

Mathematics Learning through Islamic Environmental Ethics: What is the Form?

Luluk Mauluah¹

¹Islamic Elementary School Department, Tarbiyah and Education Faculty, UIN Sunan Kalijaga, Jl. Marsda Adisucipto No 1 Yogyakarta 55281, Indonesia. Tel. +62-274-540971, Fax. +62-274-519739.

Corresponding author

¹l.mauluah@gmail.com

Abstract: A Learning mathematics in elementary schools needs to develop student's environmental literacy. For Islamic elementary schools, this is also to promote that Islam is full of values of sustainable living. By integrating mathematics learning through ISLAMIC ENVIRONMENTAL ETHICS (IEE), it is hoped that it can create fun learning while at the same time depicting Islam as environmentally friendly. This paper begins by designing the Integration-Interconnection matrix for four domains. The matrix explains the integration of Mathematics learning through the realms of philosophy, methodology, strategies and materials. After that, a learning implementation matrix was compiled, which included Basic Competencies and ISLAMIC ENVIRONMENTAL ETHICS #1-ISLAMIC ENVIRONMENTAL ETHICS #5. Based on these matrices, an example of the application of learning through ISLAMIC ENVIRONMENTAL ETHICS is given in the form of a mathematics learning project in a waste bank. Learning begins with an introduction to love for the environment with verses and hadiths related to ISLAMIC ENVIRONMENTAL ETHICS. Then continued learning related to activities in the waste bank. Materials that can be discussed include measuring time and weight, rounding decimal numbers, and simple statistics.

Keywords: Islamic Environmental Ethics, mathematics learning, waste bank

Introduction

The world view of Islam is not entirely positive. (Helbling 2012 ; Bayraklı & Hafez 2015; Iner et al 2019). There are still some people who see that Islam is radical and extreme. This is detrimental, because in fact Islam is full of values of peace, caring and compassion (Hidayat 2017; Ilham, Amiruddin & Arif 2020; Islam 2022). On the other hand, learning mathematics still requires innovation and creativity, so that the quality of learning can be maximally implemented.

Learning in schools and madrasas today is inseparable from the responsibility to promote awareness and protect nature. The concept of concern for the environment, among others, appears in various terminologies in various fields, namely: Environmental Education (Riordan & Klein 2010; Nxumalo & Ross 2019), Sustainable

Development Goal (Sadoff, Borgomeo & Uhlenbrook 2020), ESD (Kohl & Hopkins 2019) , Green Learning (Wang et al 2020), Green Company (SWA, Issue 21, 2020), Green Accounting (Bartelmus & Seifert (Eds.) 2018), Green Architecture (Ragheb, El-Shimy & Ragheb (2016), Green Business (SWA, 13rd Edition, 2012). Even this concept of caring for the environment should be integrated into mathematics learning (Spiropoulou, Roussos & Voutirakis 2005 ; Piqueras and Gallardo 2021)

Mathematics learning needs to be designed so that students enjoy learning, happy and have fun. Fun math learning, will be able to explore the potential of students well. (Setiyadi et al 2017; PRINOTAMA, LARASATI & ROOSYANTI 2019). Learning mathematics through outdoor learning can increase participation, curiosity and creative thinking (Auliandari, Agusta & Bintari 2019; Harris

& Bilton 2019; van Kraalingen 2021). For this reason, mathematics learning can be developed through outdoor learning that is integrated with the values of environmental concern based on Islamic values.

Why is it necessary to explore Islamic values related to the environment? We all understand that the understanding and application of Islamic values influences the view of Islam itself. It is time for adherents of Islam to bring up Islamic values that have inclusive values. That is, Islam which is very concerned about preserving the earth, preserving nature and so on, is an inclusive value that needs to be campaigned for. (Fathil et al 2015; Khalid 2019).

