



THE EFFECT OF SCRATCH GAME-BASED SCIENCE LEARNING MEDIA ON STUDENTS' LEARNING OUTCOMES ON MAGNETISM MATERIAL

Mentari Br Sembiring^{1*}, Nova Elysia Ntobuo², Nurhayati Nurhayati³, Dewi Diana Paramata⁴, Citron S. Payu⁵

^{1,2,3,4,5} (Science Education Program, Science Education Department, Faculty of Mathematics and Natural Sciences, Gorontalo State University)

e-mail: mentarisembiring47@gmail.com

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Abstrak

Penelitian ini bertujuan untuk mengetahui pengaruh penggunaan media pembelajaran IPA berbasis Game Scratch terhadap hasil belajar peserta didik pada materi kemagnetan di SMP. Penelitian menggunakan pendekatan kuantitatif dengan rancangan *Pre-Experimental* jenis *One-Group Pretest–Posttest Design*. Sampel penelitian berjumlah 27 peserta didik yang dipilih menggunakan teknik *sampling* jenuh. Perlakuan diberikan selama tiga kali pertemuan menggunakan media pembelajaran berbasis Game Scratch yang mengintegrasikan materi, animasi, simulasi interaktif, permainan edukatif, kuis dengan umpan balik langsung, serta navigasi yang mendorong keterlibatan aktif peserta didik dalam pembelajaran. Data dikumpulkan melalui tes hasil belajar dan dianalisis menggunakan statistik deskriptif, uji Shapiro–Wilk, uji Wilcoxon *Signed-Rank Test*, serta *Normalized Gain* (N-Gain). Hasil penelitian menunjukkan bahwa rata-rata nilai peserta didik meningkat dari 40,74 pada *pretest* menjadi 85,00 pada *posttest*. Hasil uji Wilcoxon *Signed-Rank Test* menunjukkan adanya perbedaan yang signifikan antara nilai *pretest* dan *posttest* ($p < 0,001$), sedangkan nilai N-Gain sebesar 0,74 termasuk kategori tinggi. Penggunaan media pembelajaran IPA berbasis Game Scratch diikuti oleh peningkatan hasil belajar peserta didik. Media ini berpotensi menjadi alternatif media pembelajaran IPA yang interaktif pada materi kemagnetan di SMP.

Kata Kunci: *Game Scratch*, hasil belajar, kemagnetan, media pembelajaran IPA.

Abstract

This study aims to determine the effect of using Scratch Game-based science learning media on students' learning outcomes in magnetism material in junior high schools. The study used a quantitative approach with a *Pre-Experimental* plan of the *One-Group Pretest–Posttest Design*. The research sample consisted of 27 students selected using a saturated sampling technique. Treatment was given for three meetings using Scratch Game-based learning media that integrates materials, animations, interactive simulations, educational games, quizzes with direct feedback, and navigation that encourages active student involvement in learning. Data were collected through learning outcome tests and analyzed using descriptive statistics, the Shapiro–Wilk test, the Wilcoxon *Signed-Rank Test*, and *Normalized Gain* (N-Gain). The results showed that the average student score increased from 40.74 in the pretest to 85.00 in the posttest. The Wilcoxon *Signed-Rank Test* results showed a significant difference between the

pretest and posttest scores ($p < 0.001$), while the N-Gain value of 0.74 is considered high. The use of Scratch Game-based science learning media was followed by an increase in student learning outcomes. This media has the potential to be an alternative interactive science learning media for magnetism material in junior high schools.

Keywords : Scratch game, learning outcomes, magnetism, science learning media.

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INTRODUCTION

Natural Sciences (IPA) is a subject that plays a role in developing students' knowledge, scientific thinking skills, and skills to understand various natural phenomena and apply learned concepts in everyday life (Pratiwi, 2022). The success of science learning is reflected in learning outcomes that indicate the level of student competency mastery after participating in the learning process (Yandi et al., 2023). Therefore, the learning process needs to be designed in a planned manner, centered on students, and supported by appropriate strategies and media so that learning objectives can be optimally achieved (Hetharion, 2023).

