

DEVELOPMENT OF GOOGLE SITES LEARNING MEDIA ON SOLAR SYSTEM MATERIAL TO IMPROVE SCIENCE LITERACY OF GRADE VI STUDENTS

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Abstract. Based on PISA data in 2022, Indonesian students scored an average of 383 in science, ranking 67th out of 81 countries. In addition, the use of technology-based learning media by teachers is not optimal. Therefore, it is necessary to develop more effective technology-based learning media to improve students' science literacy. The objectives of this research are (1) to know the feasibility of Google Sites, (2) to know students' responses to Google Sites, and (3) to analyse students' science literacy skills after using Google Sites. This study is a developmental study using the ADDIE model. The data collection methods used in this research were observation, interview, questionnaire and science literacy test. As data analysis techniques, quantitative data analysis and science literacy analysis were used. The findings of this study are: (1) The feasibility test of media and materials experts obtained a percentage of 90% and 86.2% in the "very feasible" category. (2) The students' responses obtained a percentage of 89.5% in the "very good" category. (3) The analysis of students' science literacy skills obtained a mean n-gain score of 0.73 in the 'High' category. It can be concluded that Google Sites learning media is feasible to be used in learning activities, and effective enough to improve the science literacy skills of students in class VI. Future research should consider examining the impact of network conditions on each student device, ensuring seamless access to the media.

Keywords: development, educational media, Google Sites, science literacy

INTRODUCTION

Advancements in science and technology require humans to adapt. Awareness of the scientific domain is crucial to addressing the challenges of the present century. Science education has significant potential to develop high-quality human resources (Handayani et al., 2022). This potential will be achieved if science education can produce students who are competent in their fields and successfully develop the ability to apply scientific knowledge and processes in real life. The act of understanding science and applying it to real life is referred to as science literacy (Handayani et al., 2022).

Science literacy is the ability to use scientific knowledge, identify questions and make inferences based on evidence to draw conclusions about nature and changes caused by human activity (PISA, 2023). Science literacy is the ability to understand science, judge its truth, and see how it affects the real world (Maula et al., 2023). Science literacy helps students use scientific knowledge, ask questions and draw conclusions to understand and make decisions about the natural world and human interactions with the environment (Ardiyanti et al., 2019). The science learning curriculum requires students to demonstrate not only an understanding of the material but also the ability to apply the theory to the surrounding environment (Hasbiyati et al., 2022). A survey conducted by the *Programme for International Student Assessment* (PISA) in 2022 revealed that the average score of Indonesian students

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was 383, which was below the OECD average of 476. Indonesia was ranked 67th out of 81 participating countries, indicating that science literacy in Indonesia remains low.

An effective approach to improving science literacy is to use digital technology as a learning medium (Shofia et al., 2024). Learning activities need to be adapted and updated through the use of technology-based learning media. This is in line with Haerani & Suhartini (2022) research, which found that science education needs to adapt to the current trends of the 21st century, and educators need to embrace technological advances.

Based on the results of observations made, it was found that the use of technology-based learning media is still very rare, only in the form of learning videos in other subjects. Teachers are still less skilled in utilising information and communication technology in making innovative and creative learning media. Teachers tend to use blackboard media as reference material for learning in school. The use of Google Sites learning media is also still not optimal and still very minimal. Therefore, in an effort to improve the quality of education in this fast-moving world era, it cannot be denied that all educational activities, especially in basic education, require digital technology in every activity (Mufliva & Permana, 2024). The results of scientific literacy tests at school are also still low. This is evidenced by the results of the science literacy test given by researchers in the form of questions to determine the level of science literacy of students; the average score of science literacy of students in class VI is 51. This is still far from the criteria for interpreting science literacy with a "good" score category, which is 72 (Erniwati et al., 2020). Building science literacy in today's generation does not mean turning students into researchers, but rather providing them with the understanding of science and technology needed to make important decisions that affect their current and future lives (Yusmar & Fadilah, 2023).

One of the learning media that can be used to improve students' science literacy is Google Sites-based learning media (Auliaty et al., 2021; Hidayanti et al., 2021; Setiyanti et al., 2021). Google Sites is a service from Google that provides features for creating websites that can be visited, similar to websites in general. The site is managed with a website-like appearance, contains text and can be enhanced with animation, audio and video (Aulia & Riefani, 2021). By using the features of Google Sites, such as multimedia integration, interactive links and collaborative capabilities, educational media can be designed to meet the needs of different students, especially in the science subject of solar system material (Kastina, 2024).

