23 (2), 2022, 486-495

Jurnal Pendidikan MIPA

e-ISSN: 2550-1313 | p-ISSN: 2087-9849

http://jurnal.fkip.unila.ac.id/index.php/jpmipa/

The Effect of Microsoft Whiteboard-Assisted Environmental Mathematics towards Environmental Care Attitudes of Pre-Service Elementary School Teachers

Ema Butsi Prihastari* & Ratna Widyaningrum

Departement of Primary School Teacher Education, Universitas Slamet Riyadi, Indonesia

Abstract: The low concern for the environment after the pandemic period which gradually ended, especially when learning in Higher Education has been carried out face-to-face. There are indications of an increasing amount of litter and an acute sense of indifference. This study determines the influence and effectiveness of the application of Microsoft whiteboard-assisted environmental mathematics on students' environmental care attitudes. The research population is pre-service elementary school teachers in semester 4 who took part in geometry and measurement courses in elementary schools and the research sample was 69 pre-service elementary school teachers in semester 4 in the course with a simple random sampling technique. Data collection techniques use environmental care questionnaires, observations, and documentation. The data analysis technique uses paired sample t test and N-gain. Based on the results of data analysis, it was found that the value of t count = 10.197 > t table = 2.201, so there is an influence of the influence of the application of Microsoft whiteboard assisted environmental mathematics on students' environmental care attitudes and an N-gain value of 56% is got, so the application of Microsoft whiteboard-assisted environmental mathematics is quite effective in improving student environmental care attitudes.

Keywords: math environment, Microsoft whiteboard, care environment.

Abstrak: *Rendahnya kepedulian pada lingkungan setelah masa pandemic yang sedikit demi sedikit mulai berakhir khususnya ketika pembelajaran di Perguruan Tinggi sudah mulai dilaksanakan secara tatap muka. Ada indikasi meningkatnya jumlah sampah dan tingginya rasa tidak peduli. Tujuan penelitian ini untuk mengetahui pengaruh dan efektivitas penerapan matematika lingkungan berbantu Microsoft whiteboard terhadap sikap peduli lingkungan mahasiswa. Populasi penelitian adalah mahasiswa PGSD semester 4 yang mengikuti mata kuliah Geometri dan Pengukuran di SD dan sampel penelitian ada 69 mahasiswa PGSD semester 4 pada mata kuliah tersebut dengan teknik sampling simple random sampling. Teknik pengumpulan data menggunakan angket sikap peduli lingkungan, observasi, dan dokumentasi. Teknik analisis data menggunakan uji paired sample t test dan N-gain. Berdasarkan hasil analisis data didapatkan bahwa nilai* t_{hitung} *= 10,197 >* t_{tabel} *= 2,201, yang berarti ada pengaruh pengaruh penerapan matematika lingkungan berbantu Microsoft whiteboard terhadap sikap peduli lingkungan mahasiswa dan didapatkan nilai N-gain sebesar 56 % yang berarti penerapan matematika lingkungan berbantu Microsoft whiteboard cukup efektif untuk meningkatkan sikap peduli lingkungan mahasiswa.*

Kata kunci: *matematika lingkungan, Microsoft whiteboard, peduli lingkungan.*

▪ INTRODUCTION

The impact of the pandemic is still being felt today, in addition to having an impact on the economy and social (Rupani et al., 2020). It turns out that the Covid-19 pandemic has an impact on the environment which if left unchecked will add new problems such as flooding due to the large amount of waste scattered, not producing waste in its place and the lack of the community in recycling plastic waste. Actually, the pandemic, slightly

Ema Butsi Prihastari
*Email: butsinegara@gmail.com

DOI: http://dx.doi.org/10.23960/jpmipa/v23i2.pp486-495
Received: 14 April 2022
Accepted: 20 June 2022
Published: 29 June 2022

changed a person's clean-living behavior (Park et al., 2021) who do not normally wash their hands are now required to wash their hands using soap and other clean-living habits. But, after everyone feels that they have been vaccinated, the good pattern has begun to decrease a little bit in certain cities.