One of the science topics in junior high school that requires special attention is magnetism. This material contains abstract concepts, such as magnetic fields, interactions between magnetic poles, and magnetic induction, so students often have difficulty understanding the concepts if learning is only delivered verbally. However, these concepts are closely related to various natural phenomena and the application of technology in everyday life. This condition indicates the need for learning media that can visualize the concept of magnetism more concretely so that students have a more meaningful learning experience and easily understand the concepts being studied (Ramlawati et al., 2017; Siswanto et al., 2018).

Learning media plays a crucial role in helping students understand the abstract

concept of magnetism. Learning media serves as a means of conveying information, facilitating student comprehension, increasing engagement during the learning process, and creating a more meaningful learning experience (Bulhayat et al., 2021; Pagarra et al., 2022). Furthermore, the use of appropriate media can support the achievement of learning objectives by increasing student attention, participation, and learning outcomes (Khoirun & Darmawan, 2025; Zahro, 2024).

One medium with the potential to support science learning is the Scratch game. Scratch is a block-based visual programming language that allows users to develop animations, simulations, educational games, and interactive quizzes without having to understand complex programming syntax (Lestari et al., 2022). Through a drag-and-drop system, users can create program flows more easily and structured, allowing students to focus more on understanding concepts rather than the programming process itself (Isnaini et al., 2021). These characteristics enable Scratch to provide more interactive learning while supporting the development of logical, creative, and computational thinking skills. Therefore, utilizing the Scratch game has the potential to help students understand abstract science concepts through a more engaging and interactive learning experience (Citarsa et al., 2021; Yuniar et al., 2025).

Various studies have shown that Scratch has been used as a learning medium in various subjects and at various levels of education. In general, these studies indicate

that Scratch-based media can create more interactive learning and support improved student learning outcomes (Alvionita et al., 2025; Puhi et al., 2026; Saputra et al., 2026). However, there are differences in the focus of these studies, both in terms of the subject matter, the characteristics of the media developed, and the context of their implementation. These findings indicate that Scratch has potential as a learning medium that can be applied to various learning contexts, while also opening up opportunities to examine its application to different materials and learning characteristics.

Although various studies have shown that Scratch has the potential to support more interactive learning and improve student learning outcomes, its application in science learning, particularly magnetism material at the junior high school level, is still relatively limited. In contrast to these studies, this study focuses on the use of the Scratch Game on magnetism material in junior high schools through media that integrates materials, animations, educational games, interactive quizzes, and feedback in one learning environment. In fact, the characteristics of magnetism material that contains abstract concepts, such as magnetic fields, interactions between magnetic poles, and magnetic induction, require media that can visualize concepts dynamically to make them easier for students to understand. Based on these conditions, this study developed a Scratch Game-based science learning media that integrates various learning components in one interactive learning environment as an effort to support students' understanding of magnetism material.

Based on the description, this study aims to analyze changes in student learning outcomes after using scratch game-based science learning media on magnetism

material and its utilization in junior high schools. This study is expected to provide empirical evidence regarding changes in student learning outcomes after the implementation of the learning media. In accordance with the one-group pretest-posttest design, the proposed research hypothesis is that there is a significant difference between student learning outcomes before and after using scratch game-based science learning media on magnetism material and its utilization in junior high schools.

METHOD

This study uses a quantitative approach with a Pre-Experimental Design type One-Group Pretest–Posttest Design (Sugiyono, 2015). This design is used to analyze changes in student learning outcomes before and after the use of Scratch Game-based science learning media on magnetism and its utilization. The study was conducted in the even semester of the 2025/2026 academic year at SMP Negeri 1 Suwawa Timur, Bone Bolango Regency, Gorontalo Province.