Materials and Methods

The research method of this paper is the early stage development method. Referring to the ADDIE model, the implementation of this paper is in the Define, Design, and Develop stages. (Rayanto 2020; Spatioti, A. G., Kazanidis, I., & Pange 2022) The Implementation and Evaluation stages are not done yet. The define stage contains procedures for analyzing Competencies standard and Basic Competencies in elementary school mathematics. Then compiling grades -Islamic Environmental Ethics values based on various references. As for the design stage, the researcher compiled the integration matrix of learning mathematics through 4 domains, namely the philosophy, methodology, strategy and material domains. And the develop stage the researcher carried out the development of the integration matrix, namely compiling an integration table consisting of Basic Competencies components, IEE values, learning activities and assessments.

Results and Discussion

This section content three results: IEE values, Integration matrix with 4 domains, and matrix of activities and assessment.

Result-1 (Islamic Environmental Ethics)

The term Islamic Environmental Ethics began to be used by Samarrai in 1990 in his article entitled: Islamic Environmental Ethics, Law, and Society Ethics of Environment and Development. (Gottlieb 2004) and by Fazlun Khalid in Richard C. Foltz's (Editor) book entitled Environmentalism in the Muslim World (Khalid 2005). The IEE principles in this paper specifically cover how to treat water, animals, plants, earth and air (Manoiu et al 2016; Mian, Khan, & Rahman 2013)

IEE 1 (Ethics for Water)

Water as a source of life is contained in the Qur'an 21:30, 25:54, 24:45 (Santoso, 2014) Also, Islam has a great attention to the importance water resources and its equipment in the form of rivers and so on. The attention is seen in the many mention of the term water (maa '), rivers and rivers (nahr and anhar), drinking water 63 times, 54 and 39 times each in the Qur'an (Naff 2009; Nisa 2017).

IEE2 (Ethics for Animals)

Islam recommends very good treatment of animals. Procedures for caring for, using as a mount, slaughtering sacrificial animals and other things are regulated in the hadiths and the Qur'an. (Awaludin 2017; Awan & Rahim 2018). Islamic attention in reminding people of the awareness of the creation of animals for the benefit of humans is contained in several verses of the Qur'an as follows. QS. 16 (An Nahl) verse 5: Farm animals for their feathers and food use. QS.16 (An Nahl) verse 7: animals are used to lift weights, Verse 8: horses, mules and donkeys for mounts and jewellery; QS 22 (Al-Hajj): camel for food and *sodaqoh* (Tasgheer & Anwar 2021).

IEE 3 (Ethics for Plant)

Islam has a deep attention to the relationship between humans and plants. It is contained in the Qur'an QS An-Nahl: 141 (Mamat & Mahamood 2017), which explains the importance of using plants without overdoing it. The importance of planting trees, planting trees as sodaqoh (if there are animals and humans use them), it is prohibited to cut trees without specific reasons; commanded by the Prophet in his hadith (Gul & Ali 2018).

IEE 4 (Ethics for Earth)

Islam refers to humans as the khalifah fil-ard (God's representative on earth). The meaning of the representatives of God, God Almighty, Merciful, Preserver, and 99 Asmaul-husna, then, of course, the weight and full of honour of the task of the Caliphate. Mention of humans as the caliph at the earth has shown the concern of Islam for the preservation of life on earth (Mardiyah, Sunardi, & Agung, 2018). In the Koran mentioned khalifah fil-ard, among others, on QS. Al-Baqarah (2): 30, which is having faith and doing good deeds, then God will make them (humans) as rulers of the earth. (Q.S. An-Nur (24): 55). Broadly speaking, these verses show the task of humans is to protect the earth in its entirety. It is also as stated in Q.S. Al-An'am: 165 (Iqbal 2016).