Surakarta is where history and culture study (Hartanto, Dharoko, & Subroto, 2020) from all directions, especially for students who take education in the city. In May 2022, several areas in Surakarta, such as Purwosari Village, Laweyan district, Solo city were flooded (Kompas.com, 2022). Apart from the high rainfall, it turns out that there are other causes. One of them is from 131 waste banks in the city of Solo, less than 50% are active during the pandemic (data from the Environmental Agency of Surakarta City). This is because of the habit of sorting waste erodes. The majority is immediately wasted even though not all waste is useless. (Liputan6.com, 2022). According to Leiden Ethnosystem and Development Programme (LEAD) researchers from Leiden University (Arif Maulana, 2020), local wisdom can solve several environmental problems.

According to Genta Tenri Mawangi (2017) based on periodic studies of local wisdom also contribute to the sustainable use of natural resources. This is behind the need for local environmentally friendly education (Hasbiah, 2015; Jundiani, 2018), which is expected to suppress these problems by changing a person's behavior to have more good environmental morals. This is in line with Hasanah's research (2014) that integrating mathematics into the reality of daily life not only makes mathematics good at mathematics but also has a concern for the environment. (Maria et al., 2020)

Mathematics as part of the curriculum, especially in the PGSD study program, has a role in instilling environmentally friendly values to students (prospective teachers) through its implementation in learning both in aspects of knowledge (cognitive), awareness or will (affective), and action (psychomotor). In this case, environmental issues can be used as contextual problems to start learning. Thus, environmental education can be integrated directly into mathematics learning. Problems - contextual problems about the environment should be simple problems (MacDonald, 2022) which is known and raises examples of problems related to environmental conservation. To reduce the level of abstraction of students towards mathematics, the mathematics learning model should bring students closer to their environment. This is in line with Hidayati's research (2008) that environmental-based mathematics learning takes examples of problems related to the environment in every teaching and learning activity, so that students feel that mathematics learning is not much different from their living environment. The environment also had an effect on the high and low achievement of mathematics (Schwabe, Boomsma, & van den Berg, 2017)

This is integrated in geometry and measurement lectures at SD, PGSD Slamet Riyadi University in the fourth semester, which in its learning utilizes the environment and technology. The chosen environment is the Pasar Gede area which is an icon and one of the cultural heritage in Surakarta. This is based on the results of research on mapping local wisdom (Prihastari & Widyaningrum, 2018) the theme in accordance with the geometry course, namely historical heritage buildings (Pasar Gede). Because lectures are still carried out in a blended learning manner, researchers use one of the facilities integrated with MS TEAMS, one of the alternatives of distance learning media during the pandemic (Barry et al., 2021) i.e. Microsoft whiteboards to discuss finding flat planes and building spaces and explaining their characteristics. The advantages of Microsoft

whiteboard (Prihastari & Widyaningrum, 2022), namely a) effective, b) minimal use of markers and paper, c) discussions can run even though they are carried out remotely, d) can be used to add drawings, diagrams, put up sticky notes, d) write with various colors, and e) there is a facilitation of the virtual ruler to draw with precision.

Based on the results of observations of environmental care attitudes using the environmental care attitude questionnaire indicator according to Prihastari & Widyaningrum (2018) in students at the beginning of lectures, a score of 65% was obtained, with the lowest score in the aspects of waste management into compost and waste or waste management. Students' concern for the environment is still lacking and needs to be improved to face-to-face learning. This if left unchecked will become an environmental problem. According to Daryanto & Suprihatin (2013) one of the factors that affect environmental awareness is a person's ignorance because they do not have knowledge about the environment. Caring for the environment according to Widyaningrum (2016: 109) is an attitude and action that always seeks to prevent damage to the surrounding natural environment and develop efforts to repair the damage to nature that has already occurred. Education in instilling awareness of the environment requires knowledge of the environment and habitualization (habitualition) until there is a change in attitude towards the environment. Thus, through environmental mathematics, it can instill awareness and provide habituation about the environment so that there is a change in attitude.

