

## **OPTIMIZING ELEMENTARY SCHOOL SCIENCE LEARNING OUTCOMES THROUGH THE USE OF MULTIPLE APPLICATIONS AND STUDENTS' LEARNING STYLES**

Wawan Gunawan

[wawan.gunawan@unipasby.ac.id](mailto:wawan.gunawan@unipasby.ac.id)

Educational Technology, Postgraduate Program, PGRI Adi Buana University

### **ABSTRACT**

The quality of elementary science learning remains a concern due to low student engagement and the limited alignment between instructional strategies and students' learning characteristics, resulting in suboptimal learning outcomes. This study aims to examine the effect of multiple application-based learning and students' learning styles on science learning outcomes, as well as their interaction. A quantitative quasi-experimental design was employed involving 60 students divided into experimental and control groups selected through simple random sampling. Data were collected using observation, questionnaires, and tests, and analyzed using multiple linear regression with prerequisite tests of normality and homogeneity. The results show that multiple application-based learning significantly improves science learning outcomes compared to conventional methods ( $p < 0.05$ ), while differences in learning styles (auditory, visual, kinesthetic) are not statistically significant. In addition, no significant interaction effect is found between instructional method and learning styles, indicating that the multiple application approach has a stronger direct influence on learning outcomes. These findings suggest that integrating multiple platforms such as LMS, WhatsApp Group, and Telegram can enhance student engagement and conceptual understanding in elementary science learning, and future research is recommended to explore broader assessment approaches and additional moderating variables.

**Keywords:** multiple applications, learning styles, science learning outcomes, elementary education, quasi-experimental, educational technology

### **ABSTRAK**

Kualitas pembelajaran sains di sekolah dasar masih menjadi perhatian karena rendahnya keterlibatan siswa dan terbatasnya keselarasan antara strategi pembelajaran dan karakteristik belajar siswa, yang mengakibatkan hasil belajar yang suboptimal. Studi ini bertujuan untuk meneliti pengaruh pembelajaran berbasis aplikasi ganda dan gaya belajar siswa terhadap hasil belajar sains, serta interaksi keduanya. Desain kuasi-eksperimental kuantitatif digunakan yang melibatkan 60 siswa yang dibagi menjadi kelompok eksperimen dan kontrol yang dipilih melalui pengambilan sampel acak sederhana. Data dikumpulkan menggunakan observasi, kuesioner, dan tes, dan dianalisis menggunakan regresi linier berganda dengan uji prasyarat normalitas dan homogenitas. Hasil menunjukkan bahwa pembelajaran berbasis aplikasi ganda secara signifikan meningkatkan hasil belajar sains dibandingkan dengan metode konvensional ( $p < 0,05$ ),

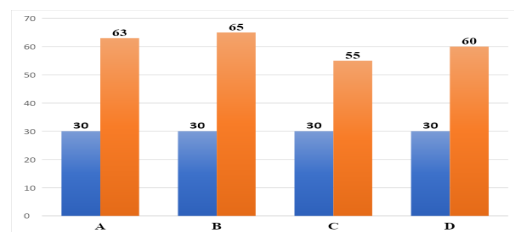
sedangkan perbedaan gaya belajar (pendengaran, visual, kinestetik) tidak signifikan secara statistik. Selain itu, tidak ditemukan efek interaksi yang signifikan antara metode pembelajaran dan gaya belajar, yang menunjukkan bahwa pendekatan aplikasi ganda memiliki pengaruh langsung yang lebih kuat terhadap hasil belajar. Temuan ini menunjukkan bahwa mengintegrasikan berbagai platform seperti LMS, Grup WhatsApp, dan Telegram dapat meningkatkan keterlibatan siswa dan pemahaman konseptual dalam pembelajaran sains di sekolah dasar, dan penelitian selanjutnya disarankan untuk mengeksplorasi pendekatan penilaian yang lebih luas dan variabel moderasi tambahan.

**Kata kunci:** berbagai aplikasi, gaya belajar, hasil belajar sains, pendidikan dasar, kuasi-eksperimental, teknologi pendidikan

### A. Introduction

In the teaching and learning process the role of the teacher is a very important instrument for improving student achievement. In fact, students have the opportunity to determine the competency achievements they need to achieve. However, in reality in learning often teachers do not actively involve students, so students are less trained to develop their abilities. Efforts to understand the lesson are only waiting for what is presented by the teacher, students should be able and able to be actively involved in the learning process being carried out, students' lack of preparation in learning can be seen when the teacher conducts questions and answers with students. Because learning activities that do not involve students result in many students not paying attention to the lesson. So it can have an impact on unsatisfactory student learning outcomes. This is in accordance with data obtained from a class IV science subject teacher at a school in the city of Surabaya.