IEE 5 (Ethics for Air)

Islamic Environment Ethics about air has to do with the importance of humans protecting water. Water availability is related to the smooth process of the water cycle (Bellette and G. Lee, 2003). This is stated in the Qur'an QS 56: 68-70. How does God send wind (air) to barren regions to make it rain, also written in the Qur'an, namely: QS 7:57 (Manoiu et al 2016)

Result-2 (Integration Matrix with four Domains)

To implement IEE-based learning, it is necessary to prepare a matrix first. This matrix refers to the

integration-interconnection matrix of Islamic values in learning through 4 domains (Abdullah 2006; Siswanto 2013). In the 4th domain, you can fill in IEE points number 1 to 5. In the matrix in this paper, Domain 1 = D1 = philosophy domain, Domain 2 = D2 = methodology domain, then Domain 3 = D3 = strategy domain and Domain 4 = D4 = material domain.

Result 2 (Integration Matrix with four Domains)

To implement IEE-based learning, it is necessary to prepare a matrix first. This matrix refers to the integration-interconnection matrix of Islamic values in learning through 4 domains (Abdullah, 2006; Siswanto 2013). In the 4th domain, you can fill in IEE points number 1 to 5. In the matrix in this paper, Domain 1 = D1 = philosophy domain, Domain 2 = D2 = methodology domain, then Domain 3 = D3 = strategy domain and Domain 4 = D4 = material domain. Then BC= basic competence, H=hadith, Q= Qur'an verse

Table 1 Matrix of integration of Basic Competencies with 4 domains

NO	BC	D1	D2	D3	D4	NOTE 1	NOTE 2
1	BC1	Q 1			IEE 3	Math tools: leaves and flowers	Use second hand box for keep the math tools
2	BC2				IEE 2	Livestock	
3	BC3	Q 2		Problem Based Learning	IEE 5	Volume of gas	Online reading

4	BC4	H1			IEE4	Math tools: bottle caps, saving the world from plastic	Buy and sell activity in the animal market :online reading sources
5	BC5	H2		Project Based Learning	IEE1	Volume of water, velocity, rasio	

The following is an example of a case in grade 3 mathematics learning, integrating IEE 4.

Table 2. Matrix of integration of Basic Competency#3.7 and #4.7 interconnection with 4 domains.

NO	BC	D1	D2	D3	D4	NOTE 1	NOTE 2
1	BC1:3.7	Q1		Project Based Learning	IEE4	Math activity in the waste bank	Use recycle box for keep the math tools
2	BC2: 4.7	H1			IEE4	Math activity in the waste bank	

Result 3 (Integration Matrix of Learning Activity and Assessment)

After compiling the integration matrix of the 4 domains and the selected basic competency matrix, the next step is compiling a more operational matrix containing the learning activities and assessments to be carried out. Planning these learning activities, the intention is that the learning carried out will be effective. (Conole & Fill 2005).

Discussion

Learning with multidisciplinary, transdisciplinary and interdisciplinary dimensions has several advantages, including to bring closer contact between general science and Islamic studies. (Abdullah, 2020). This paper provides an example,

an implementation idea regarding interdisciplinary learning between mathematics learning through integration with Islamic Environmental Ethics (IEE). Mathematics learning that is integrated with environmental concern has been carried out a lot. (Hidayati et al, 2008; Astuti, 2018; Emeraldal & Soesanto, 2022). Integration through Christian religious education and social environmental care. This paper integrates mathematics learning, specific concern with the environment based on its values in Islam. The implementation of this paper uses project based learning which is in line with several previous studies. Implementation with Project based learning can improve mathematics learning outcomes (Farida 2018; Prabowo, Saputra, & Atharina 2020). Project based learning with learning outside the classroom will improve several aspects of students' abilities. This is in accordance with the results of research, namely learning with outdoor learning improves critical thinking (Crismono 2017) and improves problem solving abilities (Taqwan 2019). This paper has only reached the learning design stage, so that research can be developed regarding other aspects and variables. Specifically in this paper, outdoor learning uses the facilities and exploration of the waste bank.