▪ METHOD

Research Design and Procedures

The research method used is quantitative research that focuses on analyzing data obtained from a sample of a population to then draw conclusions (Akar & Çelik, 2019); Hammer, & Habib, 2016; Pastore, 2017). This study used a One-Group Pretest-Posttest Design research design, where a group of subjects were given treatment for a certain period of time. (Sugiyono, 2016). Measurements of the instrument are carried out before and after the treatment is given. To measure the effect of the treatment given was tested using the t test. Meanwhile, to determine the effectiveness of the application of free variables, the N-gain test is used. Data collection techniques use observation, documentation, and questionnaires.

Instruments

Data collection instruments are used to obtain information needed in research (Pranatawijaya et al., 2019). This research uses an instrument in the form of a questionnaire of environmental care attitudes in the application of environmental mathematics assisted by Microsoft whiteboard. The scale used is in the form of a Likert scale with an interval of 1 to 4. The function of the Likert scale in this questionnaire is to measure the opinions and attitudes of a person or group about what is being studied ((Joshi et al., 2015; Pranatawijaya, et al., 2019; Saputra & Nugroho, 2017). The number of statements in the environmental care questionnaire was 30 items from highly appropriate to non-conforming intervals. This questionnaire before being used in research has been declared valid by expert judgement (Lisufiana, Supriyanto, & Khumaedi. 2019)

Participants

Once the instrument is declared valid and ready for use. The instrument is used to collect environmentally caring attitude research data sampled from a population. The population involved is pre-service elementary school teachers in the fourth semester who take part in Geometry and Measurement lectures at elementary school for the 2021/2022 Academic Year. The sample in this study was 69 pre-service elementary school teachers in the fourth semester taken from the population with a random sampling sample technique. (Adihwal et al., 2021.; Arnab, 2017)

Data analysis

The data that has been collected, then analyzed. Data analysis for the normality assumption test is Kolmogorov Smirnov. To determine the influence of the application of Microsoft whiteboard-assisted environmental mathematics on environmental care attitudes in the test with paired sample t test (Yusop et al., 2015). Whereas, to analyze its effectiveness, the N-gain test was used (Hake,1999; Majdi, Subali, & Sugianto, 2018) with the following categories of interpretation.

Table 1. Categories of interpretation of the effectiveness of N-gain score

Percentage (%)	Interpretation
< 40	Ineffective
40 – 55	Less effective
56 – 75	Quite effective
>76	Effective

(Hake, 1999).

▪ RESULT AND DISSCUSSION

The results of research obtained from instruments and data collection techniques are continued by analyzing and discussing based on relevant theories and studies.

An overview of environmental care attitudes of pre-service elementary school teachers, before and after applying microsoft whiteboard assisted environmental mathematics learning

The environmentally caring attitude questionnaire instrument before being used in research has been validated construct by expert judgement in previous studies. The questionnaire was developed in accordance with the research of Prihastari & Widyaningrumn (2018) with the following indicators: 1) habituation to maintain the cleanliness and flexibility of the surrounding environment, 2) the availability of landfills and washing stairs. 3) providing bathrooms and clean water, 4) energy-saving habituation, 5) the presence of biopores in the surrounding environment, 6) building wastewater sewers properly, 7) habituating to separate types of organic and inorganic waste, 8) waste management through composting from organic waste, 9) handling waste from practice, 10) provision of cleaning equipment, 11) existence of water storage reservoirs, and 12) the existence of an environmental clean love program, with a total of 30 items of revelation. Based on the collection of data on the value of the questionnaire of environmental care attitudes before and after the application of environmental

mathematics assisted by Microsoft whiteboard to environmental care attitudes. described in table 2 below.

Table 2. Overview of Pre-Assessment Values of Environmentally Caring Attitudes

No.	Indicators	Pre	Post
1	habituation to maintain cleanliness and sustainability of the surrounding environment	2.7	3.1
2	availability of landfills and washing stairs	3.2	3.6
3	provide a bathroom and clean water	3.3	3.7
4	energy-saving habituation	2.3	3.7
5	the presence of biopores in the surrounding environment	2.5	3.3
6	build wastewater sewers well	3.0	3.6
7	habituation to separate types of organic and inorganic waste	2.3	3.3
8	waste management through composting from organic waste	2.0	2.7
9	waste handling of practice results	2.3	2.9
10	Provision of cleaning equipment	3.2	3.6
11	the presence of a water storage reservoir	2.7	3.5
12	the existence of a clean environment love program	2.7	3.3
	Minimum value	2.0	2.7
	Maximum value	3.2	3.7
	Average value	2.583	3.358

From the results of table 1 above, in the pre column, pre-service elementary school teachers are still lacking in points: a) management to be used as compost, b) handling waste from practice, c) habituation to save energy, d) sorting types of organic and inorganic waste. As for the other indicators, it is still within sufficient limits. This is a problem and a challenge for researchers to improve good habits. The average pre value is 2.583 and the post value is 3.358.