Table 1. Mid-semester test scores



In Table 1 above you can see that almost all students got a KKM score below 70. One of the causes of low student grades cannot be separated from a teacher who acts as a factor that determines the success of his students. Internal factors are factors that can influence student learning outcomes.

One of the factors that causes students to have difficulty learning science subject matter is the lack of student learning styles in the learning process. A low learning style towards science subject matter is something that can hinder the science learning process (Hutagalung, 2022; Konilah et al., 2022). So, these difficulties have an impact on studying advanced science subject matter. This condition ultimately triggers the emergence of boredom and laziness in learning so that students lack mastery of science subject matter. Low mastery of science subject matter can be overcome by using

Multi Applications (Dewi, 2019; Ferdiansyah & Andriasari, 2023; Santoso & Rukmana, 2023). Multi-Application is very helpful and very effective in building a learning atmosphere because in Multi-Application there is a way to describe a concept in various forms, for example verbally, images, symbols and graphics, which can increase students' understanding so that students actively participate directly in the learning process (Gerung et al., 2021; Karlia & Nurmansyah, 2022; Ridwan & Susano, 2023).

Multi-Application is a learning approach that in presenting material combines text, images, symbols and graphics via LMS, WhatsApp Group and Telegram (Bustamin, 2021; Nurmansyah et al., 2022; Putri et al., 2021). With Multi Applications, it can provide optimal learning opportunities for each type of intelligence and is also more effective in improving mastery of science subject matter (Mushlihah et al., 2018; Ramdan, 2020; Safitri et al., 2023). Because learning with Multi Applications has various advantages. The advantage of multi-representation is that it is able to provide opportunities for students to understand concepts, communicate, and how to work with systems and processes of certain science subject matter concepts (Ferdiansyah & Andriasari, 2023; Gerung et al., 2021; Mohamad Firdaus, 2022).

Various applications used such as LMS, WhatsApp Group, and Telegram can provide ease of interaction in the learning process (Qiu et al., 2023; Ramdan, 2020; Santoso & Rukmana, 2023). Good

learning activities can be seen from learning activities in participating in learning. Learning activities (Wijaya, 2015) are interactions between individuals and individuals and individuals and the environment that can bring about change for the better. Learning is an activity, there is no learning if you don't do activities, this condition is important because activity is a very vital principle in teaching-learning interactions (Moreno-López et al., 2017; Ramadhan & Syahidin, 2022; Zheng et al., 2021).

### **Literature Review**

In previous research, the application of Multi Applications was used in the process of Improving Assisted Social Sciences Learning Outcomes Multi-Platform for Class V Elementary School Students (Winarti & Salamah, 2022). Anyone can use Multi Applications during lecture activities (Fatmawati et al., 2022). Several studies related to Multi Applications have shown that students are more independent and active in lectures (Ruipérez-Valiente et al., 2020). From this point of view, implementing Multi Applications is more effective in the learning process. However, on the other hand, its implementation needs to be studied more effectively. For this reason, this research focuses more on how to apply Multi Applications and learning styles to learning outcomes. Thus, this research aims to ensure that applications that have been used via LMS, WhatsApp Group and Telegram can be developed according to the

needs of students' learning styles in learning activities so as to create more active and effective learning. Apart from that, it is hoped that this research can help improve students' learning outcomes for science subject matter in online learning by implementing the Multi Application.

### **B. Method**

This type of research is quantitative by type *quasy experimental design*. Experimental research has three variables, namely the independent variable (*independent*), dependent variable (*dependent*), and moderator variables.

Table 2. Research Design

Class	Pre-Test	Treatment	Post-Test
Experimental Class	O <sub>1</sub>	X <sub>1</sub>	O <sub>2</sub>
Control Class	O <sub>3</sub>	X <sub>2</sub>	O <sub>4</sub>

The sample is a part or representative of the population studied. The sample used in this research was simple random sampling. This sampling technique is called random because in taking the sample, the researcher mixes the subjects in the population so that all subjects are considered the same. In this way, the researcher gives each subject equal right to have the opportunity to be selected as a sample. Because the rights of each subject are the same, the researcher is free from feelings of wanting to privilege one or several subjects to be used as samples. In this research, the researcher took the VA class as a test subject (experimental class) with a total of 30 students and the VB class as a

control class with a total of 30 students.