The solar system is a set of astronomical objects consisting of planets, moons, asteroids, comets and other celestial bodies, all under the gravitational influence of the Sun. The system stretches across space and is organised by the gravitational pull of a central body, the Sun. These components interact with each other and move in their respective orbits around the Sun (Kementerian Pendidikan dan Kebudayaan, 2018). In the solar system, there are inner planets consisting of the planets Mercury, Venus, Earth and Mars, then there are outer planets consisting of the planets Jupiter, Saturn, Uranus, Neptune, and there are also celestial bodies consisting of small planets, asteroids, comets and meteors (Kementerian Pendidikan dan Kebudayaan, 2018). Many studies have developed technology-based learning media to improve students' understanding of learning. In previous studies related to the development of Google Sites learning media, there are not many studies that discuss the use of Google Sites to improve science literacy. As research conducted by Mulyaningsih et al., (2023) the development of Google Sites learning media can improve students' reading literacy. Another study also conducted by Setianingsih et al., (2024) said that the

development of learning media using Google Sites was able to improve students' critical thinking skills and digital literacy. Previous research has developed Google Sites media, but there are still few that discuss science literacy. Therefore, this research aims to develop Google Sites learning media to improve science literacy by adding features that interest students, such as adding interactive quizzes and creating a comment column for students to ask if they do not understand the material.

Based on the problems described above, it is necessary to develop technology-based learning media that support students during the learning process and can improve students' science literacy skills, so the solution needed is the development of Google Sites-based learning media. Therefore, the objectives of this research are: (1) to analyse the feasibility of Google Sites media; (2) to analyse students' responses to Google Sites media; and (3) to analyse students' science literacy skills after using Google Sites media.

RESEARCH METHOD

This research uses the Research and Development (R&D) research method using the ADDIE model, which consists of several stages, namely analysis, design, development, implementation, and evaluation. This ADDIE model is simple and most commonly used for the development of products such as models, learning strategies, learning methods, media, and teaching materials (Cahyadi, 2019).

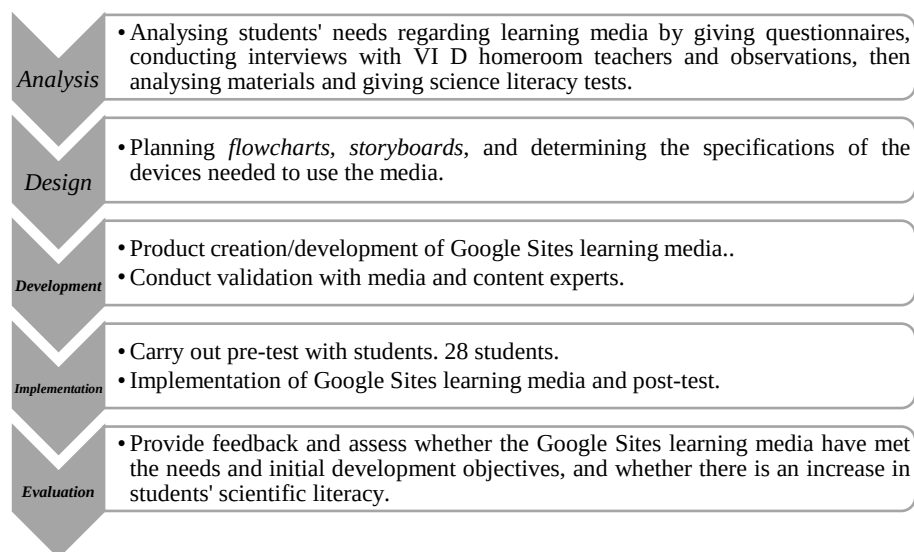


Figure 1. Flowchart of Google Sites media development research

In the analysis stage, the needs of students in terms of learning media, material analysis and scientific literacy of students in Class VI were analysed. Based on the results of observations and interviews, it was found that the use of technology-based learning media is still very rare, so there is a need for technology-based learning media that can help teachers and students learn. In addition, the results of the science literacy test given to the students to measure their scientific literacy obtained an average value of 51%, including in the low category. The results of material analysis are the use of thematic books Grade 6 Theme 9 Curriculum 2013 revised edition of the material used is the solar system.

At the design stage, a flowchart is made showing the stages in the creation of the media visualisation. A storyboard is also created, which includes slides, displays

and full descriptions that include the text to be displayed, the addition of supporting images and videos, the placement of objects and attractive templates to use as a background on the display page. The next step is to determine the device specifications needed to open the Google Sites learning media.

The development phase, during which the product is created according to the design created, includes the input of prepared material, the creation of the interface of each page, the input of images, backgrounds and supporting learning videos. Once the product is ready, a validation test is carried out by media experts and material experts. After the evaluation and suggestions from the media and materials experts, the learning media is revised according to the suggestions.