Conclusions

The form of math learning through the Islamic Environmental Ethics is started with making the integration matrices. The first is matrix about the integration math learning in the 4 domains. Then making the matrix/table of the learning activity through IEE. The implementation in the classroom must pay attention of the using hadith and ayah for giving inspiration and the basic of Islamic values for student. Exploring the waste bank is one of the alternative activity as the outdoor learning.

References

- ASTUTI, R. W. (2018). Pembelajaran Matematika Dengan Menggunakan Pendekatan Paradigma Pedagogi Reflektif (PPR) Untuk Mengembangkan Sikap Kepedulian Sosial Siswa Sekolah Menengah Atas (SMA).
- Auliandari, L., Agusta, E., & Bintari, S. E. (2019). Does problem based learning through outdoor learning enhance creative thinking skills. *Jurnal Bioedukatika*, 7(2), 85.
- Awaludin, A. (2017). Program Pengabdian Kepada Masyarakat Teknik Handling Dan Penyembelihan Hewan Qurban. *Jurnal Pengabdian Masyarakat Peternakan*, 2(2).
- Awan, J. A., & Rahim, S. (2018). Animal rights and welfare in Islam. *International Journal of Avian & Wildlife Biology*, 3(6), 427-430.
- Bayraklı, E., & Hafez, F. (Eds.). (2016, March). *European islamophobia report 2015*. Setra.
- Bellette, S. and Geraldine Lee, G. (2003) (editor); *NT Waterwatch Education Kit. Part 1: The Water Cycle and Water Properties*. Published by Department of Infrastructure, Planning and Environment (DIPE) PO Box 30 Palmerston NT 0831
- Bartelmus, P., & Seifert, E. K. (Eds.). (2018). *Green accounting*. Routledge.
- Conole, G., & Fill, K. (2005). A learning design toolkit to create pedagogically effective learning activities. *Journal of Interactive Media in Education*, (1).
- Crismono, P. C. (2017). Pengaruh outdoor learning terhadap kemampuan berpikir kritis matematis siswa. *Jurnal Pendidikan Matematika dan Sains*, 5(2), 106-113.
- Emeralda, G., & Soesanto, R. (2022). Peningkatan Kepedulian Siswa melalui Implementasi Integrasi Iman dan Pembelajaran: Kajian terhadap Pembelajaran Matematika Jarak Jauh. *PEADA: Jurnal Pendidikan Kristen*, 3(1), 58-74.
- Farida, F., Fitria, Y., Saputri, L., & Syawir, S. (2018). Meningkatkan Aktivitas Dan Hasil Belajar Siswa Menggunakan Model Projek Based Learning (PjBL) di Kelas V SD Pembangunan UNP: Hasil Penugasan Dosen di Sekolah (PDS). *Jurnal Pds Unp*, 1(1), 89-95.