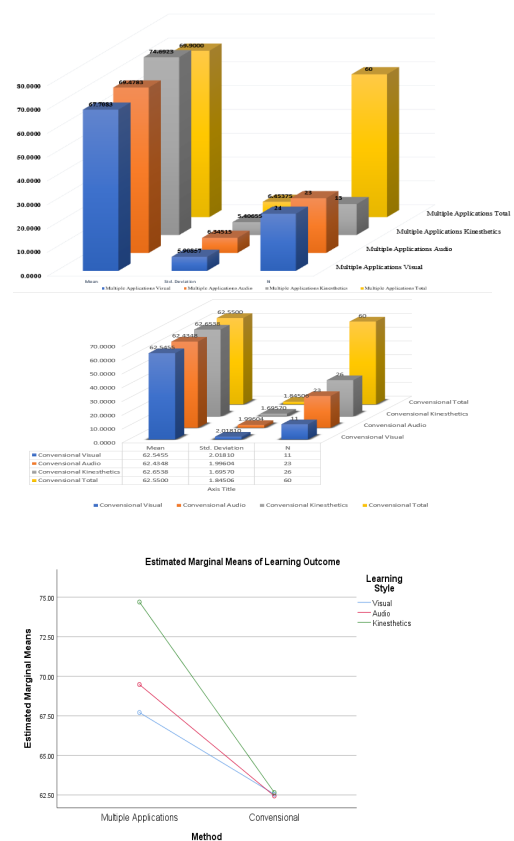
The sampling technique is a sampling technique. To determine the sample that will be used in the research. In this study, researchers used *probability sampling* namely a sampling technique that provides equal opportunities for each element (member) of the population to be selected as a member of the sample. Researchers use *Simple random sampling*, is said to be simple because it takes members sample and random populations without paying attention to the strata in that population. This method is used if members of the population are considered homogeneous.

The data collection techniques that researchers use is: (1) Observation, (2) Questionnaires, and (3) Tests. Before carrying out data analysis with quantitative correlation using multiple linear regression analysis techniques, several prerequisite tests must be carried out, namely the Normality test, homogeneity test, while to test the hypothesis using SPSS series 25 for Windows software. Before carrying out the multiple linear regression test, prerequisite tests are first carried out, namely the Normality test and homogeneity test as conditions for research to be carried out.

### **C. Results**

Based on the value data obtained by students, tabulation is then carried out to obtain pretest and posttest value data. On pretest After carrying out an independent t test, it showed a

significant value for the average value of the science lesson material at the pretest between the group of students who used the Multi Application method and the conventional method of 0.103 ( $p > 0.05$ ), which means that the average value of the science lesson material at the time The pretest between the group of students who used the Multi Application method and the conventional method did not show any meaningful or significant differences ( $p > 0.05$ , accept  $H_0$ ). This means that both classes have equal abilities. From the results of hypothesis testing, the results presented are presented in Table 1. Based on the results of hypothesis testing 1, it was found that different Multi Application methods had significantly different effects on science subject matter with a significance value of 0.000 ( $p < 0.05$ ). The research results showed that the average value of the science lesson material for the group of students treated with the Multi Application method was superior to that group students who received conventional methods. The research results show rate the group with the Multi Application method was 79.03 and the conventional method was 75.99. This means that the application of the Multi Application method provides better science learning material compared to the application of the conventional method.



## Discussion

### 1. Effect of Multi Application Methods and conventional methods for science learning outcomes

The results of the Multiple Linear Regression Test show that the Science Learning Results group of students who study using the Multi Application method higher than students who study using conventional methods. Average score of Science Learning Outcomes for groups of students who studied using the Multi Application method amounted to 69.9000 and the average Science Learning Outcome score for students who studied using conventional methods was 62.2550. This is due to the Multi Application method can help students discover knowledge, not only through

discussion and interaction with peers, but also assist students in the process construct.

The results of the analysis of science learning for students who study using the Multi Application method show that students are trained in the process of constructing knowledge. In science learning, students are asked to determine how to construct their own science lessons. When learning first begins, students are initially confused about how to construct knowledge, even though there are instructions. However, after carrying out science lessons several times, students begin to get used to using the Multi Application method, so that they can also construct knowledge well.

Multi-Application Method certainly has a positive impact on learning achievement and science learning outcomes. Because this method provides an excellent vehicle for students to become fully involved in the Multi Application Method to solve problems with a high level of success. This involvement clearly supports increasing student learning achievement and science learning outcomes.