There was an average increase of 0.775 in the environmental care attitude of pre-service elementary school teachers in the fourth semester in geometry and measurement lectures in elementary schools. Aspects of waste management to be composted and handling waste from practice have increased. Likewise in other aspects of environmental care indicators. Students when taking documentation to discuss in Microsoft whiteboards see firsthand what kind of clean and dirty environmental conditions. Researchers also provide environmental insights related to how to live cleanly, manage waste so that it does not accumulate and some of it can be processed into useful things. This is in line with research (Clarke & Roche, 2018) which states that providing broad thinking and feedback on projects and contextual tasks given improves the quality of learning

In addition, through Microsoft whiteboard with blended learning, researchers can deliver teaching materials more easily and contextually. This is in line with the research of Tugimin & Maryani (2014) the objectives of using whiteboard interactive learning media in the learning process are as follows: a) to make it easier for lecturers to demonstrate teaching materials in the learning process, b) so that lecturers can more easily carry out learning implementation planning activities, c) to motivate students to share

roles in the learning process, and d) so that lecturers and students feel comfortable in the learning process, because whiteboard is not dusty. As well as the research of Jannah and Sontani (2018) infrastructure that affects learning motivation, one of which is whiteboard or whiteboard. So, environmental math is greatly helped by Microsoft's whiteboard. Researchers are more focused on teaching material even though it is carried out online and students are not confused when receiving material because there is an explanation written through Microsoft whiteboard. Thus, discussions between students in Geometry and Measurement lectures in elementary schools can be focused because communication is established through the microsoft whiteboard media and researchers can immediately correct errors experienced during the discussion (Beth L. Hewett, 2006). To find out the effect of the application of microsoft whiteboard assisted environment mathematics on environmental attitudes is described in the following table 3.

Table 3. Correlation Value and t Test

	N	Correlation	Sig.	t	df	Sig.(2-tailed)
Score	12	0.666	.018	10.197	11	.000

Based on table 2, the correlation value between the pre and post-values of environmental care attitudes was 0.666. it carried previously pre and post-data out normality tests using Kolmogorov Smirnov got the results of both normal data. Then for the t-test, it got $t_{count} = 10.197 > t_{table} = 2.201$ with significance, so Ho was rejected and Ha was accepted. This proves that there is a Microsoft-assisted environmental mathematics whiteboard has an influence on improving the student's environmental care attitude. Students are more able to apply science through contextual things than abstract examples or just doing questions.

