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The Implementation of Pop-Up Book Media: Potential Implication on Mathematics and Science Learning Outcomes

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Abstract: Mathematics is important to the broader implications for science education, as science and mathematics are inherently interconnected. The use of interactive and engaging media such as pop-up books can be a valuable tool for teaching natural science concepts and improving student learning outcomes. This study aims to improve students' mathematics learning outcomes through the implementation of pop-up media during the learning process. The current study also describes potential implication of the result to the natural science learning. This research is classroom action research (CAR). This research was conducted at SD Inpres Baru with 16 third grade students as subjects for two cycles. Research data were analyzed descriptively-quantitatively. Data on student learning outcomes were collected using multiple-choice tests. In addition, observation sheets are also used to collect data on teacher and student activities. The results of the research in cycle I showed that the average student score reached 68.87 with classical completeness reaching 43.75%, while the results of observations of teacher activity (68%) and students (69%) were in the sufficient category. In cycle II, the average student score increased to 87 with classical completeness reaching 87.5%. There were better teacher (89%, good category) and student (91%, very good category) activity compared to the results in cycle I. Based on the results of the study, it can be concluded that the implementation of Pop-up Book learning media in learning mathematics can improve students' learning outcomes on flat shape material. The result can be applied to natural science teaching as well, where teachers need to be more active and effective in guiding students in experiments and demonstrations, and ensure that students are actively participating in the learning process.

Keywords: Learning outcomes; Mathematics learning; Pop-up Book; Science Learning

Introduction

Based on the theory of cognitive development, elementary school students are generally in the operational operational stage (Ranjitkar et al., 2019) which involves simple representational processes in the thinking process (Sukaisih et al., 2020). In response to these conditions, learning in elementary schools is emphasized to be more motivating, interactive, and inspiring to provide space so that creativity can grow according to students' talents and interests (Sudarsih, 2021). Unfortunately the development of information and technology is always accompanied by the emergence of learning problems such as learning that is less interesting (Biazus & Mahtari, 2022; Pertiwi et al., 2019) which results in a decrease in student learning outcomes (Alika & Radia, 2021; Hardiansyah & Mulyadi, 2022) especially in mathematics (Amir, 2015; Nisa et al., 2018).

Mathematics is a scientific discipline that plays an important role in human life (Nasruddin et al., 2020). Mathematics according to some opinions is the mother of science because it is closely related to other disciplines, especially physics (Retnawati et al., 2018), chemistry (Korpershoek et al., 2015) and various other exact science groups. Mathematics involves logic and quantitative calculations Hamdani et al. (2020), so that it has implications for the importance of mastering mathematics for students so they can solve problems in life related to mathematical calculations (Evendi, 2022). Mathematics is the science of logical reasoning and problems related to numbers. The development of

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learning mathematics in children according to Piaget's learning theory goes through 4 stages, namely concrete, semi-concrete, semi-abstract, abstract (Fahma & Purwaningrum, 2021). Therefore, mathematics must be studied by students starting from the elementary school level up to tertiary institutions.

Many people, especially Elementary School students, think that learning mathematics is an unpleasant activity, students sit for hours devoting their thoughts to a subject both presented by the teacher and what is being faced at the study table (Sudarsih, 2021). These activities are always felt as a burden to deepen knowledge. As educators, teachers have a responsibility in solving learning problems to facilitate learning that is meaningful and not boring (Syafari & Montessori, 2021).

The results of pre-research conducted through observation and interviews with class III guardians at SD Inpres Baru, learning activities in mathematics still use the lecture method and the lack of use of learning media so that the average student score in mathematics is still lower than the standard value determined by the school. The scores obtained by students in mathematics are still low compared to other subjects. The average score for mathematics learning outcomes (score= 47.5) was found to be lower compared to other subjects in semester I such as science (score= 62.0), Indonesian (score= 62.0), citizenship (score= 59.5), and social science (score = 57.5). This proves that students' grades in mathematics were very low in the final semester I test because the teacher had not optimized the supports in the learning process such as interesting strategies in the process of teaching and learning activities.