The implementation stage is the stage where the developed media is used in the classroom. Before the media is implemented with the students, the students are first given science literacy questions as a pre-test, and then implement the learning media on Google Sites, where there is also a post-test of science literacy questions. When everything is done, students are given a questionnaire about their reactions to the developed media.

The evaluation stage is the final stage in the ADDIE model. The purpose of the evaluation is to assess whether the Google Sites learning media have met the needs and initial objectives of the development and whether there is an increase in students' science literacy skills.

Data collection techniques in this study include observation, interviews, questionnaires and science literacy tests. The instruments used in this study were observation sheets, interview sheets, student media needs analysis questionnaires, media and materials expert validation questionnaires, pre- and post-test questions and student response questionnaires. The analysis technique used is the n-gain test to analyse science literacy skills, media feasibility analysis, materials and student responses to the developed Google Sites media. To find out the results of the acquisition of media expert validation scores and questionnaire materials distributed to validators, the content of which consists of a series of questions. The criteria can be found in Table 1.

Table 1. Media and material expert assessment criteria

Criteria	Score
Very Good	5
Good	4
Fair	3
Less	2
Very Poor	1

(Maulita & Saputra, 2023)

In order to find out about the acquisition of student response scores, a questionnaire was distributed to the students, which consisted of a number of questions, as can be seen in Table 2 for the evaluation criteria.

Table 2. Student response assessment criteria

Kriteria	Skor
Strongly Agree	5
Agree	4
Fair	3
Disagree	2
Strongly Disagree	1

(Rahayu et al., 2023)

The results of the questionnaire evaluation are then analysed using the following formula:

$$P (\%) = \frac{\text{total score obtained}}{\text{maximum score}} \times 100\%$$

(Maharani & Sari, 2023)

The results of the calculation according to the formula are then compared with the eligibility criteria in Table 3 for eligibility categories for media and material experts and in Table 4 about eligibility categories for student responses.

Table 3. Media and material expert validator eligibility categories

Assesment Criteria	Percentage (%)
Very Feasible	81-100 %
Worth	61-80 %
Less Feasible	41-60 %
Not Feasible	21-40 %
Very Inappropriate	0-20 %

(Rahayu et al., 2023)

Table 4. Student response eligibility categories

Assesment Criteria	Percentage (%)
Very Good	≥86 %
Good	70-85 %
Simply	54-69 %
Less	37-53 %
Very Less	≤ 36%

(Rahayu et al., 2023)

Table 5. Science literacy score criteria

Criteria	Assesment
Very Good	86-100
Good	72-85
Simply	58-71
Less	43-57
Very Less	≤ 43

(Erniwati et al., 2020)

Analysis of students' science literacy was carried out using n-gain analysis to see if there was an increase in scores between the *pretest* and *posttest*. The n-gain formula is as follows:

$$Ngain = \frac{\text{Score posttest} - \text{Score pretest}}{\text{Score maks} - \text{Score pretest}}$$

(Hake, 1999)

After obtaining the results of the n-gain analysis, it is continued by calculating student scores in Table 6.

Table 6. N-gain criteria

N-gain value	Criteria
High	$g > 0,7$
Medium	$0,7 > g > 0,3$
Low	$g < 0,3$

(Hake, 1999)

RESEARCH RESULTS AND DISCUSSION

This development produces a web-based learning medium using *Google Sites*. The results of the research based on the stages that have been carried out are as follows:

Analysis

This analysis stage was carried out during the pre-research to identify the needs in the research process. During this stage, the researchers conducted a materials analysis, a needs analysis and a science literacy skills analysis. In the material analysis stage, it was found that the school was still using the revised edition of the 2013 curriculum. The book used is Thematic Theme 9 'Exploring Space' and the material used is the Solar System. The results of the needs analysis show that technology-based learning media are still very rarely used in the classroom. Teachers tend to use conventional methods, although the schools have sufficient technological equipment, but its use is not optimal.

Based on the results of the Media Needs Questionnaire, 92% of the students stated that they felt the need to be provided with learning media that could excite and motivate them to learn. Based on the results of the pre-research scientific literacy test, it was found that the average student score for the first indicator 'explaining phenomena scientifically' received a score percentage of 63.8% with a low category, the second indicator 'evaluating and designing scientific investigations' received an average score percentage of 53% with a low category and the third indicator 'interpreting data and scientific evidence' received an average score percentage of 44.6% with a low category.

