Quagga
Jurnal Pendidikan dan Biologi

p-ISSN 1907-3089, e-ISSN 2615-5869
Vol 18, No. 2, 2026, pp 119 - 126
Available online https://journal.fkip.uniku.ac.id/quagga
DOI: https://doi.org/10.25134/quagga.v18i2.520

The Effect of Guided Inquiry Integrated with the SAMR Model (Substitution, Augmentation, Modification, Redefinition) on Student Learning Outcomes

Eva Nurlailiyah[1], Zulfiani[2*]
[1,2]Biology Education, Faculty of Tarbiyah and Teaching Sciences, Universitas Islam Negeri Syarif Hidayatullah Jakarta, Jl. Ir H. Juanda No.95, South Tangerang, Indonesia
*Corresponding author : zulfiani@uinjkt.ac.id

APA Citation: Nurlailiyah, E., & Zulfiani (2026). The Effect of Guided Inquiry Integrated with the SAMR Model (Substitution, Augmentation, Modification, Redefinition) on Student Learning Outcomes. *Quagga: Journal of Education and Biology*, *18(2)*, 119-126. https://doi.org/10.25134/quagga.v18i2.520.

Received: 11-03-2026 Accepted: 06-04-2026 Published: 01-07-2026

Abstract: *Teacher centered biology learning results in low cognitive learning outcomes for students. Pedagogical innovation that systematically integrates investigative approaches with technology is needed. This study aims to analyze the effect of the Guided Inquiry learning model integrated with the SAMR (Substitution, Augmentation, Modification, Redefinition) model on student learning outcomes in biology lessons on the respiratory system. A quasi-experimental design with a nonequivalent control group was employed, involving 65 Grade XI students from a state senior high school in South Tangerang City, drawn through purposive sampling. The experimental class of 32 students received Guided Inquiry learning integrated with SAMR, while the control class of 33 students received Guided Inquiry without SAMR integration. Data were gathered using pretest and posttest instruments in multiple-choice format, which had been validated and tested for reliability. The analytical procedures encompassed N-Gain calculation, the Shapiro-Wilk normality test, Levene's homogeneity test, and the Mann-Whitney U test. Findings indicated that the average posttest score of the experimental class (97.57) exceeded that of the control class (90.36) with a difference of 7.21 points, , with an N-Gain of experimental class 84.10% or (g) = 0.84 in the high category. The Mann-Whitney U test yielded an Asymp. Sig. (2-tailed) value of 0.000 (< 0.05), confirming a statistically significant effect. The use of Guided Inquiry combined with the SAMR model had a significant impact on student learning outcomes, as it was shown to effectively improve the quality of biology learning.*

Keywords: *Guided Inquiry, SAMR Model, Learning Outcomes, Respiratory System,Biology.*

1. INTRODUCTION

The development of digital technology has transformed educational practices and demands the meaningful integration of technology in science learning (Salsabila & Agustian, 2021). In biology learning, technology not only functions as a tool for delivering material, but also as a means of building interactive and contextual learning experiences (Gilakjani, 2017). However, learning practices in schools are still dominated by a teacher-centered approach that limits active student participation and results in low cognitive learning outcomes (Fitroh *et al*., 2025). This condition indicates the need for pedagogical innovation that can integrate an investigative approach with the systematic use of technology.

A learning model that holds considerable relevance in fostering student activity and improving academic achievement is the Guided Inquiry model. This model places students as active subjects in the process of searching for and discovering concepts through the stages of orientation, problem formulation, hypothesis proposal, data collection, hypothesis testing, and conclusion drawing (Rianandari, & Purnomo, 2023). A number of studies show that Guided Inquiry has a

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DOI: https://doi.org/10.25134/quagga.v18i2.520

positive effect on improving students' cognitive learning outcomes and critical thinking skills because it encourages direct involvement in the scientific process (Amijaya *et al*., 2018). However, its implementation often faces obstacles such as time constraints, laboratory facilities, and suboptimal use of technology to support the investigation process.

To optimize technology integration, the SAMR (Substitution, Augmentation, Modification, Redefinition) model can be used as a conceptual framework in transforming digital based learning (Hamilton *et al*., 2016). This model was developed by Ruben R. Puentedura, this model serves as a reflective instrument enabling educators to assess and upgrade the degree to which technology is woven into pedagogical practice. SAMR consists of four levels divided into two main dimensions, namely enhancement and transformation (Hamilton *et al*., 2016).