- Fathil, M., Saam, Z., Sukendi, S., & Nizar, S. (2015; Khalid, F. (2019). Islam and environment: education perspective. *Al-Ta lim Journal*, 22(2), 96-106.
- Fitriyani, D., & Kania, N. (2019, October). Integrasi nilai-nilai keislaman dalam pembelajaran matematika. In *Prosiding Seminar Nasional Pendidikan* (Vol. 1, pp. 346-352).
- Gottlieb, R. S. (Ed.). (2004). *This sacred earth: Religion, nature, environment*. Second Edition. Published in 2004 by Routledge 29 West 35th Street New York, NY 10001 <http://www.routledge-ny.com/>
- Gul, P & Ali, B (2018): AN ISLAMIC APPROACH TOWARDS ENVIRONMENTAL PROTECTION; *Journal of Law and Society Law College* Vol. XLIX, No. 73 University of Peshawar July 2018
- Harris, R., & Bilton, H. (2019) van Kraalingen, I. (2021).. Learning about the past: Exploring the opportunities and challenges of using an outdoor learning approach. *Cambridge Journal of Education*, 49(1), 69-91.
- Helbling, M. (2012). *Islamophobia in the West. Measuring and Explaining Individual Attitudes*.
- Hidayat, N. (2017). Nilai-nilai Ajaran Islam Tentang Perdamaian (Kajian antara Teori dan Praktek). *Aplikasia: Jurnal Aplikasi Ilmu-ilmu Agama*, 17(1), 15-24.
- Hidayati, K., Arliani, E., Retnawati, H., & Isnaeni, I. (2008). Implementasi pembelajaran matematika berwawasan lingkungan dengan pendekatan kooperatif guna mengembangkan sikap ramah lingkungan dan meningkatkan hasil belajar siswa. *Pythagoras: Jurnal Pendidikan Matematika*, 4(1).
- Ilham, M., Amiruddin, M. M., & Arif, A. (2020). Islamic Harmony Exemplar: The Qur'an's Frame on Social Interaction with Non-Muslims. *FITRAH: Jurnal Kajian Ilmu-ilmu Keislaman*, 6(2), 191-206.
- Iner, D., Asquith, N., Ip, R. H. L., Islam, Z., Mason, G., Vergani, M., & Zayied, I. (2019). Islamophobia in Australia-II (2016-2017). Charles Sturt University.
- Islam, T. (2022, December). *Theology of Peace: An Analysis from Islamic Perspective*. In *Proceeding of International Prophetic Conference* (No. 8th, pp. 511-515).
- Iqbal, M. (2016). Mewujudkan Kesadaran Energi Melalui Konsep Khalifah Fi al-'Ard. *JURNAL PENELITIAN*, 187-200
- Ivanitskaya, L., Clark, D., Montgomery, G., & Primeau, R. (2002; *Interdisciplinary learning: Process and outcomes*. *Innovative higher education*, 27(2), 95-111.
- Khalid, F(2005) *Applying Islamic Environmental Ethics*; in Richard C. Foltz (Editor); *Environmentalism in the Muslim World*; Nova Science, New York, 2005
- Khalid, F. (2019). *Signs on the Earth: Islam, modernity and the climate crisis*. Kube Publishing Ltd.