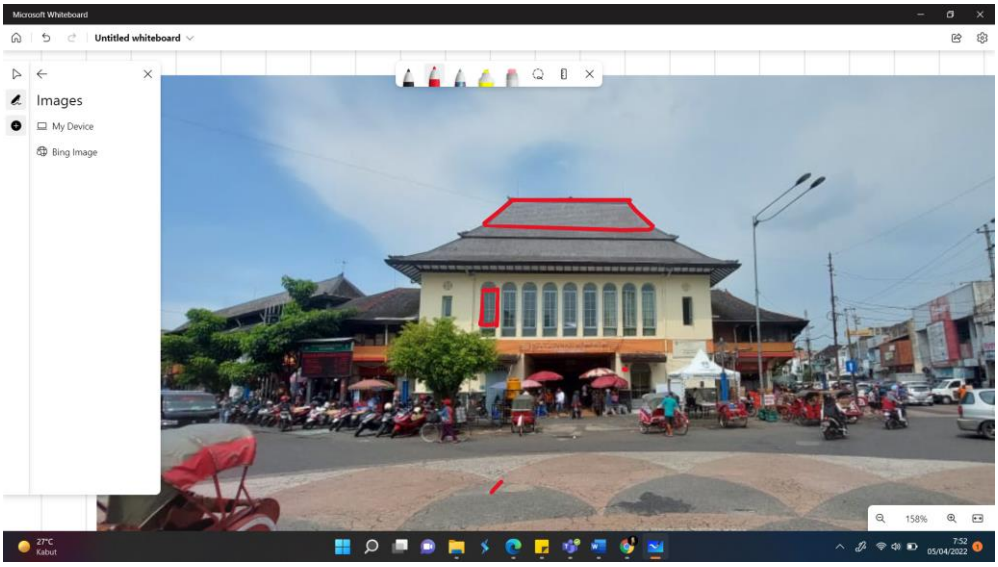

Figure 1. Examples of Microsoft Assisted Environment Math Implementations Whiteboard in Geometry and Measurement lectures in elementary schools

The effectiveness of implementing Microsoft whiteboard assisted environmental mathematics to environmental care attitudes

According to table 4, an N-gain value of 56% was got, which, if consulted with the conversion table, was declared quite effective, the free variable impacted the bound variable. On the application of the Microsoft whiteboard in the mathematics learning environment gets a fairly effective score. This is certainly supported by the motivations and expectations of students with the advantages that exist on the Microsoft whiteboard, namely a) time effectiveness, b) minimizing the use of markers and paper, c) cooperation in groups that are carried out directly or remotely, d) can add drawings, put up sticky notes, or make diagrams, e) draw with various colors of pens and geometric fields precisely with a ruler. (Prihastari & Widyaningrum, 2022). In addition, students' skills in mathematics learning technology and visualization are gained through this Microsoft whiteboard. This is in line with the results of research (Rath, Sidhu, & Wong, 2020) which states that the whiteboard is one of the learning solutions during the pandemic because it can increase interest, skills, become a bridge for learning that will be carried out online and offline, as well as increase learning with visual learning.

Table 4. N-gain analysis results

Pre	Post	N-gain	Information
2.583	3.358	55.738	Quite effective

▪ CONCLUSION

Based on the results and discussion of the research above, it was concluded that there is an influence from the application of Microsoft whiteboard assisted environmental mathematics on environmental care attitudes with an average pre value of 2.583 and an average post value of 3.358. Based on the correlation value of 0.666 and the t test obtained a calculated t value = 10.197 > t table 2.201 with α=0.025 and 2) the results of the N-gain analysis obtained a gain score of 56% with a fairly effective category. So, Microsoft whiteboard assisted environmental mathematics is quite effective in improving the environmental care attitude of pre-service elementary school teachers in the fourth semester who take part in Geometry and Measurement in elementary schools.

The researcher's suggestion in the next study, if the application of environmental mathematics can be carried out consistently using face-to-face meetings, it can increase the effectiveness of environmental care attitudes. Educators in the field of mathematics can provide contextual examples to students through real images of the environment of daily life. The shortcomings in this study, Microsoft whiteboard can be used if it is connected to the internet and to make it easier to write on the whiteboard requires tools such as a mouse or stylus pen.

▪ REFERENCES

Akar, H., & Çelik, O. T. (2019). Organizational justice and cynicism: A mixed method study at schools. *International Journal of Evaluation and Research in Education, 8*(1), 189–200

MacDonald. (2022). Contextual influences on children’s mathematical understandings. *Learning, Culture and Social Interaction*. 35

Maulana. (2020). Pengetahuan Kearifan Lokal Berperan Pecahkan Masalah Global. Kantor Komunikasi Publik: Universitas Padjajaran. Retrieved 5 Juni 2022 from https://www.unpad.ac.id/2020/12/pengetahuan-kearifan-lokal-berperan-pecahkan-masalah-global/

Hasbiah. (2015). Analysis of Local Wisdom as An Environmental Conservation Strategy in Indonesia. *Sampurasun e-Journal* 1(1). 1-7

Rath, A., Sidhu, P., Wong, M., & Pannuti, C. (2021). The impetus to interactive learning: whiteboarding for online dental education in COVID-19. *Journal of Dental Education*.

