skill. Thus, it makes science is studied as *an sich* subject without knowing the function and the usage of learning science. When students are going to learn the next level of schooling, they have forgotten what they have already learnt in the previous because science is learned without being associated with God as the creator. According to respondents, in studying science, children should be equipped with very basic questions such as why God created the earth and everything in it, why other planets other than earth cannot be inhabited by humans? Those questions will stimulate students to think about their God, so that it can build up their love for God, increase their religious faith as well as enjoy science. Some parents also said that science and religion is still considered as different matter that is studied as separated subject.

In addition, another respondent from the parents' side, also stated that if science is associated with Islam, then students will be more enthusiastic in learning. Children will be more curious about the relationship between religion and science, so that it can increase the spirit to learn science more. Meanwhile, according to other respondents also stated that, if science is associated with Islam, science lessons will be easier and more interesting, because between science and Islam is in line.

4 DISCUSSION

Haught in his book Science and Religion, categorizes the linkage between science and religion into four patterns: conflict, contrast, contact and confirmation (Haught, 1995). In the first relation pattern, there are two conflicting groups; a group of pure scientists who skeptically viewed at the whereabouts of religion, and the clerical group that made the scriptures as the sole source of truth. Both groups consider that between science and religion are two different and even contradictory things. Therefore, those two groups do not meet at the same point of view even which can lead to a long-term debate. Whereas for those who are in contrast group, assume that religion and science are two different things and have their respective working area. Therefore, in this pattern of relation Haught suggests a clear limitation between religion and science, thus closing the possibility of religious justification by using the criteria of the process of science, or vice versa. Unlike the two previous patterns of relationships, although religion and science are two distinct entities, they can interact each other. This group believes that science still has implications for religion and vice versa, thus, religion cannot ignore the sustainable development occurred in the field of science.

Furthermore, in the relation of confirmation, Haugh states that the existence of religion and science has mutually supportive and reinforcing the link. Religion fully supports the efforts undertaken for the development of science, and also science cannot stand alone to fulfill itself in making scientific endeavors. Therefore, religion cannot provide guarantees in the form of a specific theory of phenomena or natural occurrences, but provides a

guarantee of truth that fosters beliefs so as to keep a scientist constantly trying to uncover the secrets of reality. This means that religion is the foundation of a large building called science (Yusuf, 2007). In relation to the pattern of the fourth relation, Golshani reveals that between science and religion are two entities that cannot be separated from one another, and even occupy an equal place as an essential part of the religion (Gholsani, 2000). According to Golshani, all the events that exist in the universe cannot be separated from the existence of God (2000). Thus, God as the creator of the universe, should be the end point of the scientist's reflection process.

Even though some scientists are still considering science and religion in conflict or even contradict each other, there is growing paradigm shifting among Moslem scholars that science and religion are interconnected. It is, therefore, science should be taught along with the religious values and principles in an educational setting (Muspiroh, 2013; Ishak, 2015; Hamzah, 2015). This new shifting paradigm has also raised in Islamic school stakeholders under this study, of whom the majority have a similar agreement that science and Islam are not contradictory and should be integrated in science teaching. Integrating Islam and science means that teachers as a central role model should also be able to put religious values into their science teaching, not *an sich* teaching science as an independent subject (Muspiroh, 2013). In this case, the role of the teacher is not only transferring knowledge of science, but also why and what science is for and its relationship with himself as a servant of God as well as a leader –*Khalifah*—in the earth (Ishak, 2015). Thus, there should not be a dichotomy between science and religious teaching, especially at school level, since in Moslem belief the source of all knowledge is coming from Allah (Al Attas, in Ishak, 2015).

As in the findings, this paradigm has been also in line with Indonesian national curriculum. Religious values are a part of the spirit of science teaching, reflecting on national curriculum which is stated in its first core competence. Building spiritual students' competence is also a part of science teachers' responsibility—not only the task for religion subject teachers (Muspiroh, 2013). Further, Hidayah (2014) also argued that science, social and religion should be taught in an integrative and interconnected way for the three of them are equally interrelated. Separating one of them may impact to the relationship between humanity and godliness values and leads to the secularism (Hidayah, 2014).

Other than that, the spirit of Islam integration toward science is also in line with the Indonesian Education goal, which is stated in Indonesian constitutional law chapter 31, verse 3 and 5 (Muspiroh, 2015) and through Indonesian law of national education system number 20, year 2003, chapter 3 (Hamzah, 2015). Either in the constitutional or in the law of national education system, it is stated that the goal of the Indonesian education system is not only to equip the citizen to have good knowledge and skills, but also to create excellent citizen with good moral and strong belief to their own God. This indicates that the idea of Islam integration toward science is not contradictory with the main purpose of Indonesian education system, and it is in reverse, is a part of Indonesian Education goal manifestation

However, the result of this study confirms that, even though school stakeholders mostly agree with the spirit of integration, it does not in line with its implementation. Still, Islam and science are taught in different way in Islamic school. Beside religion becomes a single subject, some of schools instill Islamic values to the students through daily habituation. In this context, Islam and science are still integrated into school independently (Asykuri & Kuipers, 2017). Teachers feel incapable of integrating Islamic values into their teaching, and interestingly, even though they believe that Islam and Science are essential to be integrated, in some cases, they stated that religious teaching is the responsibility of teachers of religion subject to teach. This shows that in integrating Islamic values, teachers are still lack of confidence toward their own capability. This finding is consistent with that of Asykuri and Kuipers (2017). Moreover, in their research they found three models of Islamic integration done by teachers in the classroom, they are contextual, ideologies and independent integration.

In relation to the improvement of student's science literacy, Muspiroh (2013) stated that Islam-Integrated science will strengthen not only students' cognitive skill, but also their affective and psychomotor skills. Indeed, this will create a holistic learning environment. School stakeholders' belief in the improvement of science literacy also supports evidence from previous observation conducted by Hamzah (2015). His experimental study reveals that students achieved higher scores of science after they use Islam-integrated science module offered by the researcher. This indicates that Integration of Islam in science will encourage students to think at a higher level of consciousness (Sardjiyo, 2005). So that this will encourage students to be able to think critically, and be able to contextualize science into everyday life as a religious person. Moreover, students will also be able to interpret scientific data and evidence, and be able to explain scientific phenomena. With the ability to think at a higher level of awareness,

students will naturally have a responsible and wise behavior in addressing the reality of life faced. Thus, through Islamic integration, students will become more "scientific literate".

Yet, the point that needs to be considered and prepared is how to integrate Islam into the science of science because a clear concept is needed in the process of Islamic integration of science subjects.

5 CONCLUSIONS

Basically the integration of Islam on science education is one of the spirit of the 2013 curriculum, yet in the school level it cannot be optimally implemented. The relation pattern between science and religion is still contrasting, despite the growing belief among educational stakeholders about the relationship between science and religion. Religion is still not able to be used as a basis for thinking in learning science, or conversely, science has not been able to be used as a tool to interpret God's verses. Whereas in the context of education in an Islamic school environment, religion must become an internalized part and a spirit on each its learning activities. Accordingly, science should not be unfamiliar because each method is useful to interpret the existence of God's creation in the universe.

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