In line with the results of pre-research, Fimansyah (2015) stated that there was an insignificant interaction effect between learning strategies and students' interest in learning mathematics which affected student learning outcomes, due to students' interest in learning being mediocre because it was influenced by several factors such as facilities that lacking, teacher attention, parental attention or materials for calculating the circumference and area of triangles are less interested.

Learning that can be used to create learning that attracts students' attention, one of which is by utilizing learning media in the learning process. Learning media is anything that can convey messages through various channels, can stimulate students' thoughts, feelings and willingness so that they can encourage the creation of a learning process to add new information to students so that learning objectives can be achieved properly (Alika & Radia, 2021). Appropriate learning media can provide positive benefits for students to increase learning enthusiasm, students develop according to their interests and speed, provide stimulation and equality of experience, provide perceptions of the same conception (Maghfiroh et al., 2020). This is supported by research that has successfully applied instructional media to improve student learning outcomes (Afandi et al., 2021).

A pop-up book is a book that has moving parts or has three-dimensional elements and provides an interesting story visualization, and displays images that can move when the page is opened (Afandi et al., 2021). The display in the pop-up book is very attractive and makes it possible to enhance and illustrate student learning material in an interesting way (Colidiyah, 2018). From this opinion it can be seen that Pop-up Book media is a book-shaped media that has three-dimensional elements and. In Pop-up Books, material is conveyed in the form of attractive images because there are sections which, when opened, can move, change or give the impression of arising.

Pop-up book media is one of the learning media that is practical to use, easy to carry, looks in two and three dimensions which can increase student enthusiasm for learning and can use media independently or in groups. Through the use of this media, it is hoped that teachers can change the boring learning atmosphere for SD Inpres Baru students to become more interesting, so that students become motivated to learn, and pay close attention to the lessons delivered by the teacher. So that with an interesting learning atmosphere this will be able to improve students' low mathematics learning outcomes.

Based on this background, this study seeks to improve student learning outcomes through the application of pop-up book media in mathematics learning. This research is important to do to provide a new point of view in learning mathematics at SD Impres Baru on flat shape material. The results of previous research have also shown the potential of pop-up book media in increasing student learning outcomes in science subjects (Safri et al., 2017), effective in increasing learning success (Praheto & Sayekti, 2018). Furthermore, pop-up book media are claimed to be used to increase student learning autonomy (Elmunsyah et al., 2019).

The current research use of pop-up book media in mathematics teaching to improve student learning outcomes. Mathematics is an essential scientific discipline that requires logical reasoning and quantitative calculations (Rahmawati, 2022). Elementary school students are in the operational stage of cognitive development, which involves simple representational processes in thinking. However, students often find learning mathematics unpleasant and boring (Haeriah et al., 2022). Teachers have a responsibility to make learning meaningful and interesting. The use of learning media is an effective way to make learning more attractive to students (Kusumawati et al., 2022).

Learning media is anything that can convey messages through various channels and stimulate students' thoughts, feelings, and willingness to learn (Khairunnisah et al., 2021). The appropriate use of

learning media can increase learning enthusiasm, provide stimulation and equality of experience, and provide perceptions of the same conception (Mayarni et al., 2021; Suryati et al., 2021, 2022). Pop-up book media is a practical and easy-to-carry learning medium that has two and three-dimensional elements that can increase student enthusiasm for learning. Pop-up books are book-shaped media that convey material in the form of attractive images that can move, change or give the impression of arising.

Method

This research is a Classroom Action Research (CAR) whose main objective is to improve student learning outcomes in mathematics, especially in learning flat shapes. This research was carried out in 2 (two) cycles with each cycle consisting of 4 (four) stages of activities referring to the Kemmis and Mc Taggart model PTK design, namely: (1) planning stage, (2) action implementation stage, (3) implementation stage observation or observation, and (4) the reflection stage. This research was conducted on class III students at Impres Baru Elementary School with 16 students (6 boys; 10 girls) on geometric material as subjects.