Results of classroom observations of students learning using the Multi Application method obtained that students can explain and construct knowledge with the material to be studied. Based on the results of constructing knowledge, students can explain some of the related material. Students can develop the results obtained. Apart from that, during the learning process the curiosity

of students who learn using the Multi Application method This is very visible, because students often ask teachers about things related to the material, not procedural things in the learning process.

Students who study using conventional methods can only explain the data obtained during class learning. Students cannot develop the results obtained. Students also do not have a high level of curiosity, because when the teacher provides material reinforcement, students only pay attention and take notes without anyone wanting to ask questions.

This research is strengthened by findings (Hayes & Weibelzahl, 2009) which found that the Multi Application method supports the design and development of independent learning activities. Plaza et al., (2018) found that the use of the Multi Application method to support student activities in learning. Students who use the Multi Application method the results are better than students who do not use the Multi Application method (Edwin et al., 2012). Pinzon et al., (2015) revealed that the Multi Application method really helps the investigation process and really helps students to develop an understanding of a concept.

Learning using the Multi Application method can optimize student learning outcomes. Cincovic & Tartalja, (2019) stated that the Multi Application method can help students solve complex problems, provide a structure for organizing scientific arguments and explanations, or highlight the

process of science. Multi-Application method can also help teachers in classes who cannot guide all groups all the time. Multi-Application Method help students associate between science concepts and Learning Outcomes (González García et al., 2019), making learning more meaningful and more effective, developing communication skills and Learning Outcomes (Amelia & Islamy, 2022). Multi-Application method is an ideal method to help students understand how one concept can relate to others (Karmilah, 2023).

### **1. The Influence of Different Learning Styles (Audio, Visual and Kinesthetic) on Science Learning Outcomes**

The results of the Multiple Linear Regression Test showed that there were differences in science learning outcomes between students with different learning styles (audio, visual and kinesthetic). Average science learning outcomes scores for students with different learning styles (audio, visual and kinesthetic). Although there are differences between the three scores, these differences are not significant.

The existence of differences in science learning outcomes between students who have different learning styles (audio, visual and kinesthetic) means that students who have a visual learning style have an average score of 67.7083, students who have an audio learning style have an average score of 69.4783, and students who have an those who have a

kinesthetic learning style have an average score of 74.6923.

Students' science learning outcomes are assessed based on written tests, it is possible for students to discuss and help each other. In the process of constructing this knowledge there is interaction between students who have different learning styles (audio, visual and kinesthetic). This can also cause students with different learning styles (audio, visual and kinesthetic) to have high science learning outcomes scores. This is one of the weaknesses of this research, because the assessment of Science Learning Outcomes is only based on written tests.

Different learning styles are a prerequisite for learning new knowledge. The more relevant a student's learning style, the easier it is for students to learn new things. Students can learn more meaningfully if their learning links student learning styles. According to (Mahmudati & Lestyanawati, 2022; Sufianti, 2022), learning style is a prerequisite for meaningful learning. Learning styles can be used as a learning foundation that can help students' understanding of a concept.

Sumarli et al., (2022); Tanama, (2022) states that when students have an understanding of concepts that are mutually exclusive, then when they are asked to receive new information, they do not pay attention to the relationship between these concepts. So, students understand new concepts separately and cannot connect one concept to another. Therefore, when students receive

new knowledge, students look for conditions, concepts, or processes in the knowledge they have construct new knowledge or to solve new problems.

Azis et al., (2022); Togala, (2015); Yulistio, (2022) states that prior knowledge has a strong influence on student performance in the future. Prior knowledge essentially constructs students' thinking framework. Besides that, students with higher prior knowledge will have better self-confidence and tend to have a positive attitude. Isnanto, (2022); Setyawati et al., (2022) stated that prior knowledge has a moderating effect on effectiveness *self-explanation* in solving chemical problems. The higher the initial chemistry knowledge, the better *self-explanation* Her breasts are getting stronger. Meanwhile, students with low initial knowledge will experience difficulties in learning *self-explanation*.