The Substitution level involves the use of technology as a direct replacement for conventional tools without any functional changes, while Augmentation involves the use of technology as a replacement with enhanced functions, such as automatic feedback in online quizzes (Nair, & Chuan, 2021). These two levels fall under the enhancement category because they only improve the quality of existing tasks. Furthermore, Modification of technology allows for significant task redesign, and the highest level is Redefinition, which is the stage where technology enables the creation of new learning activities that were previously impossible without digital support, such as virtual simulations (Hamilton *et al*., 2016). These last two levels fall under the transformation category because they encourage fundamental changes in the design and learning experience of students.

Although research on Guided Inquiry and SAMR has been conducted separately, research that explicitly integrates the Guided Inquiry syntax with the SAMR framework in biology learning is still limited. Certain prior studies concentrate solely on evaluating the effectiveness of Guided Inquiry without examining the degree of technology transformation applied, while others implement SAMR without embedding it systematically within the stages of inquiry-based learning. This gap indicates that investigations into how varying levels of technology integration may shape the quality of the scientific inquiry process in biology education remain scarce.

The novelty of this study lies in its deliberate synthesis of Guided Inquiry stages with SAMR levels within an integrated instructional design, applied to the topic of the respiratory system, to evaluate the cognitive learning outcomes of high school students. This study not only tests the effectiveness of Guided Inquiry but also analyzes how the level of technology integration affects the quality of students scientific investigation process.

On this basis, the present study aims to analyze the effect of Guided Inquiry integrated with the SAMR model on student learning outcomes. The findings are expected to offer theoretical contributions toward the advancement of technology-based learning models, as well as practical insights for teachers designing innovative and transformative biology instruction in the digital era.

2. RESEARCH METHOD

This study employs a quantitative approach using a quasi-experimental method (pseudo experiment). The experimental method is a research method used to find the effect of a particular treatment on another under controlled conditions (Sugiyono, 2021). In this study, the researcher did not randomize the subjects into groups, so it falls under the category of quasi experimental design (Sugiyono, 2021).

The research design used was the Nonequivalent Control Group Design, which involves an experimental group and a control group without random assignment (Sugiyono, 2021). The groups were not determined randomly because the subjects were already in established classes. The study population comprised all XI grade students enrolled in state senior high schools in South Tangerang for the even semester of the 2025/2026 academic year. Two classes were selected as the sample through purposive sampling on the basis of subject teacher recommendations, taking into account the equivalence of initial cognitive abilities based on previous learning outcomes.

The independent variable in this study was the SAMR-integrated Guided Inquiry learning model,

Quagga
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while the dependent variable was students' cognitive learning outcomes. Two groups participated, the experimental group, which received Guided Inquiry instruction integrated with SAMR, and the control group, which received Guided Inquiry instruction without SAMR integration.

Data collection was conducted through pretest and posttest administrations. The test instruments consisted of multiple-choice questions that had been validated and assessed for reliability, item difficulty, and discriminating power. The full instrument comprised 30 items addressing respiratory system content, trialed on 31 XII grade students at a state high school in South Tangerang. Reliability analysis using Cronbach's Alpha produced a coefficient of 0.942, placing it in the very high category (Yusup, 2018). The instrument specification grid is presented in Table 1.

Table 1. Pre-test and Post-test Instrument Grid

Sub. Topic	Cognitive Level				Total Questions
	C1	C2	C3	C4	
Basic concepts of the respiratory system	1	2, 3, 4	-	5	5
Structure and function of the human respiratory system	-	9, 10, 11, 12, 15	6, 7, 8, 18	13, 14, 16	12
Lung volume and capacity	-	20	19, 21, 23	17, 22	6
Respiratory system disorders	25, 29	24, 26, 27	28, 30	-	7

The research procedure was implemented across three stages: planning, execution, and finalization. During the planning stage, all instructional materials and assessment instruments were prepared and validated. In the execution stage, both groups completed a pretest to establish baseline knowledge, after which learning activities were conducted according to each group's designated treatment. In the final stage, both groups were administered a posttest to quantify post-treatment learning outcomes.