The planning stage is carried out by making learning plans in the form of: (1) RPP (Learning Implementation Plan) using pop-up book media, (2) student learning outcomes assessment instruments, and (3) observation sheets of the implementation of learning and student learning activities. The implementation stage, namely carrying out actions in the form of learning activities in accordance with the devices that have been made at the planning stage in accordance with the RPP (Learning Implementation Plan). The observation stage includes observing the implementation of learning and student learning activities on the learning process carried out by the teacher, as well as evaluating student learning outcomes at the end of each learning cycle. Observation activities are carried out by asking colleagues to observe the implementation of learning and student learning activities during learning and putting a check mark (√) on the observation sheet. Evaluation activities are carried out at the end of each learning cycle by providing ten items oriented to indicators of cognitive learning outcomes in flat shape material. The reflection stage, namely looking back at the implementation of the process and learning outcomes achieved in each cycle, then finding alternative solutions to improve processes and results in the next cycle. The flowchart of this research can be illustrated as shown in Figure 1.

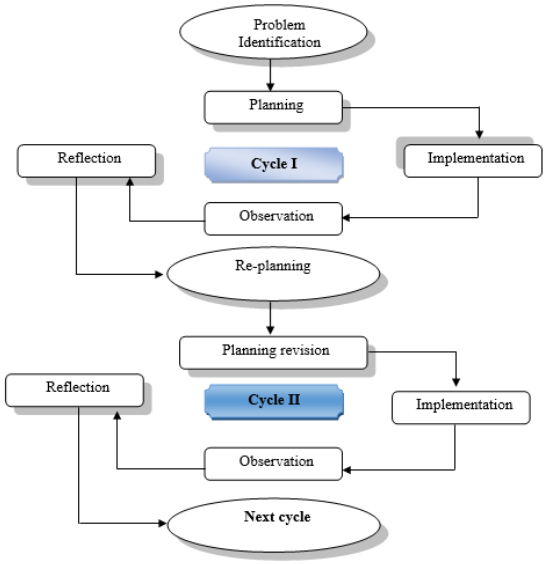

Figure 1. Cycle plot in the model of CAR (Prayogi & Asy'ari, 2013)

Data collection is done through giving tests and observations. The test consists of an exploratory test and a final action test. An exploratory test is given with the aim of knowing students' ability to solve questions related to the material being taught. The final test of the action is given at the end of each action given with the aim of knowing the mastery of the concept and improving students' mathematics learning outcomes after giving the action. While observations are made during the learning activities take place. The implementation was carried out by filling in the format prepared by the researcher with the aim of knowing the activities and behavior of the research subjects during the learning process.

The research data were analyzed descriptively-quantitatively. Teacher and student activity data obtained through observation sheets were analyzed and expressed as a percentage using the Equation 1.

$$\text{average score} = \frac{\text{obtained score}}{\text{maximum score}} \; x \; 100\% \quad (1)$$

The results of the analysis obtained are then categorized based on the categorization adapted from (Asiyah, 2022) as presented in Table 1.

Table 1. Categories of Teacher and Student Activity

Score (%)	Category
91 < score ≤ 100	Very good
71 < score ≤ 90	Good
51 < score ≤ 70	Enough
31 < score < 50	Not good
0 < score ≤ 30	Very not good

Data on student learning outcomes were analyzed quantitatively based on the yad score obtained in each

cycle. The frequency of students who were declared to have achieved individual and classical mastery criteria was also determined in this study. The completeness score of individual students is determined using the Equation 2.

$$\text{score} = \frac{\text{obtained score}}{\text{maximum score}}\ x\ 100 \quad (2)$$

While the classical completeness of students as a group is expressed as a percentage which is determined using the Equation 3.

$$\text{score} = \frac{\text{number of students complated}}{\text{number of students}}\ \text{x}\ 100 \quad (3)$$

Students are declared complete individually if the score obtained is ≥ 65 according to the Minimum Completeness Criteria that apply at SD Inpres Baru. On the other hand, students are declared classically complete if the percentage of classical completeness achieved is ≥ 70%.

