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THE EFFECT OF THE EARTH SCIENCE COMMUNITY LEARNING MODEL ASSISTED BY GEOGRAPHICAL TOOLS LEARNING MEDIA ON STUDENT LEARNING OUTCOMES IN GEOGRAPHY LEARNING

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ABSTRACT: Geography learning requires active involvement of students in understanding geosphere phenomena contextually and spatially. However, learning that is still focused on teachers has the potential to result in low student understanding, especially in natural resource material. This study aims to determine the effect of the Earth Science in Community (EarthComm) learning model assisted by geographical tools on student learning outcomes in geography learning. This study uses a quantitative approach with a pre-experiment type through a one group pretest-posttest design. The research sample consisted of 20 students in one class at SMAS Methodist Banda Aceh. The research instrument was an objective multiple-choice test administered through pretest and posttest. Data analysis was performed using the Shapiro–Wilk normality test and the paired sample t-test hypothesis test at a significance level of 5%. The results showed that the data were normally distributed and that there was a significant effect of the EarthComm learning model assisted by geographical tools on the understanding of natural resource material, as indicated by a two-tailed significance value $\leqslant 0.05$, namely 0.00000012. Thus, the EarthComm learning model assisted by geographical tools is effective in improving student understanding and is relevant for application in geography learning.

Keywords: Earth Science in Community, geographical tools, Google Earth, geography learning

1. INTRODUCTION

Learning is a form of activity that guides students towards more meaningful directions and goals [1]. n addition, the learning process is also an effort to mature and change people from individuals to improve the quality of their attitudes and behavior, as well as increase individual knowledge. Therefore, [2] believes that a good learning process is characterized by positive interpersonal interactions between students and teachers as well as among students, which contribute significantly to the formation of socio-emotional conditions.

In its application, the learning process also requires the achievement of learning objectives so that it can build knowledge and skills that are useful in dealing with various problems in life [3]. [4] states that learning characteristics have two special characteristics, namely prioritizing the thinking process and building continuous dialogue. These characteristics can be achieved if teachers do not only act as conveyors of material, but also as classroom managers, motivators, facilitators, mentors, and good assessors [5]. Therefore, teachers are required to no longer rely solely on teacher-centered models, but to make more use of two-way interaction so that the classroom atmosphere can develop well.

In essence, geography is a science that observes and studies natural phenomena comprehensively in a spatial and regional context define geography as a discipline that examines the phenomena and characteristics of the earth's surface and humans using a spatial approach, while also explaining the correlations and interactions between them. This is because the main framework of geography always examines natural and human factors in relation to interrelationships, interactions, and spatial integration [6]. Therefore, geography learning should not make teachers the sole source of information, but also involve interaction with all sources of information used so that learning objectives can be achieved [7].

Geography education is the process of learning about the spatial aspects of the Earth's surface, which encompasses all natural phenomena and human life with its regional variations [8]. At the high school/MA level, the scope of Geography covers most of the interactions between humans and the environment. This requires an interesting

learning process so that students become more active and can easily achieve learning objectives. However, reality shows that teacher and student factors are often the main causes of many obstacles in Geography learning.

This is due to the persistent stigma that geography is simply a subject to be memorized, which leads to lectures and note-taking. As a result, students tend to be passive and unmotivated, which impacts their skills development and lowers their learning outcomes [9]. Therefore, one learning model that can be applied is Earth Science in the Community, commonly abbreviated as EarthCom.

According to [10], the earth science in community learning model has advantages over other learning models because it can improve science literacy through investigative activities carried out by students. Investigative activities that emphasize issues in the environment and Earth will help students build their knowledge, so that students will strive to discover and apply their own ideas [11]. In addition, another advantage of the earth science in community learning model is that it not only supports web-based research but also field investigations, so it can be applied not only in urban schools but also in non-urban areas because it does not depend on internet access [12]. In earth science in community, the learning process is the main focus, while learning outcomes are seen as a consequence of students' efforts to build knowledge through exploration and application of ideas [13]. Through the earth science in community learning model, students will encounter many experimental processes and face failures, thus continuing to be motivated to achieve success.