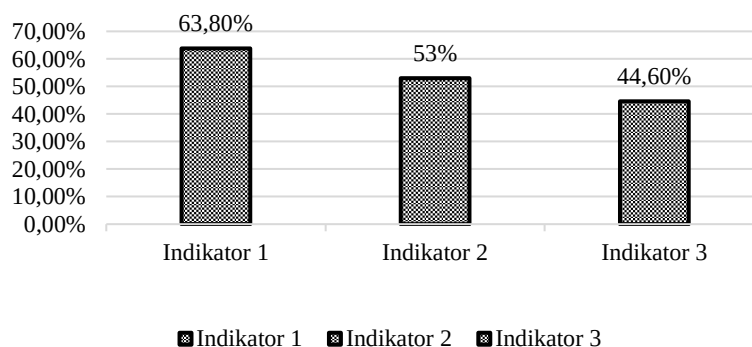


Figure 2. Pre-research results of the science literacy test

Description : Indikator 1 = Explain phenomena scientifically
 Indikator 2 = Evaluate and design scientific investigations
 Indikator 3 = Interpret data and scientific evidence

(PISA, 2023)

Design

The second stage is the design stage. The material used is solar system material for grade VI science subjects. To facilitate interaction with users of Google Sites learning media, the researchers create flowcharts and storyboards to determine the sequence of slides, visual appearance, and placement of text, images, and supporting learning videos on each slide. Next, researchers determine the specifications of the device that will be used to access Google Sites, namely Android 10 or IOS, RAM and storage of at least 4GB/64GB, have a connection to WiFi or a minimum quota of 1GB, have a search engine such as Google, for the recommended network is 4G LTE, chipset used Snapdragon, Mediatek, Samsung Exynos etc. The flow of learning media can be seen Figure 3.

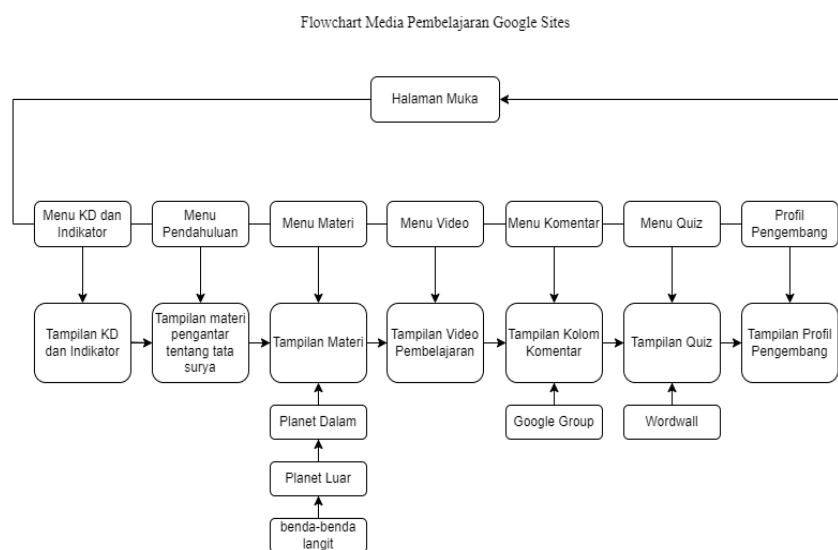


Figure 3. Flowchart

Development

The development phase is the product realisation phase after the design phase. At this stage, the researchers have developed Google Sites media. To access these Google Sites learning media, the following link: www.sitasurpedia.my.id can be used. The display or slide contained in Google Sites consists of a home page where, after arriving at the home page, there are buttons/icons consisting of KD and Indicators, Introduction, Material, Video, Comment Page, Quiz and Developer Profile.



Figure 4. Google Sites media menu display

Once Google Sites is complete, the product is validated by media and materials experts to ensure the feasibility of the media created. The results of the media validation are shown in Table 7.

Table 7. Media expert validation results

No.	Aspect assessed	V1	V2	Percentage	Criteria
1	Display Aspect	13	15	93,3%	Very Feasible
2	Presentation Aspect	12	14	86,6%	Very Feasible
3	Benefit Aspect	9	9	90%	Very Feasible
Total number of scores		34	43	90%	Very Feasible

Description :

V1 = Validator 1

V2 = Validator 2

The product conforms to the valid standard if there is conformance between the product and the content or process standard and the criteria assessed by the validator (Nirmala et al., 2023). The results of the media validation show that the learning media based on Google Sites are of very good quality, with an overall percentage of 90% for all aspects. However, the media expert validator made some suggestions related to the presentation aspect. The suggestions include removing the 'Next' and 'Back' buttons on each slide and recommending the use of the navigation buttons that are already available on Google Sites. It is also recommended to add a reference source or channel at the end of each learning video to avoid copyright infringement. The detailed revisions are shown in Table 8.