Table 1. Pre-Experimental Design Type One-Group Pretest–Posttest Design

Pretest	Treatment	Posttest
O_1	X	O_2

Description:

O_1 = Pretest score (before treatment)

X = Implementation of Scratch Game-based learning media

O_2 = Posttest score (after treatment)

The population in this study was all 27 students of class IX-A of SMP Negeri 1 Suwawa Timur. The research sample was determined using a saturated sampling technique (total sampling), which is a sampling technique by making all members of the population as research samples

(Sugiyono, 2015). This technique was used because the population size was relatively small, so all students of class IX-A were included as research samples.

This research was conducted after obtaining approval from the school as the research site. Students were given an explanation of the research objectives and procedures before participating in the learning activities, and informed consent was provided in accordance with research ethics regulations. Student data will be kept confidential and used solely for research purposes.

The research instrument was a multiple-choice learning outcome test consisting of 20 questions on magnetism and its utilization. The test instrument first went through an expert judgment process by the lecturer to assess the suitability of the content, construction, and language of the questions. Based on the validation results, the instrument was declared suitable for use in the study. Furthermore, the instrument's reliability was tested using the Cronbach's Alpha coefficient and obtained a value of 0.683, indicating that the instrument has a sufficient level of reliability. The instrument was used to measure student learning outcomes through pretests and posttests.

The research data were analyzed using descriptive and inferential statistical analysis. Descriptive statistical analysis was used to determine the average value of student learning outcomes at the pretest and posttest stages. Furthermore, data normality tests were conducted using Shapiro–Wilk. The results of the normality test showed that the data were not normally distributed, so hypothesis testing was conducted using the Wilcoxon Signed-Rank Test to determine differences in student learning outcomes before and after using the Scratch Game-

based science learning media. In addition, improvements in student learning outcomes were analyzed using the Normalized Gain (N-Gain) value based on Hake's criteria (1999).

Table 2. N-Gain Effectiveness Criteria

N-Gain Value (g)	Category
$g \leq 0,30$	Low
$0,30 < g < 0,70$	Medium
$g \geq 0,71$	High

RESULTS AND DISCUSSION

Student learning outcomes were analyzed based on pretest and posttest scores after learning using Scratch Game-based science learning media on magnetism and its utilization. Descriptive statistical analysis was conducted to describe the characteristics of the learning outcome data, including minimum, maximum, average (mean), and standard deviation values. The results of the descriptive statistical analysis are presented in Table 3.

Table 3. Results of Descriptive Statistical Tests

	Min	Max	Mean	Std. Deviation
Pretest	15	80	40,74	18,486
Posttest	70	100	85,00	8,086

Based on Table 3, the average value of student learning outcomes in the pretest was 40.74 and in the posttest was 85.00. The minimum and maximum pretest scores were 15 and 80 respectively, while the posttest were 70 and 100. The standard deviation for the pretest was 18.486 and the posttest was 8.086. After conducting descriptive statistical analysis, a normality test was performed on the pretest and posttest data to determine whether the data were normally distributed, thus providing a basis for selecting the appropriate statistical analysis technique for hypothesis testing. The normality test was

conducted using the Shapiro–Wilk test because the number of students in this study was less than 50. The results of the normality test are presented in Table 4.

Table 4. Shapiro-Wilk Results

	Shapiro-Wilk		
	Statistik	df	Sig
Pretest	,887	27	,007
Posttest	,948	27	,195

Based on Table 4, the significance value of the Shapiro–Wilk test on the pretest data was 0.007 and the posttest was 0.195. Because the significance value of the pretest was less than 0.05, the pretest data were declared not normally distributed. Therefore, hypothesis testing was conducted using the Wilcoxon Signed-Rank Test. The results of the Wilcoxon Signed-Rank Test are presented in Table 5.