[14] stated that there are 11 syntaxes of earth science learning processes in the community, namely: a) chapter challenge, b) think about it, c) investigating, d) reflecting on the activity and challenge, e) digging, f) check your understanding, g) applying what you have learned, h) preparing for the chapter challenge, i) inquiring further, j) chapter assessment, k) alternative assessment. The advantage of this learning model is that it is able to develop solutions to geosphere phenomena based on contextual discoveries and can stimulate students to be environmentally aware [15].

According to [16], the earth science in community learning model can be applied to Geography lessons because it has been proven to have a significant effect on mastery of the material. These results are supported by research data from SMAN 1 Mojokerto, which shows that the earth science in community model affects Geography learning outcomes because it can stimulate students' concern for understanding the fundamental problems in a region [17]. [18] also proved that the experimental class that applied the earth science in community learning model produced relatively higher average scores than the conventional learning model applied in the control class.

The application of the earth science in community learning model also serves to increase students' awareness of the environment. A study conducted on 600 high school students in Turkey showed that earth science in community was able to increase students' knowledge and attitudes towards natural resources, especially renewable energy [19].

The use of relevant learning media will also encourage a more optimal learning process, one of which is the use of geographical tools. Geographical tools are investigative tools used to communicate, obtain, and process information in geography learning. There are several geographical tools that can be used in geography learning, namely visual representations, geospatial technology, visuals and graphics, field studies, and maps [20]. These types of digital learning tools have been used to enhance the geography learning experience and create an interactive learning environment [21]. One of the geographical tools that can be utilized in learning is Google Earth. This is because Google Earth is very easy to use to assess and examine phenomena and features on the Earth's surface [22].

Google Earth is a platform that displays terrain, topography, and world maps that can be overlaid with various geographical information in digital and three-dimensional form [23]. The advantages of Google Earth lie in its 3D visualization, interactive navigation, and various additional information such as photos, videos, and descriptions that encourage student understanding. The features available on Google Earth also provide opportunities for students to examine geographic data, identify geosphere phenomena, and visualize their findings on this platform [24]. Through a contextual learning approach, students are not only trained in analytical skills, but also develop solution-oriented thinking and collaboration skills [25].

Google Earth can be optimized as a medium to assist the geography learning process, particularly regarding natural resources, as it provides a digital representation of the Earth that is easily accessible to both students and teachers. However, as an application that provides satellite imagery, topographic maps, and 3D visualization features, Google Earth requires image interpretation intervention in conducting exploration activities so that the objects displayed become easier to identify [26]. The elements of interpretation referred to include hue/color, shape, size, texture, pattern, shadow, site, and association [27]. Thus, teachers and students can display the location of a geosphere phenomenon, so that students can directly apply essential concepts, approaches, and principles of geography in the learning process [28]. According to [29], Google Earth can serve as a link between

the conceptual foundations of students and teachers in studying interactive maps.

According to [30], optimizing Google Earth as a learning medium has a significant effect on student understanding, with better learning outcomes compared to learning without this medium. This is also reinforced by [31] in their research, which shows that classes using Google Earth show superior average learning outcomes compared to classes using PowerPoint. Not only that, learning that uses Google Earth is also more practical in stimulating student participation and can encourage students to explore their geography skills [32].

2. METHODS

This study was conducted at SMAS Methodist Banda Aceh. The research sample consisted of 20 students in the same class. This study used a quantitative approach with a pre-experimental design using a one-group pretest–posttest design. The data collection technique used was testing. The research instrument used was a test sheet. Data analysis techniques included validity and reliability tests for the research instrument, normality tests using the Shapiro-Wilk statistical test, and hypothesis testing using the paired sample t-test statistical test. The researcher used Microsoft Excel to perform testing and data analysis. After conducting validity tests using the product moment correlation formula and reliability tests using KR-20 on 30 multiple-choice questions, there were 19 questions that could be used in the pretest and posttest because they were valid. Furthermore, these 19 questions were also declared reliable because they showed a coefficient of 0.893, which is greater than 0.70 and can therefore be categorized as having high reliability.