Table 8. Media expert revision result

No	Advice	Description
1	The Next button on each page is removed. Use the three-dash button on the top left corner only to switch pages.	Before Revision: There are back and next buttons to move between pages on each page.
		After Revision

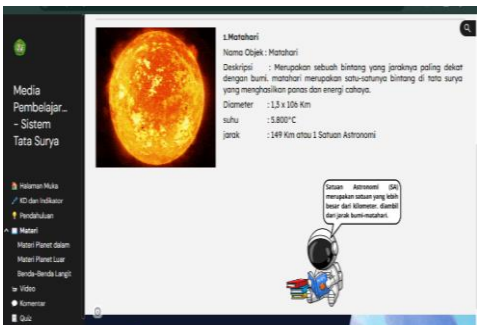
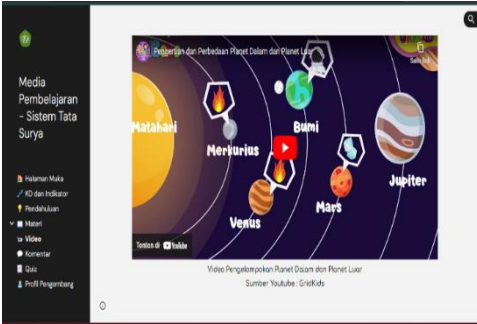
		
2	Add video source	Before Revision: Before revision there is no video source listed on the media.
		After Revision : 

Table 9. Material expert validation

No.	Aspect assessed	V1	V2	Percentage	Criteria
1	Learning Aspect	13	14	90%	Very Feasible
2	Language Aspect	8	8	80%	Very Feasible
3	Presentation Aspect	13	13	86,6%	Very Feasible
Total number of scores		34	35	86,2%	Very Feasible

Description :

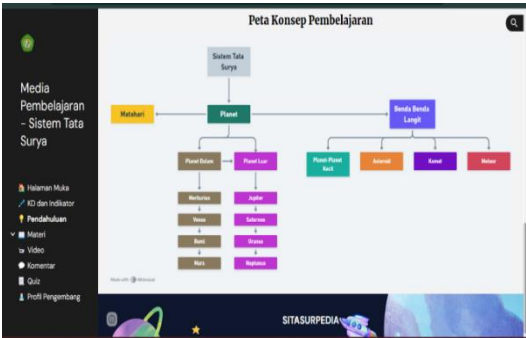
V1 = Validator 1

V2 = Validator 2

The results of the material expert validation by two experts show that, overall, the material contained in the Google Sites media is rated as 'very feasible' with a percentage of 86.2%. In terms of language, there are several suggestions made by the material experts, namely that the use of capital letters and punctuation in the material section needs to be adapted to the rules of Indonesian writing. Correct capitalisation and punctuation ensure that the message is conveyed appropriately, so that communication between the writer and reader runs smoothly. This is important in the context of education, where information needs to be conveyed accurately and easily understood (Muawanah et al., 2022). In addition, there are also suggestions regarding the presentation aspect, namely adding a concept map in the introduction so that students can see what material is being given and make it easier for students to know the learning flow. This is in line with the research conducted by Harahap

(2019) which found that concept maps help students to understand the relationship between ideas and help them to better understand the material. Concept maps also serve as a tool to find students who misunderstand something. The detailed revisions are shown in Table 10.

Table 10. Material expert revision results

No	Advice	Description
1.	In the Quiz menu section, adjust the questions to the rules of Indonesian writing.	Before Revision : In the materials menu, there are still some sentences that do not use capital letters at the beginning of the sentence, and the use of punctuation such as commas and periods is still incorrect. After Revision The use of capital letters at the beginning of sentences and punctuation is correct and follows the rules of writing. 
2.	In the introduction menu section, add a concept map of the material.	Before Revision : There is no concept map in the introduction menu section. There is only an introduction to the material, so the validator suggested adding a concept map. After Revision : 

Implementation

The implementation of learning media for Grade VI students took place in several stages. Before implementation, a pre-test was conducted to measure the students' initial scientific literacy. The results of this pre-test become a reference to see the development of the students' skills before using the learning media. The media

were then implemented in the classroom. Each student is given access in the form of a learning media site that can be accessed through each student's mobile phone.



Figure 5. Implementation of Google Sites learning media

This implementation process went smoothly, although there were some obstacles, such as Wi-Fi not reaching some students' mobile phones, so the researchers provided hotspots with more stable network quality to overcome these problems. After students finished using the Google Sites media, they were given a post-test to measure their science literacy. Students were then given a student response questionnaire to get their feedback on the effectiveness of Google Sites as a learning resource.

Evaluation

The evaluation stage is the final stage of this research. The purpose of the evaluation is to see if the media developed meets the needs and objectives of the initial development. At this stage, the feasibility of Google Sites shows very good results. The students' response to Google Sites is also very positive. The results of the students' responses can be seen in Table 11.