## 2. The Effect of Interaction Between Multi-Application Methods and Learning Styles on Students' Science Learning Outcomes

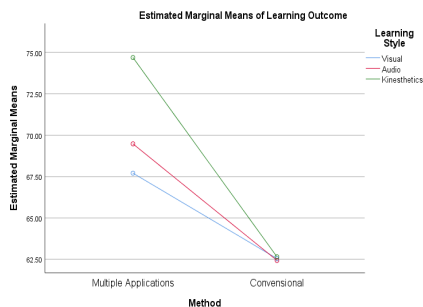
The results of the hypothesis test show that there is an interaction effect between the Multi Application Method and learning styles on students' science learning outcomes. Science Learning Results for students who study through the Multi Application Method higher than the science learning outcomes of students who study using conventional methods. Thus, this research has the opportunity to find results that there is interaction between the

Multi Application Method and student learning styles.

Results of classroom observations of students learning using the Multi Application Method shows that students' science learning outcomes develop optimally, students can construct knowledge well. Thus, students' science learning outcomes in this class develop on the basis of students' learning styles. Thus, there is interaction between the Multi Application Method and learning styles on students' science learning outcomes. This is in line with research (Deswin, 2019; Prabanitha et al., 2020; Ramadhana et al., 2022) revealed a similar thing, namely that students' initial knowledge did not interact with treatment that used static and animated image media.

These results are in line with research (Viyanti et al., 2021) which found an interaction between prior knowledge and learning strategies. To get a clear picture of whether there is an interaction effect in this research, it can be seen in the posttest mean plot graph in Figure 1. From Figure 1 it can be explained that the Multi Application method has a better average for all learning styles as shown in the line at the top. and Science lesson materials using conventional methods at the bottom so that a clear pattern of lines appears parallel and does not touch. So, it can be concluded from both the analysis results and the posttest average plot that there is no interaction between the two variables, namely (Multi Application method and conventional method) and learning style (FI, neutral, and

FD). However, if we look at the average science lesson material in both the Multi Application method and conventional method, students with the FI learning style have better science lesson material than neutral and FD.



Based on research findings, it shows that the Multi Application method has a strong main influence on science subject matter. Therefore, the results of the Multi Application method analysis show an increase in science learning materials that are better for all learning styles. Likewise, with learning styles, research results show that the FI learning style has a higher average science subject matter than neutral and FD. With the influence of the Multi Application method and learning style having the same strong influence on science subject matter, the interaction effect is weak and not significant.

Several research results that use the Multi Application method as an independent variable almost all show that the Multi Application method has a better influence, both in science learning and other fields. This Multi-Application method shows rate Science lesson material is better than other Multi Application methods. This shows that the Multi Application method has a

strong influence on the dependent variable (Science subject matter).

Apart from the main influence of the Multi Application method variable, this research also examined the influence of the learning style variable on science subject matter. Differences in learning styles possessed by individuals influence individual science lesson materials. Research findings show that FI's main learning style has a strong influence on clinical learning, so FI has a higher average than the Multi Application method and conventional methods. This is also supported by the findings of previous researchers.

Theoretical and empirical support for the main problem is the influence of the Multi Application method and learning styles on the science subject matter, which has a weak/no impact on the interaction of the Multi Application method and learning styles on the Science subject matter. The findings of this research are in accordance with the findings of Nofriansyah et al., (2022); Sari, (2019) which states that the presence of a strong main effect will weaken the interaction between the independent variable and moderator on the dependent variable.

#### **D. Conclusion**

Based on research it can be taken conclusion as follows. (1) There is a difference in science subject matter between learning using the Multi Application method and the conventional method, with the class average score showing that students who received learning treatment using the Multi

Application method obtained higher science subject matter than those using the conventional method. (2) There is a significant (significant) difference in the average value of student learning outcomes between those who have FI, FD and neutral learning styles. It was found that performance learning the application of the science learning process for students with the Field Independence (FI) learning style is higher than for students with the Field Dependence (FD) learning style. (3) There is no interaction between the Multi Application method and students' learning styles regarding science subject matter. This is possible due to several internal factors influence student learning outcomes