Data were analyzed using SPSS software. The analysis began with calculating the N-gain value to determine the increase in learning outcomes using the N- formula (Sukarelawa *et al.*, 2024) and the results of the pretest and posttest for the experimental and control classes were analyzed. N-gain scores are interpreted based on the three categories proposed by Hake (1998): high gain ($\langle g \rangle > 0.7$), medium gain ($0.3 \leq \langle g \rangle \leq 0.7$), and low gain ($\langle g \rangle < 0.3$) (Hake, 1998). These categories were used to determine the level of effectiveness of the treatment on student learning outcomes. Next, a prerequisite analysis test was conducted in the form of a normality test using Shapiro–Wilk at a significance level of 0.05 (Hajaroh & Raehanah, 2021) to determine the data distribution. Hypothesis testing was performed using the Mann-Whitney U nonparametric test to compare the two independent groups.

3. RESULTS AND DISCUSSION

The study generated data from both the experimental and control classes. Prior to instruction, all students in both groups completed a pretest to measure their baseline understanding of respiratory system content. The experimental class then underwent Guided Inquiry learning integrated with the SAMR model, while the control class received Guided Inquiry instruction without SAMR integration. Upon completion of all learning sessions, both classes sat for a posttest. The pretest and posttest data are presented in Table 2.

Table 2. Pretest and Posttest Results for the Experimental Class and Control Class

Statistics	Experimental Class		Control Class	
	Pretest	Posttest	Pretest	Posttest
Sample Size	32	32	33	33
Mean	89,83	97,57	85,54	90,36
Minimum Score	59	78	74	78
Maximum Score	96	100	89	96
Std. Deviation	8,084	4,938	3,381	3,693

Based on Table 2, the sample size in the experimental class was 32 students and in the

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DOI: https://doi.org/10.25134/quagga.v18i2.520

control class was 33 students. The two classes were selected through purposive sampling based on teachers' recommendations, taking into account the students' comparable academic abilities, adequate technological facilities, and equal allocation of study time, so that both could serve as a valid basis for comparing learning outcomes. The average pretest score for the experimental class was 89.83 and for the control class was 85.54, indicating that the initial abilities of the two classes were relatively similar before the treatment was given. The mean pretest score of the experimental class was 89.83, compared to 85.54 for the control class, indicating broadly comparable baseline abilities before treatment was administered. Following instruction, the mean posttest score of the experimental class rose to 97.57, while that of the control class reached 90.36 a difference of 7.21 points. This gap suggests that SAMR-integrated Guided Inquiry produced superior learning gains. The experimental class also achieved a maximum posttest score of 100, compared to 96 for the control class, and its post-treatment standard deviation declined, reflecting a more uniform distribution of outcomes across students. N-Gain results are displayed in Table 3.

Table 3. N-Gain Test Calculation Results for the Experimental Class and Control Class

Statistics	N-Gain Score Experimental Class	N-Gain Score Kontrol Class
Sample Size	32	33
Mean	84,10	34,77
Minimum Score	33	14
Maximum Score	100	75
Category	High	Medium

Table 3 reveals that the mean N-Gain of the experimental class was 84.10% or ⟨g⟩ = 0.84, which falls into the high category (⟨g⟩ > 0.7. Meanwhile, the mean N-Gain score of the control class was 34.77%, or ⟨g⟩ = 0.35, classified as the medium category (0.3 ≤ ⟨g⟩ ≤ 0.7) (Hake, 1998). The minimum and maximum N-Gain values in the experimental class were 33 and 100 respectively, while those of the control class were 14 and 75. Taken together, these figures indicate that the learning gains in the experimental class substantially exceeded those of the control class, affirming that the incorporation of SAMR-based technology within Guided Inquiry yielded a more pronounced impact on learning improvement.

Data Analysis Prerequisite Tests

Normality Test and Homogeneity Test

Table 4. Normality Test and Homogeneity Test Results

Statistics	Experimental Class		Control Class	
	Pretest	Posttest	Pretest	Posttest
Sig.	0,000	0,000	0,000	0,000
Conclusion	Not normally distributed	Not normally distributed	Not normally distributed	Not normally distributed
Levene Statistic	0,361 (Sig. 0,550) Homogeneous			

Based on Table 4, the Asymp. Sig. (2-tailed) value for the pretest and posttest data of both classes is 0.000. This value is smaller than 0.05 (0.000 < 0.05). Accordingly, all four datasets are classified as non-normally distributed. This finding necessitated the use of a nonparametric procedure for hypothesis testing, namely the Mann-Whitney U test.