Table 11. Student response results

No.	Aspect assessed	Acquisition Score	Maximum Score	Percentage	Criteria
1	Learning	13	14	90%	Very Feasible
2	Presentation	8	8	80%	Very Feasible
3	Use	13	13	86,6%	Very Feasible
	Total number of score	34	35	86,2%	Very Feasible

The ease of use for learning when using Google Sites media motivates students. Google Sites is seen as helping them to understand the material. Based on this response, Google Sites has been well received by users.

The n-gain analysis showed a significant increase in students' science literacy after using Google Sites. Based on the results of the SPSS 26 for Windows test, it shows that the students' science literacy skills are in the "high" category. This indicates that the use of media has contributed to the improvement of students' scientific literacy according to the indicators of scientific literacy, namely (1) explaining phenomena scientifically, (2) evaluating and designing scientific investigations, (3) interpreting data and scientific evidence (PISA, 2023). The results of the n-gain test are shown in Table 11.

Table 12. n-gain test results

	Descriptive Statistics				
	N	Minimum	Maximum	Mean	Std. Deviation
NGain_Score	28	.25	1.00	.7345	.19980
NGain_persen	28	25.00	100.00	73.4481	19.98019
Valid N (listwise)	28				

The mean value derived from the N-Gain Score results is 0.73, which categorises it as 'High'. The mean value derived from the NGain Percent results is 73.44%, which categorises it as 'Quite Effective'. It can be posited that students' science literacy level is situated within the high category, supported by a number of key factors. These include the implementation of a 21st-century based learning approach, which places emphasis on the development of critical skills, collaboration, communication and creativity. The contemporary educational system in Indonesia, particularly through the implementation of a curriculum that emphasises 21st-century skills, aims to integrate technology, problem-solving and active learning. These factors facilitate students' comprehension of scientific concepts, utilisation of the scientific method, and analytical thinking, which collectively constitute the foundation of science literacy (Pratiwi et al., 2019; Yusmar & Fadilah, 2023). This suggests that the utilisation of Google Sites as a learning medium has facilitated the enhancement of science literacy competencies in accordance with the aforementioned indicators, namely the capacity to explain phenomena in a scientific manner, evaluate and design scientific investigations, and evaluate and design scientific investigations. This is consistent with the findings of Windyariani (2021) who posited that science learning can be effectively facilitated by observing the environment and nature around us, thereby fostering the development of skills, insights, and awareness regarding technology utilisation in our everyday lives. In a further study, Asyhari (2015) found that students who are able to utilise scientific evidence and explain scientific phenomena develop at a faster rate through class discussion activities facilitated by the teacher. This allows students to convey ideas, arguments or information they have obtained, either orally or in writing.

CONCLUSIONS

The learning media developed are Google Sites on solar system material to improve students' scientific literacy. This media is in the form of a web and can be accessed via mobile phones or other devices such as laptops. Based on the results of the feasibility of the Google Sites learning media carried out by the media expert validators and the material expert validators, the results of the media expert validation are given the category 'highly feasible', while the results of the material expert validation are given the category 'very feasible'. The results of the analysis of the students' responses received a positive response with a rating of 'very good'. The results of the n-gain test also showed an increase in the scientific literacy of the students in class VI D, which was included in the 'High' category.

Google Sites-based learning media has been shown to be effective in improving students' science literacy skills, so it can be used in learning activities. For future research, it is recommended to pay attention to the quality of the Internet network when accessing these media, as an adequate network is needed for smooth access. It is also important to pay attention to the writing and punctuation of each material presented. It is also recommended to look for supporting applications for the quiz function to make the quiz presentation more interesting and interactive.