## REFERENCES

- Amelia, R., & Islamy, M. I. (2022). Pelatihan Penyusunan Desain Pembelajaran Online Multiplatform bagi Guru Madrasah Ibtidaiyah Kelas Atas pada Masa Pandemi Covid-19. *Journal of Research on Community Engagement*, 3(2). <https://doi.org/10.18860/jrce.v3i2.15792>
- Azis, R. N. A., Oktavianti, I., & ... (2022). Gaya Belajar Visual Anak Selama Pandemi Di Kelurahan Purwodadi. *ULIL ALBAB: Jurnal Ilmiah ...*, 1(4).
- Bustamin, S. (2021). Aplikasi Dekstop Multi Platform untuk Redis Client Framework Electron JS dan React JS. *Dewantara Journal of Technology*, 2(1). <https://doi.org/10.59563/djtech.v2i1.83>
- Cincovic, J., & Tartalja, I. (2019). Experience in Developing Multiplatform Educational Video-Game. *27th Telecommunications Forum, TELFOR 2019*. <https://doi.org/10.1109/TELFOR48224.2019.8971353>
- Deswin, Y. (2019). PENGARUH PENGGUNAAN MEDIA PEMBELAJARAN DAN GAYA BELAJAR TERHADAP KEMAMPUAN MENYIMAK BAHASA INGGRIS (Studi Pada Siswa SMK Swasta Jakarta Pusat). *Research and Development Journal of Education*, 4(2). <https://doi.org/10.30998/rdje.v4i2.3377>
- Dewi, D. A. (2019). Pembelajaran Matematika Melalui Blended Learning Berbasis Multi Aplikasi Sebagai Strategi Menghadapi Era Revolusi Industri 4.0. *Lentera: Jurnal Pendidikan*, 14(2). <https://doi.org/10.33654/jpl.v14i2.884>
- Edwin, M., Juan Carlos, M., Juan, T., César, R. J., Johan, V. M., & Oscar, I. T. (2012). Multiplatform learning system based on interactive digital television technologies, IDTV. *38th Latin America Conference on Informatics, CLEI 2012 - Conference Proceedings*. <https://doi.org/10.1109/CLEI.2012.6427218>
- Fatmawati, L., Suyatno, S., Setiadi, A. N., Ndari, W., & Saifud, A. (2022). The effectiveness of the development of multi-

- platforms-based disaster risk reduction learning media to manifest Sekolah Siaga Covid-19. *International Journal of Multidisciplinary Research and Growth Evaluation*.  
<https://doi.org/10.54660/anfo.2022.3.5.10>
- Ferdiansyah, M., & Andriasari, S. (2023). Jurnal Indonesia: Manajemen Informatika dan Komunikasi APLIKASI EMAIL CLIENT MULTI-PLATFORM Jurnal Indonesia: Manajemen Informatika dan Komunikasi. *Jurnal Indonesia: Manajemen Informatika Dan Komunikasi*, 4(1).
- Gerung, R. A., Fadilah, K., Wardani, Y., Mulyadi, M., Toamain, A. S., Anggrahita, S., Sari, S. K., & ... (2021). Kendali Perangkat Listrik Rumah Tinggal Dengan Aplikasi Teknologi Multi-Platform. *Scholar.Archive.Org*, 7(1).
- González García, C., Núñez-Valdez, E. R., Moreno-Ger, P., González Crespo, R., Pelayo G-Bustelo, B. C., & Cueva Lovelle, J. M. (2019). Agile development of multiplatform educational video games using a Domain-Specific Language. *Universal Access in the Information Society*, 18(3).  
<https://doi.org/10.1007/s10209-019-00681-y>
- Hayes, P., & Weibelzahl, S. (2009). Text messaging to improve instructor immediacy and its role in multiplatform e-learning systems. In *Multiplatform E-Learning Systems and Technologies: Mobile Devices for Ubiquitous ICT-Based Education*.  
<https://doi.org/10.4018/978-1-60566-703-4.ch004>
- Hutagalung, R. (2022). Pengaruh Rasa Ingin Tahu (Curiosity) dan Gaya Belajar Visual Terhadap Hasil Belajar IPA di Sekolah Dasar. *Jurnal Basicedu*, 6(2).  
<https://doi.org/10.31004/basicedu.v6i2.2518>
- Isnanto, I. (2022). Hasil Belajar Siswa Ditinjau Dari Gaya Belajar. *Aksara: Jurnal Ilmu Pendidikan Nonformal*, 8(1).  
<https://doi.org/10.37905/aksara.8.1.547-562.2022>
- Karlia, J. A., & Nurmansyah, W. (2022). Aplikasi Multi Platform Penerapan Algoritma Naive Bayes untuk Klasifikasi Keterlambatan Pembayaran Premi Asuransi. *STRING (Satuan Tulisan Riset Dan Inovasi Teknologi)*, 7(1).  
<https://doi.org/10.30998/string.v7i1.11932>
- Karmilah, M. (2023). PERSEPSI MAHASISWA TERHADAP MULTIPLATFORM DIGITAL PADA KULIAH BAHASA INGGRIS SECARA DARING. *Jurnal Teras Kesehatan*, 6(2).  
<https://doi.org/10.38215/jtkes.v6i2.120>
- Konilah, K., Sunarsih, D., & Purnomo, A. (2022). Analisis Gaya Belajar Peserta Didik pada Pembelajaran Matematika Kelas V MI. *Jurnal Ilmiah KONTEKSTUAL*, 3(02).  
<https://doi.org/10.46772/kontekstual.v3i02.664>
- Mahmudati, R., & Lestyanawati,