3. RESULTS AND DISCUSSION

The data presented are the results of pre-tests and post-tests conducted on 11th grade students at SMAS Methodist Banda Aceh. Purwanto (2011) explains that the level of mastery of the material is determined by the percentage of the score achieved by students against the maximum score, which is then classified into qualitative categories. The formula used is mastery level (%) = (score obtained / maximum score) × 100.

Based on these percentages, the level of mastery of the material is classified into five categories, namely very low, low, moderate, high, and very high, which are represented in the categories of fail, poor, fair, good, and very good.

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Table 1. Frequency Distribution of Student Pretest Scores

No	Value	Frequency	Percentage of Mastery	Category
1	0 – 10	5	<54%	Fail
2	11	4	55% – 59%	Poor
3	12 – 14	5	60% – 75%	Fair
4	15 – 16	3	76% – 85%	Good
5	17 – 19	3	86% – 100%	Very Good
Total		20	100%	

Based on the data above, it can be seen that there are 5 students in the failing category, 4 students in the low category, followed by 5 students in the fair category. There are 3 students in the good category and 3 students in the excellent category. This distribution shows that the initial abilities of the students are at a moderate to good level, but are not evenly distributed in the excellent category..

Table 2. Frequency Distribution of Student Posttest Scores

No	Value	Frequency	Percentage of Mastery	Category
1	0 – 10	0	<54%	Fail
2	11	0	55% – 59%	Poor
3	12 – 14	4	60% – 75%	Fair
4	15 – 16	6	76% – 85%	Good
5	17 – 19	10	86% – 100%	Very Good
Total		20	100%	

The posttest results show that 10 students were in the excellent category, while 6 others were in the good category, and 4 were in the fair category. There were no students in the poor and failing categories. This indicates an improvement in student learning outcomes after the treatment was

given. To ensure data normality, the pretest and posttest results will be tested using the Shapiro-Wilk test.

Based on the results of normality testing using the Shapiro–Wilk method calculated manually with the help of Microsoft Excel, a Wcount value greater than Wtable was obtained at a significance level of 0.05. Thus, the null hypothesis (H_0) was accepted, and the research data was declared to be normally distributed.

Table 3. Normality Test Results

Variable	n	t-count	t-critical	Decision
Pretest	20	0.975	0.905	Normal
Posttest	20	0.927	0.905	Normal

Hypothesis testing using a paired sample t-test was used to test the difference in the average learning outcomes of students. Based on calculations using Microsoft Excel, a two-tailed significance value of 0.00000012 was obtained. This figure indicates a tendency for an increase in understanding of natural resource material among 11th grade students who used the earth science in the community model assisted by geographical tools learning media..

Table 4. Results of the Paired Sample T-Test

Variable	Mean Pretest	Mean Posttest	Mean Difference	t statistic	df	Sig. (2 tailed)	Description
Learning Outcome Score	12,10	16,20	-4,10	-8,166	19	0,00000012	Significant

These results are in line with Aliman's (2024) findings, which show that when the earth science in community learning model is combined with geographical tools, it can be an effective means of teaching students about geography, especially in terms of human and environmental interactions. Research conducted by [18-21], also revealed that the application of the earth science in community model has been proven to significantly improve geography learning outcomes compared to conventional models. Through the earth science in community learning model, students are required to observe and analyze data in order to gain a comprehensive understanding.

The findings of this study also show that the earth science in community learning model assisted by geographical tools is not only a relevant strategy for teaching Geography (especially natural resource material), but also capable of catalyzing the development of scientific and spatial thinking in students. Research conducted by [17-22], also shows similar results, where students who learn using the earth science in community model assisted by Google Earth images tend to experience a significant increase in spatial thinking skills. The active participation of students in learning activities through observing environmental phenomena, collecting data, and analyzing information has been proven to encourage active and meaningful knowledge development [33-34].