Result and Discussion

Pre-action results

Pre-action activities are carried out through pre-tests with simple flat shape materials. The results of the pre-action showed that students had difficulties in solving the questions given. Evidenced by the low percentage of students' classical completeness (12.5%) and individual completeness (2 students). Pre-action results are presented in Table 2.

Table 2 shows the highest score (70) and lowest score (20) obtained by students in the pre-action stage. The percentage of students' classical completeness (12.5%) was declared not to meet the standard to be declared complete (70%). Students have difficulty working on initial test questions because students do not understand the concept of material properties of plane shapes and are also not familiar with simple flat shapes. So it is necessary to apply learning actions that can attract students' attention to study the properties of flat shapes so that they are easy to understand. The application of interesting learning is one of the supporters to improve student learning outcomes (Bilad et al., 2022), so that the application of learning media is an option that has the potential to achieve this goal (Verawati et al., 2022). Pop-up book media is a learning media that can be used to attract attention and efforts to improve student learning outcomes (Nurhidayah et al., 2021). The initial test results and supported by relevant previous research are used as a reference for conducting classroom action research by utilizing the Pop-up Book learning media in order to improve student learning outcomes in mathematics learning in class III SD Inpres Baru.

Table 2. Pre-action Test Analysis Results

Acquisition Aspect	Results
Maximum score	70.00
Minimum score	20.00
Number of student	16.00
Number of Completed Students	2.00
Classical completeness percentage	12.50%

Cycle I Results

Cycle I consisted of 1 meeting with the time allocation for each meeting being 2 hours or 70 minutes and continued with the final test of cycle I on the same day. The researcher acts as a teacher, the class teacher acts as an observer for the activities of the teacher and students in cycle I. The observer is guided by the observation sheet that has been prepared. The final results of the cycle I action test are presented in Table 3.

Tabel 3. Cycle I Test Analysis Results

Acquisition Aspect	Results
Maximum score	95.00
Minimum score	52.00
Number of student	16.00
Number of Completed Students	7.00
Classical completeness percentage	43.75%

Based on Table 3 it can be seen that the highest score analysis obtained by students is 95 while the lowest score is 52 out of 16 students who took the test. There were 7 students who were declared complete with a classical completeness percentage of 43.75%. The acquisition of student scores increased after implementing learning with the application of pop-up book learning media from the acquisition of pre-action test scores (12.5%) compared to the results of the first cycle of action (43.75%). The Acquisition of Classical Mastery has not yet reached the set indicator. Thus, this research is still considered unsuccessful because it has not reached the set indicators so it needs to be continued in the implementation of cycle II actions.

Observation of Teacher and Student Activities

Observation of teacher activities is carried out with the aim of seeing the suitability between the learning carried out in class and the learning implementation plan made previously. Observation of the teacher's activity was assessed by the observer; in this case it was carried out by a class III teacher at SD Inpres Baru. Based on the results of observations of teacher activity, the total score in cycle 1 was 49 out of a maximum score of 72 so that an average percentage of 68% was obtained in the sufficient category. The results obtained have not reached the indicators that have been set, and show that

teacher activities still need to be improved.

Observations of student activities are carried out during class learning by filling out the observation sheets provided. Observation of student activity aims to see the suitability and increase in student activity in participating in ongoing learning. Based on the results of observations of student activity, it showed that the total score in cycle 1 was 50 out of a maximum score of 72 so that an average percentage of 69% was obtained in the sufficient category. The results obtained have not reached the indicators that have been set, and this shows that student activities still need to be improved.

Cycle I Reflection

Reflection was carried out to analyze the data obtained from the actions in cycle I to find out the deficiencies in cycle I which were used as the basis for improvements in the actions in cycle II. Based on the test results and the results of learning observations observed by observers in cycle I, things were still lacking, such as (1) the teacher did not master the class in carrying out learning activities; (2) teachers do not make students active in participating in the learning process to the fullest so that there are still students who do not understand the material being taught; and (3) some students were busy playing the pop-up books that were distributed so they didn't pay attention to the teacher's explanation.