- R. (2022). Penguatan Gaya Belajar Berbasis Teknologi Masa Transisi Pasca Pandemi Covid-19 di SMP Negeri 1 Wonosobo. *SOROT: Jurnal Pengabdian Kepada Masyarakat*, 1(1). <https://doi.org/10.32699/sorot.v1i1.2483>
- Mohamad Firdaus. (2022). Perancangan aplikasi chat-room dengan prinsip threading melalui pemrograman dengan bahasa java. *TEKNOSAINS: Jurnal Sains, Teknologi Dan Informatika*, 9(2). <https://doi.org/10.37373/tekn.o.v9i2.242>
- Moreno-López, G. A., Ramírez-Monsalve, E. de J., & Jiménez-Builes, J. A. (2017). Ubiquitous learning model based on platforms of multi-screen TV (uLMTV). *DYNA (Colombia)*, 84(203). <https://doi.org/10.15446/dyna.v84n203.64160>
- Mushlihah, K., Yetri, Y., & Yuberti, Y. (2018). Pengembangan Media Pembelajaran Berbasis Multi Representasi Bermuatan Sains Keislaman dengan Output Instagram pada Materi Hukum Newton. *Indonesian Journal of Science and Mathematics Education*, 1(3). <https://doi.org/10.24042/ijse.v1i3.3595>
- Nofriansyah, N., Pernantah, P. S., & Riyadi, S. (2022). Gaya Belajar Peserta Didik Berprestasi. *EDUKATIF: JURNAL ILMU PENDIDIKAN*, 4(1). <https://doi.org/10.31004/edukatif.v4i1.1899>
- Nurmansyah, W., Triayomi, R., Livinus, M. M., Studi, P., Fakultas, I., Dan, S., Universitas, T., & Charitas, K. M. (2022). Aplikasi Sistem Pakar Multi Platform. *Jurnal Jaringan Sistem Informasi Robotik (JSR)*, 6(1).
- Pinzon, V., Hugo, V., Barrera-Leon, Fernanda, L., Narvaez, G., & Camilo, C. (2015). *GearMeApp: Multiplatform application for personalized physical training, to support the learning in the physical activity execution*. <https://doi.org/10.1109/columnbiancc.2015.7333459>
- Plaza, P., Sancristobal, E., Carro, G., Castro, M., Blazquez, M., & Garcia-Loro, F. (2018). Multiplatform educational robotics course to introduce children in robotics. *Proceedings - Frontiers in Education Conference, FIE, 2018-October*. <https://doi.org/10.1109/FIE.2018.8658513>
- Prabanitha, M. I., Sudarma, I. K., & Dibia, I. K. (2020). Korelasi Antara Gaya Belajar dengan Hasil Belajar IPA. *Mimbar Ilmu*, 25(2). <https://doi.org/10.23887/mi.v25i2.25650>
- Putri, S. A. D. A., Oktaviana, D., & Ardiawan, Y. (2021). *ANALISIS KEBUTUHAN PENGEMBANGAN SMART BOOK BERBASIS APLIKASI MULTI-PLATFORM BERMUATAN ETNOMATEMATIKA*.
- Qiu, J. F., Jia, Y. Z., Hua, Z. H., Cao, M. S., & Fan, J. (2023). A Multi-platform Cache Partitioning Method Based on