Levene's test of homogeneity yielded a significance value of 0.550. As this value exceeds 0.05 (0.550 > 0.05), H_0 is accepted. Confirming that the variance in learning outcomes across the experimental and control classes is homogeneous.

Hypothesis Testing – Mann–Whitney U Test

Table 5. Research Hypothesis Test Results (Mann–Whitney U)

Statistics	Learning Outcomes
Mann-Whitney U	97,500
Wilcoxon W	658,500
Z	-5,854
Sig.	0,000
Conclusion	**H_0 Rejected/H_a Accepted**

Because the data are non-normal data distribution, the Mann-Whitney U nonparametric test was selected as the inferential tool to assess whether a meaningful difference in learning outcomes existed between the two independent

Quagga
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groups. Based on the results of the Mann–Whitney U test in Table 5, the Asymp. Sig. (2-tailed) value is 0.000. Because the significance value 0.000 < 0.05, H_a is accepted and H_0 is rejected. It can be concluded that there is a significant difference in learning outcomes between the experimental class that uses the SAMR-integrated Guided Inquiry model and the control class that uses Guided Inquiry without SAMR integration. This shows that the application of SAMR-integrated Guided Inquiry has a significant effect on student learning outcomes.

Discussion

This study was conducted at SMAN in South Tangerang with the aim of analyzing the effect of the Guided Inquiry model integrated with the SAMR (Substitution, Augmentation, Modification, Redefinition) model on students' cognitive learning outcomes in the Respiratory System material for grade XI. Based on the research results, the average posttest score for the experimental class was 97.57 and for the control class was 90.36, with a difference of 7.21 points. These results were reinforced by the average N Gain score of the experimental class of 84.10% (high category) compared to the control class of 34.77% (medium category), as well as the Asymp. Sig. (2-tailed) value in the Mann Whitney U test of 0.000 (< 0.05). Thus, the SAMR integrated Guided Inquiry model has been proven to have a significant effect on improving student learning outcomes.

Learning outcomes are an important indicator of the success of the learning process (Lovisia, 2018). Improved learning outcomes reflect the achievement of deep learning in students, namely the ability to understand and apply concepts meaningfully (Putri *et al*., 2022). experimental class indicate that the integration of SAMR-based technology in Guided Inquiry learning can encourage students to achieve a deeper understanding of abstract biological concepts, particularly in the Respiratory System material. These results are in line with the findings Amijaya *et al*. (2018) which state that the guided inquiry model has a positive effect on students' learning outcomes and critical thinking skills.

The significant difference between the experimental and control classes in this study was not solely due to the use of the Guided Inquiry model, but also because of the structured integration of technology through the SAMR framework. The SAMR model, developed by Ruben Puentedura in 2006, provides a comprehensive framework for gradually integrating technology into learning, starting from the Substitution level, Augmentation, Modification, to Redefinition, thereby enriching students' learning experiences in a meaningful way (Wahyuni *et al*., 2020).

In the orientation stage, teachers use PowerPoint presentations as a substitute for blackboards (Substitution level), which allows for a more structured and visual presentation of material. The problem formulation and hypothesis formulation stages are carried out through the Google Docs collaborative platform (Augmentation level), where students can collaboratively formulate and hypotheses accompanied by hyperlinks to scientific reference sources and direct comments from teachers. The most transformative stage occurs in data collection by utilizing Virtual Reality (VR) technology to observe the respiratory system virtually from a microscopic perspective that is impossible to do physically (Redefinition level). The conclusion stage is carried out through the creation of multimedia digital reports using Google Docs that can be accessed by other groups and the creation of infographics (Modification level).

The integration of technology at various levels of SAMR has proven to be capable of creating a environment more participatory learning and facilitating independent knowledge construction (Gilakjani, 2017). This is in line with the statement Alfiana (2021) that the SAMR model can help teachers design more interesting and effective learning that is able to optimally engage students to improve learning outcomes. It is also intended to enhance student engagement in the learning procces (Zulfiani *et al*., 2025). The VR technology used during the data collection phase had a particularly significant impact, as it allowed students to explore the structure of the human respiratory system in three dimensions and interactively.