- Kohl, K., & Hopkins, C. A. (2019). ESD FOR ALL: Learnings from the# IndigenousESD global research. *Journal of Teacher Education for Sustainability*, 21(2), 105-120.
- Mamat, M.N. & Mahamood, S.F. (2017) Islamic Philosophy on Behaviour-Based Environmental Attitude; *Asian Journal of Environmen-Behaviour Studies*, ajE-Bs, 2(2), Jan / Mar 2017 (p.81-91)
- Manoiu, V.M, Düzgüneş, Azzeddine and Manoiu, V.S. (2016) A QUALITATIVE EXPLORATION OF THE HOLY QURAN'S ENVIRONMENTAL TEACHINGS; *IJAEDU- International E-Journal of Advances in Education*, Vol. 2, Issue 5, August 2016
- Manuel Garcia-Piqueras and José-Reyes Ruiz-Gallardo (2021) Green STEM to Improve Mathematics Proficiency: ESA Mission Space Lab.
- Marcelino, D. (2020). Green Purchase Intention Pada Konsumen Nutrifood di Bandung: Peran Environment Concern Dengan Mediasi Green Trust. *Jurnal Sekretaris dan Administrasi Bisnis*, 4(1), 01-20
- Mardiyah, W., Sunardi, S., & Agung, L. (2018). Peran Manusia Sebagai Khalifah Allah di Muka Bumi: Perspektif Ekologis dalam Ajaran Islam. *Jurnal Penelitian*, 12(2), 355-378.
- Naff, T (2009). Islamic Law and the Politics of Water. Dalam Joseph W. Dellapenna dan Joyeeta Gupta (Eds.). *The Evolution of the Law and Politics of Water* (hlm. 37-52).Dordrecht: Springer Science + Business Media B.V.
- Nisa,Z.Z (2017) Konsep Pengelolaan Air dalamIslam *Jurnal PENELITIAN*, Volume 14 Nomor 1 2017
- Nxumalo, F., & Ross, K. M. (2019). Envisioning Black space in environmental education for young children. *Race Ethnicity and Education*, 22(4), 502-524.
- Prabowo, D., Saputra, H. J., & Atharina, F. P. (2020). Pengaruh Model Pembelajaran Project Based Learning Terhadap Hasil Belajar Siswa Kelas V SD Sawah Besar 01. Elementary School: *Jurnal Pendidikan dan Pembelajaran ke-SD-an*, 16-â.
- PRINOTAMA, A. N., LARASATI, D. A., & ROOSYANTI, A. (2019). Pengaruh Joyfull Learning terhadap Motivasi Belajar di SDN Karah I Surabaya. *Trapsila: Jurnal Pendidikan Dasar*, 1(01), 96-105.
- Rayanto, Y. H. (2020). Penelitian Pengembangan Model Addie Dan R2d2: Teori & Praktek. Lembaga Academic & Research Institute.
- Riordan, M., & Klein, E. J. (2010). Environmental education in action: How expeditionary learning schools support classroom teachers in tackling issues of sustainability. *Teacher Education Quarterly*, 37(4), 119-137.
- Sadoff, C. W., Borgomeo, E., & Uhlenbrook, S. (2020). Rethinking water for SDG 6. *Nature Sustainability*, 3(5), 346-347.
- Setiyadi, R., Pebriana, R., Jubaedah, E., Nurparihat, S. H., & Ramadhani, H. S. (2017). Meningkatkan kemampuan berfikir kreatif siswa melalui penerapan metode pembelajaran joyfull learning di sekolah dasar kabupaten bandung barat. *utile: Jurnal Kependidikan*, 3(2), 103-113.
- Siswanto, Siswanto. "Perspektif Amin Abdullah Tentang Integrasi-Interkoneksi Dalam Kajian Islam". *Teosofi: Jurnal Tasawuf dan Pemikiran Islam* 3, no. 2 (December 2, 2013): 376-409. Accessed January 11, 2023. <http://jurnalfuf.uinsby.ac.id/index.php/teosofi/article/view/35>.
- Spatioti, A. G., Kazanidis, I., & Pange, J. (2022). A comparative study of the ADDIE instructional design model in distance education. *Information*, 13(9), 402.
- Spiropoulou, D., Roussos, G., & Voutirakis, J. (2005). The Role of Environmental Education in Compulsory Education: The Case of Mathematics Textbooks in Greece. *International Education Journal*, 6(3), 400-406.
- SWA 2012. *Bisnis Hijau*, <https://swa.co.id/swa/magazine-edition> Edisi 13. 2012
- SWA, Edisi 21, 2020 *Green Company* <https://swa.co.id/swa/magazine-edition>
- Taqwan, S. H. B. (2019). Pengaruh pembelajaran luar kelas (outdoor learning) terhadap kemampuan pemecahan masalah siswa kelas vii smp negeri 05 seluma. *Jurnal Pendidikan Matematika Raflesia*, 4(1), 10-18.
- Tasgheer, A & Anwar, M.J (2021) . An Islamic Perspective of Animals' Welfare paradigm", *AL-ILM* 5 no 2 (2021): 44-59; Institute of Arabic & Islamic Studies, Govt. College Women University, Sialkot
- van Kraalingen, I. (2021). A systematized review of the use of mobile technology in outdoor learning. *Journal of Adventure Education and Outdoor Learning*, 1-19.
- Wang, J., Xue, Y., Sun, X., & Yang, J. (2020). Green learning orientation, green knowledge acquisition and ambidextrous green innovation. *Journal of Cleaner Production*, 250, 119475.
- Yesnazar, A., Japbarov, A., Zhorabekova, A., Kabylbekova, Z., Nuralieva, A., & Elmira, U. (2020). Determination of primary school childrenâ€™ s speech skills in interdisciplinary communication in learning environments. *World Journal on Educational Technology: Current Issues*, 12(4), 373-388.