Hewett, B. L. (2006). Synchronous online conference-based instruction: A study of whiteboard interactions and student writing. *Computers and Composition*. Volume 23 (1). 4-31

Barry, D. M., Kanematsu, H., Ogawa, N., & McGrath, P. (2021). Technologies for teaching during a pandemic. *Procedia Computer Science*, *192*, 1583-1590.

Daryanto & Suprihatin,. (2013). Pengantar Pendidikan Lingkungan Hidup. Yogjakarta: Gava Media

Lisufiana, D., Supriyanto, T., & Khumaedi, M. (2019). Validity and Reliability Content of Instrument of Assessments Mengalihaksarakan Serat Wulangreh Pupuh Gambuh Class VIII. *Journal of Research and Educational Research Evaluation*, *8*(2), 165-170.

Clarke, D. & Roche, A. (2018). Using contextualized tasks to engage students in meaningful and worthwhile mathematics learning. *The Journal of Mathematical Behavior*. 51, 95-108

Prihastari, E. B. & Widyaningrum, R. (2018). Implementasi MAS NOVEL berbasis Kearifan Lokal Untuk Penanaman Karakter Peduli LIngkungan pada Siswa SD. Seminar Nasional Pendidikan. "Mengembangkan Kompetensi Pendidik dalam Menghadapu Era Disrupsi". PGSD-POR UMS, 4-5 Desember

Prihastari, E. B. & Widyaningrum, R. (2022). *Matematika Lingkungan Berbasis Budaya Berbantu Microsoft Whiteboard* [Microsoft Whiteboard Culture-Driven Environment Math]. *Mendidik: Jurnal Kajian Pendidikan dan Pengajaran*. Vol.8 (1) hal. 128-135

Mawangi. G. T. (2017). Kearifan local atasi kerusakan lingkungan hidup. Retrieved 5 Juni 2022 from https://www.antaranews.com/berita/657048/kearifan-lokal-atasi-kerusakan-lingkungan-hidup

Hake, R, R. (1999). Analyzing Change/Gain Scores.*AREA-D American Education Research Association's Devision*. D, Measurement and Reasearch Methodology.

Hammer, H. L., & Habib, L. (2016). A quantitative analysis of uncertainty in the grading of written exams in mathematics and physics. *Eurasia Journal of Mathematics, Science and Technology Education*, *12*(4), 975–989

Hasanah, S.I. (2014). *Sumber belajar matematika dari lingkungan alam sekitar berbasis pondok pesantren* [Sources of learning mathematics from the surrounding natural environment based on Islamic boarding schools]. *INTERAKSI, 9(1),* 28-31

Yusop, H., Yeng, F. F., Jumadi, A., Mahadi, S., Ali, M. N., & Johari, N. (2015). The effectiveness of excellence camp: A study on paired sample. *Procedia Economics and Finance*, *31*, 453-461.

Hidayati,K., Arliani,E., Retnawati,H., & Isnaeni, I. 2008. *Impelementasi pembelajaran matematika berwawasan lingkungan dengan pendekatan kooperatif guna mengembangkan sikap ramah lingkungan dan meningkatkan hasil belajar siswa* [Implementation of environmentally sound mathematics learning with a cooperative approach to develop environmentally friendly attitudes and improve student learning outcomes]. *Pythagoras: Jurnal Matematika dan Pendidikan Matematika*, 4(1) 33-4

Joshi, A., Kale, S., Chandel, S., & Pal, D. K. (2015). Likert scale: Explored and explained. *British journal of applied science & technology*, *7*(4), 396.

Jundiani. 2018. Local Wisdom in the Environmental Protection and Managemment. *IOP Conf. Series: Earth and Environmental Science.* 175

Park, K. H., Kim, A. R., Yang, M. A., Lim, S. J., & Park, J. H. (2021). Impact of the COVID-19 pandemic on the lifestyle, mental health, and quality of life of adults in South Korea. *PLoS One*, *16*(2), e0247970.