This is in line with Mufida opinion (2021) that efforts are needed to increase teacher readiness in teaching, namely: mastery of mathematics learning materials, preparation of characterized Mathematics lesson plans, and the ability to link the material being taught with more varied and interesting methods in learning mathematics needs to be intensified integrated character. Thus some of these things become a reference for improvement for researchers in cycle II.

Cycle II Results

The implementation of cycle II actions was carried out in accordance with the stages of direct learning using the Pop-up Book media and then giving the final cycle II test which was carried out on the same day as the implementation of cycle II actions to find out student learning outcomes through the use of Pop-up Book learning media with The number of essay questions is 10 items. The results of the cycle II test analysis are presented in Table 4.

Tabel 4. Cycle I Test Analysis Results

Acquisition Aspect	Result
Maximum score	100.00
Minimum score	55.00
Number of student	16.00
Number of Completed Students	14.00
Classical completeness percentage	87.50%

Based on Table 4 it can be seen that the highest score obtained by students is 100 while the lowest score is 55, out of 16 students who took the test. There were 14 students who were declared complete with a classical completeness of 87.5%. This shows that there is an increase in student learning outcomes from cycle I to cycle II. These results have reached the standard of action success (70%), so the research was not continued to the next cycle.

Observation of Teacher and Student Activities

Based on the results of observations of teacher activities, it is known that the total score in cycle II is 57 out of a maximum score of 64 with an average percentage of 89% (good criteria). On the other hand, the results of observations of student activity also showed an increase in cycle II. The total score in cycle II is 58 out of a maximum score of 64 with an average percentage of 91% (very good criteria). The results obtained have reached the indicators set, so that in this cycle the research was declared successful. These results are closely related to the use of pop-up book media in this research (Figure 2 & Figure 3). The use of media serves as the actualization of abstract concepts learned by students. Consistent with this statement, instructional media is recognized as an effective communication tool in learning Atubi (2023), thus having a positive impact on students' learning outcomes (Prastiti et al., 2023).

Figure 2. Right triangle in pop-up book media

Cycle II Reflection

Based on the results of learning tests, observations of teacher activities and student activities in cycle II it can be stated that learning in the classroom is optimal according to learning objectives. This is inseparable from the intensity of learning carried out through the application of pop-up book media which is a means of increasing student learning outcomes.

Figure 3. Equilateral triangle in pop-up book media

The results of this study are in line with the opinion of Mufidah et al. (2021) that the higher the learning intensity, the higher the learning outcomes.

Potential implication and implementation on natural Science learning

The current research highlights the importance of the use of learning media in natural science teaching, especially in mathematics. Learning media can provide positive benefits to students, including increased learning enthusiasm, student development according to their interests and speed, and equality of experience (Devi et al., 2021). Pop-up book media is a valuable learning medium that can help make learning more interesting and engaging for students. By utilizing this media in teaching mathematics, teachers can create a more attractive learning atmosphere that can improve students' low learning outcomes in mathematics.

The use of pop-up book media in mathematics teaching can be an effective way to improve student learning outcomes. Teachers can use this learning medium to change the boring learning atmosphere for students and make learning more meaningful and interesting (Riawan et al., 2020). By using appropriate learning media, teachers can stimulate students' thoughts, feelings, and willingness to learn, thus achieving the learning objectives properly (Kaukaba & Lutfi, 2022). Therefore, it is essential to incorporate the use of learning media, such as pop-up books, into natural science teaching to enhance student engagement and improve learning outcomes. The use of Pop-up Book media, which is an attractive and interesting learning tool, has been found to improve student learning outcomes. The use of relevant learning media can be beneficial in natural science teaching as well, especially in teaching topics that require visual or hands-on learning, such as experiments and demonstrations (Djidu et al., 2021).