Improved mastery of natural resource material among 11th grade students is also closely related to the use of geographical tools (in this study, Google Earth imagery was used) that can effectively visualize the physical conditions of an area. This is in line with [11] research, which proves that the integration of geographical tools in geography learning can make it easier for students to understand academic concepts. Learning media such as satellite images, digital maps, and spatial representations are also very relevant for understanding the spatial distribution of natural resources [25]. Similar findings were also reported by [26-28], where geographical tools were proven to make it easier for students to understand the correlation between geosphere phenomena through data visualization and spatial pattern interpretation. Similarly, [29-32] showed through their research that geography learning supported by geographical tools has a more significant impact on the development of relational thinking skills and student comprehension levels compared to conventional learning. In addition, [11] mention that the consistent use of geographical tools in geography learning not only develops students' visualization skills, but also their cognitive engagement and analytical abilities.

Furthermore, this study also confirms that the implementation of the earth science in community

learning model assisted by geographical tools is capable of creating investigative and collaborative learning. In line with this study, [14] stated that the use of geographical tools in the earth science in community model can increase student participation in environmental learning through data accumulation and analysis activities when compared to only viewing static data. Through collaborative tasks that require discussion, teamwork, and the development of research-based problem-solving strategies, which are at the core of the earth science in community model, students are encouraged to be more active [11]. This learning model has been proven to increase students' motivation, social and scientific skills, including scientific communication and systemic thinking about the relationship between humans and the environment [17].

Thus, the application of the earth science in community learning model assisted by geographical tools has been proven to have a significant effect on improving students' understanding and learning outcomes in Geography. Furthermore, the repetitive application of the earth science in community learning model assisted by geographical tools not only optimizes conceptual mastery of natural resources in Geography lessons, but also encourages active learning, cooperation, and critical thinking skills in a real-world context. The application of this model is highly relevant to the achievements of the Pancasila Student Profile as outlined in the Merdeka Curriculum, particularly in relation to creativity, critical thinking, and global awareness.

4. CONCLUSION

Based on the results of research conducted on 11th grade students at SMAS Methodist Banda Aceh, it can be concluded that the application of the earth science in community learning model assisted by geographical tools has a significant effect on improving the understanding of natural resource material among 11th grade students at SMAS Methodist Banda Aceh. This is evidenced by the results of the hypothesis test, which shows a two-tailed significance value of ≤ 0.05, namely 0.00000012, so that empirically, the learning model applied is effective in improving student learning outcomes compared to before the model was applied.

Improvements in student understanding are influenced by the characteristics of the earth science in community model, which emphasizes inquiry-based learning, direct observation, and contextual analysis of environmental data. Support from geographical tools such as Google Earth provides a visual and concrete learning experience, making it easier for students to comprehensively and spatially master the concept of natural resources. These findings are in line with previous studies confirming that the integration of earth science in community and geographical tools effectively improves learning outcomes, spatial thinking, and understanding of the relationship between humans and the environment. In addition to cognitive aspects, this model also encourages active engagement, collaborative learning, and the strengthening of higher-order thinking skills, including analytical, scientific, and contextual skills.

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6. REFERENCES

[1] Junaedi, I. (2019). Proses pembelajaran yang efektif. Journal Of Information System, Applied, Management, Accounting And Research, 3(2), 19-25. https://www.journal.

[2] Nugraha, M. (2018). Manajemen kelas dalam meningkatkan proses pembelajaran. TARBAWI: Jurnal Keilmuan Manajemen Pendidikan, 4(1). 27-44. https://doi.org/10.3

[3] Ali, M. K., Kamal, A. L., Safitri, D., & Sujarwo, S. (2024). Penggunaan Google Earth dalam Pembelajaran IPS. Jurnal Teknologi Pendidikan, 1(4), 9. https://doi.org/10.47134/

[4] Aliman, M., et al. (2019). Improving Environmental Awareness of High School Students' in Malang City through Earthcomm Learning in the Geography Class. International Journal of Instruction, 12(4), 79-94. https://doi.org/10.29333/iji.2019.1246a

[5] Aliman, M., Sumarmi, & Marni, S. (2024). Developing Spatial Thinking through the Earthcomm Learning Model: Exploring the Role of Earth Science in the Community. Journal of Social Studies Education Research, 15(1), 251-281.