Table 5. Results of the Wilcoxon Signed-rank test

Posttest-Pretest	
Z	-4,554
Asymp.Sig. (2-tailed)	<0,001

Based on Table 5, the results of the Wilcoxon signed-rank test show a z-value of -4.554 with a significance value of $p < 0.001$. These results indicate a significant difference between student learning outcomes in the pretest and posttest after using scratch game-based science learning media. The effect size value of 0.88 indicates that the difference has a large effect size.

Table 6. N-Gain Results

Number of Students	Pretest (%)	Posttest (%)	N-Gain	Category
27	40,74	85,00	0,74	Tinggi

Based on Table 6, the n-gain value is 0.74. Based on Hake's (1999) criteria, this value is included in the high category ($g \geq 0.70$). These results indicate that the increase in student learning outcomes is in the high

category after using scratch game-based science learning media.

The results of the study indicate that there are changes in student learning outcomes after learning using Scratch Game-based science learning media on the topic of magnetism and its utilization. These findings are supported by the results of the Wilcoxon Signed-Rank Test which shows differences in learning outcomes between before and after learning, as well as the N-Gain value which is in the high category. These results indicate that the use of Scratch Game-based science learning media is followed by an increase in student learning outcomes after the learning process.

The results of the study also showed that the percentage of classical completion reached 96.29%, indicating that most students had achieved the minimum completion criteria on the material of magnetism and its utilization. The high learning completion indicates that after participating in learning using Scratch Game-based science learning media, most students were able to achieve the expected competencies. However, this achievement needs to be understood as an indicator of learning success after using the media and not as evidence that all changes in learning outcomes are entirely caused by the media used.

Changes in learning outcomes are also evident from the characteristics of the pretest and posttest data. The increase in average scores and the decrease in standard deviations indicate that student learning outcomes after the learning process tended to be better and more evenly distributed compared to before the learning process. However, this study did not analyze changes in learning outcomes based on students' initial ability groups, so the differences in media

benefits across ability groups require further study.

The N-Gain analysis result of 0.74, which is considered high, reinforces the finding that there was an increase in students' conceptual mastery after learning using Scratch Game-based science learning media. This finding is consistent with the results of the Wilcoxon Signed-Rank Test, which showed a difference in learning outcomes before and after learning.

Improved student learning outcomes can be attributed to the characteristics of Scratch Game-based science learning media that integrates materials, animations, educational games, interactive quizzes, and feedback in a single learning environment. The integration of these various components allows for more concrete presentations of magnetism concepts through engaging visualizations. Abstract concepts, such as magnetic fields, interactions between magnetic poles, and magnetic induction, become easier to understand because students can observe visual representations that are difficult to obtain through direct observation. The presentation of material combined with game activities and quizzes also provides opportunities for students to actively interact with the learning material, making the learning process more meaningful. This is in line with the opinion of Pagarra et al., (2022) who stated that learning media can help concretize difficult-to-understand concepts, making them easier for students to learn.

The findings of this study also support the opinion of Citarsa et al. (2021) who stated that Scratch provides an easy-to-use learning environment so that students can focus more on problem-solving activities rather than the technical aspects of programming. Furthermore, Yuniar et al. (2025) explained

that Scratch can support the development of logical, creative, and computational thinking skills through interactive learning activities. These characteristics are evident in the learning process, where students not only receive information but also engage in concept exploration through educational games, interactive quizzes, and direct feedback. This active engagement provides opportunities for students to construct their understanding through direct learning experiences. This condition aligns with constructivism theory, which states that students construct knowledge through experience, interaction, and active involvement in the learning process.

In addition to the interactivity aspect, the characteristics of Scratch Game-based science learning media also support the creation of a more meaningful learning experience. Science learning not only emphasizes mastery of concepts but also encourages students to observe phenomena, analyze information, and draw conclusions based on evidence. In this study, the media developed not only presents information in text form but also combines visualizations, game activities, and interactive quizzes that allow students to actively explore the concept of magnetism. Through these activities, students have the opportunity to understand concepts based on learning experiences carried out during the learning process.