These findings are also consistent with the research Kaflori & Rafianti (2023) which concluded that the Problem-Based Learning

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DOI: https://doi.org/10.25134/quagga.v18i2.520

model integrated with SAMR technology significantly improves learning outcomes compared to models that are not integrated with SAMR. The SAMR model can also be linked to Bloom's Taxonomy; at the Substitution level, activities focus on the ability to remember and understand; the Augmentation level involves understanding and application; the Modification level emphasizes the ability to analyze and evaluate; while the Redefinition level integrates the ability to evaluate and create (Nair, & Chuan, 2021). Thus, learning that uses all levels of SAMR continuously encourages students to achieve higher cognitive levels according to Bloom's Taxonomy.

The Guided Inquiry model itself has been proven to consistently improve cognitive learning outcomes because the concepts acquired through the inquiry process become more meaningful and are stored longer in students' cognitive structures (Lestari *et al*., 2020). Rianandari, & Purnomo (2023) state that the Guided Inquiry model encourages students to actively ask questions, discuss, and discover concepts independently under the guidance of a teacher, and that increased learning activity is directly proportional to improved cognitive learning outcomes. The main advantage of the Guided Inquiry model in this study is evident from the high N-Gain of the experimental class (84.10), which shows that students' active involvement in the digital technology-assisted inquiry process significantly contributes to improved learning outcomes.

Another factor that contributed to the success of learning in the experimental class was the use of a collaborative platform (Google Docs), which enabled direct social interaction between students and between students and teachers. Social interaction within groups is an important component of Guided Inquiry learning, as it encourages students to think independently, interact with each other, exchange ideas, and deepen their understanding (Amijaya *et al*., 2018). Teachers act as facilitators who provide guidance and feedback directly through digital comment features, so that students remain on the right track in discovering the concepts being studied.

Although the control class also used the Guided Inquiry model, the absence of SAMR technology integration resulted in a less transformative learning experience. Without VR technology and digital collaborative platforms, the exploration of abstract concepts related to the respiratory system became more limited. This reinforces the argument that technology is not merely a complement, but an instrument capable of fundamentally changing the quality and depth of the learning experience. Hamilton *et al*., (2016) acknowledge that although the SAMR model has some limitations in the context of implementation, it remains effective in facilitating improved learning experiences when applied in a structured and contextual manner.

There were several students in the experimental class who still obtained moderate N Gain. This condition may be due to differences in individual cognitive abilities, levels of learning readiness, and the need to adapt to the use of VR technology, which is still new to some students. This shows that although the Guided Inquiry model integrated with SAMR is generally effective in improving learning outcomes, reinforcement of material and individual assistance are still needed to ensure equitable learning outcomes for all students.

Overall, this study provides empirical evidence that the integration of the Guided Inquiry model with the SAMR framework can create more meaningful, in-depth, and transformative biology learning in the digital age. Students not only act as consumers of information, but also as active producers of knowledge through technology assisted investigation activities. These findings reinforce the urgency of developing teachers' technological competencies and digital infrastructure support in schools as prerequisites for the successful implementation of SAMR based learning.

4. CONCLUSION

Based on the results of data analysis, there is a statistically significant effect of the SAMR-integrated Guided Inquiry model on the cognitive learning outcomes of grade XI students on the Respiratory System material at SMAN in South Tangerang City. This is evidenced by an Asymp. Sig. (2-tailed) value of 0.000 (< 0.05) in the Mann–Whitney U test, with a higher posttest average for the experimental class (97.57) compared to the control class (90.36).

The application of Guided Inquiry integrated with SAMR encourages students to be actively

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DOI: https://doi.org/10.25134/quagga.v18i2.520

involved in the scientific investigation process assisted by digital technology in stages, starting from digital presentations (Substitution), Google Docs collaboration (Augmentation), Virtual Reality exploration (Redefinition), to multimedia reporting (Modification). Through this process, abstract biology learning becomes more concrete, interactive, and meaningful thereby optimally improving students' cognitive learning outcomes. This learning model can be a relevant alternative strategy in biology learning in the digital era.

5. ACKNOWLEDGMENTS

This research was completed with the help, support, and cooperation of others. Therefore, the author would like to thank Mrs. Hilda Nur Fitriani, M.Pd. as a biology teacher for her assistance in the research at the school and her input during the implementation process.

6. REFERENCES

Alfiana, H. (2021). Peningkatan model SAMR serta penerapannya untuk pembelajaran online yang mendalam. *Jurnal Inovasi Teknologi Pendidikan*, *8*(1), 55–67.

Amijaya, L. S., Ramdani, A., & Merta, I. W. (2018). Pengaruh Model Pembelajaran Inkuiri Terbimbing terhadap Hasil Belajar dan Kemampuan Berpikir Kritis Peserta Didik. *J. Pijar MIPA*, *13*(2), 94–99.