[6] Aliman, M., Halek, D. H., Lukman, S., Marni, S., & Alnursa, D. S. (2022). Apakah model earthcomm dan gaya belajar dapat mempengaruhi kemampuan berpikir spasial siswa SMA?. Jambura Geo Education Journal, 3(2), 114–125. https://doi.org/10.34312/jgej.v3i2.16348

[7] Altuntaş, C. E., & Turan, S. L. (2016). Awareness of secondary school students about renewable energy sources. Renewable Energy, 116, 741-748. https://doi.org/10.1016

[8] Anggrenia, I., Priandika, A. T., & Rahmanto, Y. (2023). Sistem informasi geografis pemetaan UKM di Provinsi Lampung berbasis web pada UPTD PLUT KUMKM Provinsi Lampung (studi kasus: UPTD PLUT KUMKM Provinsi Lampung). Jurnal Informatika dan Rekayasa Perangkat Lunak, 3(4), 384–390. https://doi.org/10.33365/j

[9] Chen, F., & Chen, G. (2025). Technology-enhanced collaborative inquiry in K–12 classrooms: A systematic review of empirical studies. Science & Education, 34, 1731–1773. https://doi.org/10.1007/s11191-024-00538-

[10] Favier, T. T., & van der Schee, J. A. (2014). The effects of geography lessons with geospatial technologies on the development of high school students' relational thinking. Computers & Education, 76, 225–236. https://doi.org/10.1016/j.compedu.2014.04.0

[11] Gillies, R. M. (2023). Using Cooperative Learning to Enhance Students' Learning and Engagement during Inquiry-Based Science. Education Sciences, 13(12), 1242. https://doi.org/10.3390/educsci13121242

[12] Gosselin, D., Robeck, E. C., & Smith, M. J. (2001). Earthcomm Teacher Enhancement Workshop Manual.

[13] Halomuan, U. (2021). Pemahaman Konsep Geografi Siswa dipengaruhi oleh Kemampuan Berpikir Kreatif dan Gaya Mengajar Guru. Herodotus: Jurnal Pendidikan IPS, 4(1), 26-42, https://doi.org/10.30998/herodotu

[14] Jaeger, A. J. (2024). Google Earth as a Tool for Supporting Geospatial Thinking. Land, 13(12), 2218. https://doi.org/10.3390/land

[15] Lasulika, C. T., & Lukum, A. (2025). Integrasi teknologi geospasial dalam pembelajaran kontekstual geografi di tingkat SMA. JPSS: Jurnal Pendidikan Sang Surya, 11(1), 682–689. https://doi.org/10.56959

[16] Latif, A. (2020). Tantangan guru dan masalah sosial di era digital. Jurnal Ilmu Sosial dan Pendidikan, 4(3), 613-621.

[17] Kamil, P. A. (2018). Pemanfaatan geographical tools untuk mendukung pencapaian keterampilan geografi pada siswa SMA. Jurnal Pendidikan Geosfer, 3(2), 1-8.

[18] Nisa, K., Soekamto, H., Wagistina, S., & Suharto, Y. (2021). model pembelajaran earthcomm pada mata pelajaran geografi: pengaruhnya terhadap kemampuan berpikir spasial siswa SMA. Jurnal Ilmiah Pendidikan Profesi Guru, 4(3), 500–510. https://doi.org/10.23887/jippg.v4i3.40031

[19] Norton, E., Li, Y., Mason, L. R., & Washington-Allen, R. A. (2019). Assessing the impact of a geospatial data collection app on student engagement in environmental education. Education Sciences, 9(2), 118. https://doi.org/10.3390/educsci9020118

[20] Panjaitan, B. R., Ningrum, E., & Waluya, B. (2023). Digital Learning Tools in Geography Education: A Systematic Literature Review. The Eurasia Proceedings of Educational and Social Sciences, 33, 135–143. https://doi.org/10.55549/epess.1413355

[21] Park, D.-Y., Yager, R. E., & Smith, M. (2005). Implementing EarthComm: Teacher professional development and its impact on student achievement scores in a standards-based earth science curriculum. Electronic Journal of Science Education, 9(3).