The results showed that student scores increased significantly after implementing learning with the Pop-up Book learning media (Table 4). This suggests that the use of relevant learning media can significantly enhance student learning outcomes. This finding can be applied to natural science teaching as well, where students often learn through experiments and demonstrations. The use of relevant and appropriate learning media can help students understand complex concepts and improve their learning outcomes (Sani et al., 2022). The current study emphasizes the need for teachers to master the class in carrying out learning activities and make students active in participating in the learning process to the fullest. The finding can be applied to natural science teaching as well, where teachers need to be more active and effective in guiding students in experiments and demonstrations, and ensure that students are actively participating in the learning process (Muhali, 2019).

Conclusion

This research is said to be successful by looking at the resulting goals in accordance with the provisions of classroom action research. Based on the results of research and data analysis, it can be concluded that the application of Pop-up Book learning media can improve student learning outcomes in class III mathematics learning at SD Inpres Baru. This can be seen from the student learning outcomes obtained in the first cycle, which was 43.75%, increased in the second cycle to 87.5% and achieved the performance indicator target, which exceeded 70%. In addition, the results of the analysis of student and teacher activities in cycle I obtained an average percentage of student activity of 69% and was in the sufficient category while for teacher activity an average percentage was obtained of 68% in the same category, namely sufficient. In cycle II, the results of the analysis of student activity obtained an average percentage of student activity was 91% and was in the very good category. Furthermore, the results of the analysis of teacher activity in cycle II were 89% in the good category. The results of this study indicate that the management of learning in cycle II has increased from cycle I.

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Author Contribution

Conceptualization, methodology, formal analysis, writing—review and editing by Akina; investigation, writing—original draft preparation by Dian Nitami Rukmana Paeri; writing—review and editing by Mufidah, writing—original draft preparation by Nuraini.

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References

Afandi, M., Yustiana, S., & Kesuma, N. P. (2021). The Development of Pop-Up Book Learning Media in Pancasila Materials Based on Local Wisdom at Elementary School. *ELEMENTARY: Islamic Teacher Journal*, *9*(1), 57. https://doi.org/10.21043/elementary.v9i1.10001

Alika, O., & Radia, E. H. (2021). Development of Learning Media Based on Cross Puzzle Game in Science Learning to Improve Learning Outcomes. *Jurnal Penelitian Pendidikan IPA*, *7*(2), 173-177. https://doi.org/10.29303/jppipa.v7i2.667

Amir, Z. (2015). Mengungkap Seni Bermatematika dalam Pembelajaran. *Suska Journal of Mathematics Education*, *1*(1), 60. https://doi.org/10.24014/sjme.v1i1.1364

Asiyah, S. (2022). Meningkatkan Hasil Belajar Kimia Tata Nama Senyawa Sederhana dengan Model Think-Pair-Share pada Siswa Kelas X SMA Negeri 1 Lingsar. *Reflection Journal*, *2*(1), 17-25. https://doi.org/10.36312/rj.v2i1.846

Atubi, O. F. (2023). Relevance of Symbol Systems Theory to Instructional Media for the Enhancement of Social Studies Learning Outcome. *Jurnal Penelitian Dan Pengkajian Ilmu Pendidikan: E-Saintika*, *7*(1), 48–59. https://doi.org/10.36312/esaintika.v7i1.1067

Biazus, M. de O., & Mahtari, S. (2022). The Impact of Project-Based Learning (PjBL) Model on Secondary Students' Creative Thinking Skills. *International Journal of Essential Competencies in Education*, *1*(1), 38-48. https://doi.org/10.36312/ijece.v1i1.752

Bilad, M. R., Anwar, K., & Hayati, S. (2022). Nurturing Prospective STEM Teachers' Critical Thinking Skill through Virtual Simulation-Assisted Remote Inquiry in Fourier Transform Courses. *International Journal of Essential Competencies in Education*, *1*(1), 1–10. https://doi.org/10.36312/ijece.v1i1.728