REFERENCES

- Ardiyanti, Y., Suyanto, S., & Suryadarma, I. G. P. (2019). The role of students science literacy in Indonesia. *Journal of Physics: Conference Series*, 1321(3). <https://doi.org/10.1088/1742-6596/1321/3/032085>
- Asyhari, A. (2015). Profil Peningkatan Kemampuan Literasi Sains Siswa Melalui Pembelajaran Saintifik. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*, 4(2), 179–191. <https://doi.org/10.24042/jpifalbiruni.v4i2.91>
- Aulia, D., & Riefani, M. K. (2021). Google Site as a Learning Media in the 21st Century on the Protista Concept. *BIO-INOVED: Jurnal Biologi-Inovasi Pendidikan*, 3(3), 173–178. <https://doi.org/10.20527/bino.v3i3.10524>
- Auliaty, Y., Siregar, R., & Alawiyah, N. (2021). Pengembangan Media Pembelajaran Interaktif Alat Indra Pendengaran Berbasis Literasi Sains Pada Muatan Ipa Untuk Kelas Iv Sekolah Dasar. *Educational Technology Journal*, 1(2), 31–42. <https://doi.org/10.26740/etj.v1n2.p31-42>
- Cahyadi, R. A. H. (2019). Pengembangan Bahan Ajar Berbasis Addie Model. *Halaqa: Islamic Education Journal*, 3(1), 35–42. <https://doi.org/10.21070/halaqa.v3i1.2124>
- Erniwati, Istijarah, Tahang, L., Hunaidah, Mongkito, V. H. R., & Fayanto, S. (2020). Kemampuan Literasi Sains Siswa Sma Di Kota Kendari: Deskripsi dan Analisis. *Jurnal Kumparan Fisika*, 3(2), 99–108. <https://doi.org/https://doi.org/10.33369/jkf.3.2.99-108>
- Haerani, R. P. R., & Suhartini, E. (2022). Analisis Respon Mahasiswa Terhadap Pengembangan Evergreen : Media Pembelajaran berbasis Android dengan konteks Hutan Hujan Tropis. *Edukatif: Jurnal Ilmu Pendidikan*, 4(5), 6708–6714. <https://doi.org/10.31004/edukatif.v4i5.3100>
- Hake, R. R. (1999). Analyzing change/gain scores. *Unpublished.[online] URL: http://www.physics.indiana.edu/~sdi/AnalyzingChange-Gain.pdf*, 16(7), 1073–1080. <http://www.ncbi.nlm.nih.gov/pubmed/22025883%5Cnhttp://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:ANALYZING+CHANGE/GAIN+SCORES#0%5Cnhttp://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Analyzing+change/gain+scores#0>
- Handayani, I. B., Hayat, M. S., & Roshayanti, F. (2022). Urgensi Pembekalan Literasi Sains bagi Siswa MTs NU Jogoloyo Wonosalam Demak. *Action Research Journal*, 1(3), 2808–5159. <https://doi.org/10.51651/arj.v1i3.176>
- Harahap, D. G. S. (2019). Penggunaan Peta Konsep Untuk Meningkatkan Pemahaman Konsep Siswa pada Materi Jaringan Tumbuhan. *Jurnal ESTUPRO*, 4(1), 93–97. <http://jurnal.ugm.ac.id/index.php/ESTUPRO/article/view/277>
- Hasbiyati, H., Afidati, N. I., & Haque, A. (2022). Pengembangan Multimedia Buku Digital Materi Pencemaran Lingkungan Pada Pembelajaran Ipa. *Quantum: Jurnal Inovasi Pendidikan Sains*, 13(2), 177. <https://doi.org/10.20527/quantum.v13i2.13416>
- Hidayanti, I., Sutisnawati, A., & Uswatun, D. A. (2021). Pengembangan Media Pembelajaran Berbasis Articulate Storyline untuk Meningkatkan Literasi Sains pada Siswa SD Kelas Tinggi. *DIKDAS MATAPPA: Jurnal Ilmu Pendidikan Dasar*, 4(3), 539–546. <https://doi.org/10.31100/dikdas.v4i3.1255>
- Kastina, A. (2024). Peningkatan Literasi Sains Peserta Didik Melalui Media Pembelajaran Mobile Learning Berbasis website pada materi Sistem Tata Surya Kelas VII. 5 di SMPN 3. *Jurnal Pemikiran Dan Pengembangan Pembelajaran*, 6(2), 1772–1778. <https://doi.org/10.31970/pendidikan.v6i2.1315>
- Kementerian Pendidikan dan Kebudayaan. (2018). *Menjelajah Angkasa Luar Buku Tematik Terpadu Kurikulum 2013* (2 ed., Vol. 9). Pusat Kurikulum dan Perbukuan, Balitbang, Kemendikbud. <http://buku.kemdikbud.go.id>
- Maula, A. N., Nasabella, N., Lajuardi, A. M., Mahardika, I. K., & Baktiarso, S. (2023). Upaya Pengembangan Literasi Sains Siswa Berbasis E-Book. *PHYDAGOGIC : Jurnal Fisika dan Pembelajarannya*, 5(2), 97–99. <https://doi.org/10.31605/phy.v5i2.2202>
- Maulita, Y. W., & Saputra, E. R. (2023). Pengembangan Media Pembelajaran Interaktif Articulate Storyline 3 Pada Materi Pecahan Kelas V [Universitas Pendidikan Indonesia]. In *Jurnal Edukasi* (Vol. 10, Nomor 1). <https://doi.org/10.19184/jeuj.v10i1.43692>
- Muawanah, Nurfadhillah, S., & Nuraeni, Y. (2022). Analisis Kesalahan Penulisan Huruf Kapital pada Paragraf Menggunakan Pedoman Puebi Siswa Kelas II SDN 04 Sepatan.