- Machine Learning. *Jisuanji Xuebao/Chinese Journal of Computers*, 46(10).  
<https://doi.org/10.11897/SP.J.1016.2023.02097>
- Ramadhan, R., & Syahidin, Y. (2022). The Implementation of REST API in Multi-Platform Software Development for Food and Beverage Learning Application. *Jurnal E-Komtek (Elektro-Komputer-Teknik)*, 6(1).  
<https://doi.org/10.37339/e-komtek.v6i1.814>
- Ramadhana, B. R., Prayitno, S., Wulandari, N. P., & Subarinah, S. (2022). Analisis Kemampuan Representasi Matematis pada Materi Barisan dan Deret Berdasarkan Gaya Belajar. *Jurnal Riset Pendidikan Matematika Jakarta*, 4(1).  
<https://doi.org/10.21009/jrpmj.v4i1.23025>
- Ramdan, D. S. (2020). Aplikasi Desktop Multi Platform Untuk Redis Client Berbasis Teknologi Web Menggunakan Framework ElectronJS dan ReactJS. *Jurnal TEDC*, 14(3).
- Ridwan, & Susano, A. (2023). APLIKASI EMAIL CLIENT MULTI-PLATFORM DENGAN ENKRIPSI DATA BERBASIS JAVA. *Jurnal Indonesia : Manajemen Informatika Dan Komunikasi*, 4(1).  
<https://doi.org/10.35870/jimik.v4i1.177>
- Ruipérez-Valiente, J. A., Halawa, S., Slama, R., & Reich, J. (2020). Using multi-platform learning analytics to compare regional and global MOOC learning in the Arab world. *Computers and Education*, 146.  
<https://doi.org/10.1016/j.compedu.2019.103776>
- Safitri, A. D., Sulami, A., Safitri, J., & Hartanti, D. (2023). Perancangan aplikasi belajar bahasa inggris berbasis website Website-based English learning application design. *TEKNOSAINS: Jurnal Sains, Teknologi Dan Informatika*, 10(1).
- Santoso, B. P., & Rukmana, O. (2023). Pengembangan Sistem Informasi Pengelolaan Baitulmal dengan Multi Platform. *Bandung Conference Series: Industrial Engineering Science*, 3(1).  
<https://doi.org/10.29313/bcsi.es.v3i1.6618>
- Sari, P. (2019). ANALISIS TERHADAP KERUCUT PENGALAMAN EDGAR DALE DAN KERAGAMAN GAYA BELAJAR UNTUK MEMILIH MEDIA YANG TEPAT DALAM PEMBELAJARAN. *Jurnal Manajemen Pendidikan*, 1(1).
- Setyawati, A., Rosyidah, U., & Astuti, D. (2022). Kemampuan Berpikir Kritis Matematis Siswa Melalui Model Quantum Learning Berdasarkan Gaya Belajar. *Jurnal Educatio FKIP UNMA*, 8(1).  
<https://doi.org/10.31949/educatio.v8i1.1869>
- Sufianti, A. V. (2022). Hubungan Gaya Belajar dengan Multiple Intellegences Terhadap Prestasi Peserta Didik. *IRJE : Jurnal Ilmu Pendidikan*, 2(1).

- Sumarli, S., Anita, R., & Safitri, S. (2022). PEMAHAMAN KONSEP SISWA SD PADA MATERI KALOR DAN PERPINDAHANNYA DITINJAU DARI GAYA BELAJAR. *Autentik: Jurnal Pengembangan Pendidikan Dasar*, 6(1). <https://doi.org/10.36379/autentik.v6i1.208>
- Tanama, Y. J. (2022). Kajian Gaya Belajar di Masa Pandemi Yulia Jayanti Tanama. *Kajian Gaya Belajar Di Masa Pandemi*, 6.
- Togala, Z. (2015). Pengaruh pendekatan pembelajaran dan gaya berpikir terhadap hasil belajar keterampilan elektronika setelah mengontrol pengetahuan awal. *JTP - Jurnal Teknologi Pendidikan*, 17(2).
- Viyanti, V., Suyatna, A., & Naj'iyah, A. L. (2021). Analisis Kebutuhan Pengembangan Strategi Pembelajaran Fisika Berbasis STEM di Era Digital Mengakomodasi Ragam Gaya Belajar dan Pengetahuan Awal. *Radiasi: Jurnal Berkala Pendidikan Fisika*, 14(1). <https://doi.org/10.37729/radiasi.v14i1.313>
- Winarti, F., & Salamah, S. (2022). Peningkatan Hasil Belajar IPS Berbantuan Multy Platform Pada Siswa Kelas V SD. *Proceedings Series on Social Sciences & Humanities*, 3. <https://doi.org/10.30595/pssh.v3i.321>
- Yulistio, D. (2022). Profil Belajar Mahasiswa S2 Pendidikan Bahasa Indonesia (Gaya Belajar, Aktivitas Belajar, Dan Kebiasaan Belajar). *Journal of Education, Humaniora and Social Sciences (JEHSS)*, 4(3). <https://doi.org/10.34007/jehss.v4i3.848>
- Zheng, W., Deng, R., Chen, W., Popa, R. A., Panda, A., & Stoica, I. (2021). Cerebro: A platform for multi-party cryptographic collaborative learning. *Proceedings of the 30th USENIX Security Symposium*.