Kompas.com. (2022). Rumah Warga di Solo Terendam Banjir saat ditinggal piknik, jBegini Analisis BMKG. Retrieved 5 Juni 2022 from https://www.kompas.com/sains/read/2022/05/09/160000823/rumah-warga-di-solo-terendam-banjir-saat-ditinggal-piknik-begini-analisis?page=all#:~:text=KOMPAS.com%20%2D%20Puluhan%20rumah%20warga,)%2C%20sekitar%20pukul%2014.30%20WIB, 9 Mei 2022

Liputan6.com. (2022). Mengapa Banyak Bank Sampah yang tidak aktif di Solo?. Retrivied 6 Juni 2022 from https://www.liputan6.com/lifestyle/read/4897919/mengapa-banyak-bank-sampah-yang-tidak-aktif-di-solo, 26 Februari 2022

Fernández-Torres, M. J., Hildebrandt, D., Sempuga, B. C., & Caballero, J. A. (2020). Integrating environmental concerns into the teaching of mathematical optimization. *Education for Chemical Engineers*, *32*, 40-49.

Majdi, M. K., Subali, B., & Sugianto, S. (2018). Peningkatan Komunikasi Ilmiah Siswa SMA melalui Model Quantum learning One Day One Question Berbasis Daily Life Science Question. *UPEJ Unnes Physics Education Journal*, *7*(1), 81-90.

Adichwal, N. K., Ahmadini, A. A. H., Raghav, Y. S., Singh, R., & Ali, I. (2022). Estimation of general parameters using auxiliary information in simple random sampling without replacement. *Journal of King Saud University-Science*, *34*(2), 101754.

Rupani, P. F., Nilashi, M., Abumalloh, R. A., Asadi, S., Samad, S., & Wang, S. (2020). Coronavirus pandemic (COVID-19) and its natural environmental impacts. *International Journal of Environmental Science and Technology*, *17*(11), 4655-4666.

Pastore, S. (2017). Research Designs and Methods in Self-assessment Studies: A Content Analysis. *International Journal of Evaluation and Research in Education (IJERE)*, *6*(4), 257

Pranatawijaya, V. H., Widiatry, W., Priskila, R., & Putra, P. B. A. A. (2019). *Penerapan Skala Likert dan Skala Dikotomi Pada Kuesioner Online* [Application of Likert Scale and Dichotomy Scale in Online Questionnaire]. *Jurnal Sains Dan Informatika*, *5*(2), 128–137.

Arnab, R. (2017). Chapter 3- Simple Rancom Sampling. Survey Sampling Theory and Applications. *Academic Press*. 51-88

Widyaningrum. 2016. *Pembentukan Karakter Peduli Lingkungan Siswa Sekola Dasar Melalui Sekolah Peduli dan Berbudaya Lingkungan* [Character Building of Environmental Care for Elementary School Students through Environmental Care and Culture Schools]. *Jurnal Widya Wacana. 11(1).* Februari

Saputra, P. A., & Nugroho, A. (2017). *Perancangan Dan Implementasi Survei Kepuasan Pengunjung Berbasis Web Di Perpustakaan Daerah Kota Salatiga* [Design and Implementation of a Web-Based Visitor Satisfaction Survey at the Salatiga City Regional Library]. *JUTI: Jurnal Ilmiah Teknologi Informasi, 15*(1).

Schwabe, I., Boomsma, D. I., & van den Berg, S. M. (2017). Increased environmental sensitivity in high mathematics performance. *Learning and Individual Differences*, *54*, 196-201.

Sugiyono. (2016). Metode Penelitian Pendidikan (Pendekatan Kuantitatif, Kualitatif, dan R&D). Bandung: Alfabeta

Hartanto, T., Dharoko, T. A., & Subroto, Y. W. (2020). Tri Hanakara Spatial Layout Persistence Concept of Baluwarti Sttlement in Surakarta. *Journal of Architecture and Built Environment*. 47(2), December, 99-108

Tugimin & Mariyani, Y. (2014). *Pengaruh Pemanfaatan Interaktif Whiteboard dan Motivasi Belajar Terhadap Hasil Belajar Siswa* [The Effect of Interactive Whiteboard Utilization and Learning Innovation on Student Learning Outcomes]. *Jurnal Teknologi Pendidikan dan Pembelajaran*. *1(2)*, November, 192-202