- Jurnal Pendidikan dan Konseling*, 4(5), 514–522. <https://doi.org/10.31004/jpdk.v4i5.6640>
- Mufliva, R., & Permana, J. (2024). Teknologi Digital dalam Pembelajaran di Sekolah Dasar sebagai Isu Prioritas dalam Upaya Membangun Masyarakat Masa Depan. *Kalam Cendekia: Jurnal Ilmiah Kependidikan*, 12(1). <https://doi.org/10.20961/jkc.v12i1.83127>
- Mulyaningsih, T., Hendratno, H., & Subrata, H. (2023). Literature Review: Development of Google Sites-Based Multimedia to Improve Elementary School Students' Reading Literacy. *International Journal of Emerging Research and Review*, 1(4), 000045. <https://doi.org/10.56707/ijoerar.v1i4.45>
- Nirmala, R., Wahyuni, S., & Ridlo, Z. R. (2023). Pengembangan E-Lkpd Berbasis Liveworksheet Untuk Meningkatkan Creative Thinking Skill Siswa Smp Pada Materi Pencemaran Lingkungan. *Quantum: Jurnal Inovasi Pendidikan Sains*, 14(2), 266. <https://doi.org/10.20527/quantum.v14i2.16240>
- PISA. (2023). Pisa 2022. In *Pisa 2022: Vol. I*. <https://doi.org/10.31244/9783830998488>
- Pratiwi, S. N., Cari, C., & Aminah, N. S. (2019). Pembelajaran IPA abad 21 dengan literasi sains siswa. *Jurnal Materi dan Pembelajaran Fisika*, 9, 34–42. <https://doi.org/10.20961/jmpf.v9i1.31612>
- Putri Maharani, Y., & Mutia Sari, P. (2023). Pengembangan Media Pembelajaran Google Sites Berbasis Literasi Sains Pada Pembelajaran Ipa Kelas Iii Sd. *Pionir: Jurnal Pendidikan*, 12(2), 1–14. <https://doi.org/10.20961/jmpf.v9i1.31612>
- Rahayu, E. D., Kusuma, H., & Ari, E. N. (2023). Pengembangan Media Interaktif Articulate Storyline Pada Pembelajaran Tematik Untuk Kelas 5 Sekolah Dasar. *Seminar Nasional Sosial Sains, Pendidikan, Humainora (SENASSDRA)*, 2(2), 817–827. <http://prosiding.unipma.ac.id/index.php/SENASSDRA/article/view/4504%0Ahttp://prosiding.unipma.ac.id/index.php/SENASSDRA/article/viewFile/4504/3402>
- Setianingsih, D., Yuli, T., Siswono, E., Terbuka, U., Surabaya, U. N., & Setianingsih, D. (2024). Pengembangan Media Pembelajaran Berbasis Web (Google Sites) Untuk Meningkatkan Keterampilan Berpikir Kritis Dan Literasi Digital. *ELSE (Elementary School Education Journal)*, 8(2), 440–450. <https://doi.org/http://dx.doi.org/10.30651/else.v8i2.23179>
- Setiyanti, D., Pratiwi, U., & Ashari, A. (2021). Pengembangan Media Pembelajaran Menggunakan Web Appgeyser Berbasis Sparkol Videoscribe untuk Peningkatan Kemampuan Literasi Sains. *Jurnal Inovasi Pendidikan Sains (JIPS)*, 2(2), 52–59. <https://doi.org/10.37729/jips.v2i2.1127>
- Shofia, R. N., Rakhmawan, A., Tamam, B., Wahyuni, E. A., & Hadi, W. P. (2024). Peningkatan Literasi Sains Peserta Didik Melalui Pembelajaran Dengan Pendekatan Kontekstual Berbantuan E-Magazine Eco Explorer. *Jurnal Natural Science Educational Research*, 7(2), 110–117. <https://doi.org/10.21107/nser.v7i2.26383>
- Windyarani, S. (2021). Pengembangan Bahan Ajar Berbasis Konteks Capung Untuk Melatihkan Literasi Sains Siswa Siswa SD. *Jurnal Pena Sains*, 3(2), 132–141.
- Yusmar, F., & Fadilah, R. E. (2023). Analisis Rendahnya Literasi Sains Peserta Didik Indonesia: Hasil Pisa Dan Faktor Penyebab. *LENSA (Lentera Sains): Jurnal Pendidikan IPA*, 13(1), 11–19. <https://doi.org/10.24929/lensa.v13i1.283>