The interactive nature of the media also allows students to receive immediate feedback during learning activities. Students can complete games, answer questions, see their answers, and make corrections if they encounter misunderstandings. This feedback can help students reflect on their learning process and strengthen their understanding of the concepts being studied. Thus, the combination of visualization, interaction,

educational gameplay, and feedback in Scratch Games has the potential to support student engagement in science learning.

The findings of this study enrich the empirical evidence regarding the use of Scratch in science learning, particularly on magnetism material and its utilization at the junior high school level. In contrast to previous studies that mostly examined the use of Scratch in general learning contexts, this study developed a Scratch Game-based science learning media that integrates materials, animations, educational games, interactive quizzes, and feedback to support learning the abstract concept of magnetism.

The findings of this study are consistent with previous research on the use of Scratch as a learning medium. Puhi et al., (2026) reported an increase in science learning outcomes after using Scratch-based media. In line with this research, Saputra et al., (2026) showed that Scratch media can support science/science learning through more interactive presentation of materials. In addition, Alvionita et al., (2025) showed that Scratch can increase student engagement in the learning process. The similarity between these studies and this research lies in the use of Scratch as a learning medium to support students' learning process.

Despite the similarities in the use of Scratch, this study differs in the context of its application, namely examining the use of Scratch Game-based science learning media on magnetism material and its utilization at the junior high school level. Magnetism material has abstract conceptual characteristics that require visual presentation and interaction to make it easier for students to understand. Therefore, this study contributes in the form of empirical evidence regarding changes in student learning outcomes after the use of Scratch Game-

based science learning media on magnetism material. Thus, this study expands on previous findings regarding the use of Scratch in science learning.

However, the results of this study need to be interpreted carefully in accordance with the research design used, namely the One-Group Pretest–Posttest Design. This design does not involve a control group so that various other factors cannot be fully controlled. The improvement in learning outcomes obtained can be influenced by previous learning experiences, the effect of repeated tests (testing effect), student maturation, interactions between teachers and students during learning, and other learning activities that took place during the study. Therefore, the results of this study are more appropriately interpreted as an increase in learning outcomes after the use of Scratch Game-based science learning media, not as evidence that all of the improvement is entirely due to the use of the media. Therefore, further research using an experimental design with a control group or involving a larger sample size is needed to provide stronger evidence regarding the effectiveness of Scratch Game-based science learning media on student learning outcomes.

CONCLUSION

Based on the research results, the use of Scratch Game-based science learning media on magnetism material and its utilization in junior high schools is followed by an increase in student learning outcomes. This finding indicates that Scratch Game media has the potential to support science learning through more interactive presentation of materials and help students understand abstract concepts. Practically, Scratch Game-based science learning media can be used as an alternative learning media to support the

science learning process in junior high schools. However, this study used a One-Group Pretest–Posttest Design so that further research is recommended to use a control group or a larger sample size to obtain stronger evidence regarding the effect of using Scratch Game media on student learning outcomes.