[22] Purwanto. (2011). Evaluasi Hasil Belajar. Yogyakarta: Pustaka Belajar.

[23] Putri, P. H., & Sriyanto, S. (2022). Efektivitas penggunaan media Google Earth dalam pembelajaran geografi untuk meningkatkan keterampilan geografi siswa kelas X IPS SMA Negeri 52 Jakarta. Edu Geography, 10(2), 15–34. https://doi.org/10.15294/edugeo.v10i2.60

[24] Sagala, S. (2010). Konsep dan Makna Pembelajaran. Bandung: Alfabeta.

[25] Sanisah, S., Tohirin, T., Kusmarniaty, K., & Rukakyah, S. (2024). Analisis Implementasi Pervasive Learning Model untuk Memaksimalkan Capaian Pembelajaran Geografi. Jurnal Basicedu, 8(1), 693–706. https://doi.org/10.31004/basicedu.v8i1.7155

[26] Saputri, I., Buwono, S., & Christanto, L. M. H. (2020). Pengaruh Google Earth pada pembelajaran geografi terhadap hasil belajar siswa SMA Negeri 10 Pontianak. Jurnal Pendidikan dan Pembelajaran Khatulistiwa, 9(7), 1–10. https://doi.org/10.26418/jppk.v9i7

[27] Suherdiyanto. (2014). Upaya peningkatan hasil belajar siswa melalui pembelajaran earth science in community (earthcomm). Jurnal Edukasi, 1(1), 111-123. https://doi.org/10.31

[28] Sumadyanti, U. V., Sriartha, I. P., & Maryati, T. (2024). Implementasi model pembelajaran EarthComm dalam mata pelajaran IPS. Jurnal Pendidikan IPS Indonesia, 8(1), 54–61. https://doi.org/10.23887/pips.v8i1.3533

[29] Syaviar, F. A., & Wirahayu, Y. A. (2020). Pengaruh model pembelajaran earthcomm

berbantuan citra Google Earth terhadap kemampuan berpikir spasial siswa MAN 3 Kediri. Jurnal Swarnabhumi, 5(2), 11-18. https://doi.org/10.31851/swarnabhumi.v5i2.4

[30] Tamiminia, H., Salehi, B., Mahdianpari, M., Quackenbush, L., Adeli, S., & Brisco, B. (2020). Google Earth Engine for geo-big data applications: A meta-analysis and systematic review. ISPRS Journal of Photogrammetry and Remote Sensing, 164, 152–170. https://doi.org/10.1016/j.isprsjprs.2020.04.00

[31] Thankachan, B., & Franklin, T. (2013). Impact of Google Earth on student learning. International Journal of Humanities and Social Science, 3(21), 11–16.

[32] Valderrama-Hernández, R., Alcántara, L., & Limón, D. (2017). The Complexity of Environmental Education: Teaching Ideas and Strategies from Teachers. Procedia - Social and Behavioral Sciences, 237, 968–974. https://doi.org/10.1016/j.sbspro.2017.02.137

[33] Wattiheluw, S., Leuwol, F. S., & Tetelepta, E. G. (2024). Geography Teachers' Competence in Utilizing Learning Resources at SMA Negeri 15 Central Maluku. Jurnal Pendidikan Geografi Unpatti, 3(2), 210–217. https://doi.org/10.30598/jpguvol3iss2pp210-

[34] Wijayanti, D., Anwar, S., Khairani, K., & Sukhaimi, N. A. (2022). Implementasi Inovasi Pembelajaran Geografi Tingkat SMA Dalam Kurikulum 2013. Journal on Education, 4(2), 837–843. https://doi.org/10.31004/joe.v4i2.