Fitroh, S. F., Mustafida, F., & Ertanti, D. W. (2025). Peran Guru Kelas Sebagai Fasilitator Belajar Aktif di Madrasah Ibtidaiyah. *JPMI: Jurnal Pendidikan Madrasah Ibtidaiyah*, *7*(2), 126–134.

Gilakjani, A. P. (2017). A Review of the Literature on the Integration of Technology into the Learning and Teaching of English Language Skills. *International Journal of English Linguistics*, *7*(5), 95.

Hajaroh, S., & Raehanah. (2021). *Statistik Pendidikan Teori dan Praktik*. Sanabil.

Hake, Richard R. "Interactive-Engagement versus Traditional Methods: A Six-Thousand-Student Survey of Mechanics Test Data for Introductory Physics Courses." *American Journal of Physics* 66, no. 1 (January 1, 1998): 64–74.

Hamilton, E. R., Rosenberg, J. M., & Akcaoglu, M. (2016). The Substitution Augmentation Modification Redefinition (SAMR) Model: a Critical Review and Suggestions for its Use. *TechTrends*, *60*(5), 433–441.

Kaflori, S., I., & Rafianti, I. (2023). Pengaruh Model Problem Based Learning dengan Integrasi Teknologi SAMR Terhadap Hasil Belajar Matematika Siswa SMA Wilangan. *Jurnal Inovasi Dan Riset Pendidikan Matematika* , *4*(3).

Lestari, G. D., Irawati, H., Dahlan Jl Ringroad Selatan, A., Banguntapan, K., & Istimewa, D. (2020). Literature Review: Peningkatan Hasil Belajar Kognitif Dan Motivasi Siswa Pada Materi Biologi Melalui Model Pembelajaran Guided Inquiri. *BIOMA: Jurnal Biologi Dan Pembelajarannya*, *2*(2), 51–59.

Lovisia, S. E. (2018). Pengaruh Model Pembelajaran Terbimbing terhadap Hasil Belajar. *Science and Physics Education Journal (SPEJ)*, *2*(1).

Nair, R., Choo Chuan, T., & Nair, R. S. (2021). Integrating Technology that Uses Modified SAMR Model as a Pedagogical Framework in Evaluating Learning Performance of Undergraduates. *The Educational Review, USA*, *5*(2), 373–384.

Putri, R., Ardhiansyah, S. S., Kurnia, H., Sari, M. I., & Putri, M. F. J. L. (2022). Penerapan Deep Learning dalam Pendidikan Indonesia. *Prosiding Seminar Nasional Pendidikan Pancasila dan Kewarganegaraan Universitas Pamulang*, *2*, 98.

Rianandari, N., Heru Purnomo, A. (2023). Penerapan Model Guided Inquiry terhadap Hasil Belajar Siswa dalam Pembelajaran Tematik Terpadu di Kelas II Sekolah Dasar. *Khazanah Pendidikan*, *17*(2), 237.

Salsabila, U. H., & Agustian, N. (2021). Peran Teknologi Pendidikan dalam Pembelajaran. *Islamika : Jurnal Keislaman Dan Ilmu Pendidikan*, *3*(1).

Sugiyono. (2021). *Metode Penelitian Pendidikan* (3rd ed.). Alfabeta.

Sukarelawa, M. I., Indratno, T. K., & Ayu, S. M. (2024). *N-Gain vs Stacking*. Penerbit Suryacahya.

Wahyuni, S., Mujiyanto, J., Rukmini, D., & Fitriati, S. W. (2020). Teachers' Technology Integration Into English Instructions: SAMR Model. *Proceedings of ISET* , *443*, 546–550.

Yusup, F. (2018). Uji Validitas dan Reliabilitas

Quagga
Jurnal Pendidikan dan Biologi

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DOI: https://doi.org/10.25134/quagga.v18i2.520

Instrumen Penelitian Kuantitatif. *Jorpres (Jurnal Olahraga Prestasi)*, *7*(1), 53–59.

Zulfiani, Z., Suwarna, I. P., El Islami, R. A. Z., & Sari, I. J. (2025). Trends in SAMR research in teaching and learning from 2019 to 2024: A systematic review. *International Journal of Advanced and Applied Sciences*, *12*(4), 99–106.