BIBLIOGRAPHY

- Alvionita, F., Arafah, A. A., Muhlis, Hidayat, T., & Tunru, A. A. (2025). PENGARUH MEDIA PEMBELAJARAN SCRATCH BERBASIS KEARIFAN LOKAL TERHADAP HASIL BELAJAR MATEMATIKA MATERI SUDUT SISWA KELAS V SDN 004 SAMBUTAN. *Pendas : Jurnal Ilmiah Pendidikan Dasar*, 10, 167–186.
- Bulhayat, Hanifansyah, N., & Hakim, N. (2021). *Pengembangan Media Pembelajaran PAI Model ADDIE di MTSN 1 Bangil*. 11(1), 40–60.
- Citarsa, I., Satiawan, I., Suksmadana, I., Wiryajati, I., & Nababan, S. (2021). Pengenalan Aplikasi Edukasi Pemrograman Komputer Scratch Kepada Siswa Kelas Iv Sekolah Dasar Negeri Model Mataram. *Jurnal Bakti Nusa*, 2(2), 72–81. <https://doi.org/10.29303/baktinusa.v2i2.29>
- Hake, R. R. (1999). Analyzing Change/Gain Scores. AREA-D American Education Research Association's Division D, Measurement And Research Methodology.
- Hetharion, B. D. S. (2023). *Strategi belajar mengajar*. Penerbit.cv. Azka pustaka jl.
- Isnaini, M., Fujiaturahman, S., Utami, L. S., Zulkarnain, Anwar, K., Islahudin, & Sabaryati1, J. (2021). *Pemanfaatan Aplikasi Scratch Sebagai Alternatif Media Belajar Siswa “ Z Generation ” Untuk Guru-Guru Sdn 1 Labuapi*. 5, 871–875.
- Khoirun, S. Z., & Darmawan, D. (2025). *Pengaruh Media Pembelajaran Terhadap Hasil Belajar Siswa Setingkat Sekolah Dasar*. 04(01), 85–99.
- Lestari, I., Polytechnic, C. R., Siregar, K., & Polytechnic, C. R. (2022). *Buku Mari Belajar Scratch Untuk Pemula* (Issue October 2021).
- Pagarra, H., Syawaluddin, A., Krismanto, W., & Sayidiman. (2022). *Media Pembelajaran*. In *Badan Penerbit UNM*.
- Pratiwi, N. K. R. (2022). Pengembangan Bahan Ajar IPA Berbasis Multirepresentasi Terhadap Pemahaman Konsep Siswa SMP: Sebuah Tinjauan Studi. *Jurnal Pendidikan MIPA*, 12(2019), 265–269. <http://ejournal.tsb.ac.id/index.php/jpm/index>
- Puhi, F., Mursalin, M., Yusuf, M., Nurhayati, N., & Uloli, R. (2026). Pengaruh Pendekatan Deep Learning Berbasis Media Scratch terhadap Hasil Belajar Siswa pada Materi Gaya di SMP Kelas VII. *JagoMIPA: Jurnal Pendidikan Matematika Dan IPA*, 6(2), 1546–1560. <https://doi.org/10.53299/jagomipa.v6i2.4572>
- Ramlawati, L, H. K., Saenab, S., & Yunus, S. R. (2017). *Sumber Belajar Penunjang Plpg 2017 Mata Pelajaran Ipa Bab X Kelistrikan Dan Kemagnetan*.
- Saputra, D., Linda Vitoria, & Suci Fitriani. (2026). *Penggunaan Media Pembelajaran Digital untuk Meningkatkan Hasil Belajar Ipa Peserta Didik Kelas V Sd Negeri Gue Gajah Aceh Besar*. 14(1), 15–27.
- Siswanto, J., Endang, S., & Budi, J. (2018). *Fisika Dasar : Listrik Arus Searah dan Kemagnetan*. In *Universitas PGRI Semarang* (Vol. 3).
- Sugiyono. (2015). *Metode Penelitian Kuantitatif, Kualitatif dan R&D* (pp. 1–23).
- Yandi, A., Putri, A. N. K., & Putri, Y. S. K.

(2023). Faktor-Faktor Yang Mempengaruhi Hasil Belajar Peserta Didik (Literature Review). *Jurnal Pendidikan Siber Nusantara*, 1(1), 13–24.

Yuniar, R. A., Fuady, M. S., Ayusman, M. H., & Kamal, M. R. (2025). *KAJIAN LITERATUR: EFEKTIVITAS PENGGUNAAN SCRATCH DALAM MENINGKATKAN KUALITAS PEMBELAJARAN DI ERA DIGITAL*. 3(6).

Zahro, U. A. (2024). *Penggunaan Media Pembelajaran Dalam Meningkatkan Hasil Pembelajaran Yang Efektif Pada Siswa*. 3, 6024–6031.