Colidiyah, A. (2018). The Use of Pop-Up Book to Improve English Skill At Sd Negeri 2 Gading Kulon Dau. *A Journal of Culture English Language Teaching Literature & Linguistics*, *3*(1), 94. https://doi.org/10.22219/CELTICUMM.Vol3.No1.94-104

Devi, N. S., Efendi, I., & Samsuri, T. (2021). Model Pembelajaran Kooperatif Tipe Student Teams Achievement Division Berbantuan Media Video Terhadap Motivasi dan Hasil Belajar Kognitif. *Reflection Journal*, *1*(1), 22-32. https://doi.org/10.36312/rj.v1i1.530

Djidu, H., Mashuri, S., Nasruddin, N., Sejati, A. E., Rasmuin, R., Ugi, L. E., & Arua, A. L. (2021). Online learning in the post-Covid-19 pandemic era: Is our higher education ready for it? *Jurnal Penelitian Dan Pengkajian Ilmu Pendidikan: E-Saintika*, *5*(2), 139–151. https://doi.org/10.36312/esaintika.v5i2.479

Elmunsyah, H., Hidayat, W. N., & Asfani, K. (2019). Interactive learning media innovation: Utilization of augmented reality and pop-up book to improve user's learning autonomy. *Journal of Physics: Conference Series*, *1193*, 012031. https://doi.org/10.1088/1742-6596/1193/1/012031

Evendi, E. (2022). Mathematical Thinking Styles and Its Implications in Science Learning: A Bibliometric Analysis. *Jurnal Penelitian Pendidikan IPA*, *8*(3), 1503–1511. https://doi.org/10.29303/jppipa.v8i3.1720

Fahma, M. A., & Purwaningrum, J. P. (2021). Teori Piaget dalam Pembelajaran Matematika. *MUST: Journal of Mathematics Education, Science and Technology*, *6*(1), 31-42. https://doi.org/10.30651/must.v6i1.6966

Fimansyah, D. (2015). Pengaruh Strategi Pembelajaran Dan Minat Belajar Terhadap Hasil Belajar Matematika. *Judika (Jurnal Pendidikan Unsika)*, *3*(1). https://doi.org/10.35706/judika.v3i1.199

Haeriah, H., Rahmawati, H., & Fadli, S. (2022). Analisis Kemampuan Pemecahan Masalah Materi Sistem Persamaan Linear Dua Variable Siswa Kelas VIII SMPN 21 Mataram. *Empiricism Journal*, *3*(2), 295-300. https://doi.org/10.36312/ej.v3i2.1082

Hamdani, D., Junaidi, J., Novitasari, D., Salsabila, N. H., & Tyaningsih, R. Y. (2020). Bukti yang Membuktikan dan Bukti yang Menjelaskan dalam Kelas Matematika. *Jurnal Penelitian Dan Pengkajian Ilmu Pendidikan: E-Saintika*, *4*(2), 248-258. https://doi.org/10.36312/e-saintika.v4i2.253

Hardiansyah, F., & Mulyadi. (2022). Improve Science Learning Outcomes for Elementary School Students Through The Development of Flipbook Media. *Jurnal Penelitian Pendidikan IPA*, *8*(6), 3069-3077. https://doi.org/10.29303/jppipa.v8i6.2413

Kaukaba, S. Q., & Lutfi, A. (2022). ABC - Acid and Base Chemistry: An Android Mobile Learning Media to Improve Students' Learning Outcomes and Motivation. *Jurnal Penelitian Dan Pengkajian Ilmu Pendidikan: E-Saintika*, *6*(2), 77–92. https://doi.org/10.36312/esaintika.v6i2.737

Khairunnisah, K., Karmana, I. W., Dharmawibawa, I. D., Haikal, Moch., & Abidin, S. M. (2021). Penerapan Model Pembelajaran Course Review Horay berbantuan Media Torso Biologi untuk Meningkatkan Motivasi dan Hasil Belajar Siswa.

Empiricism Journal, *2*(1), 29–39. https://doi.org/10.36312/ej.v2i1.536

Korpershoek, H., Kuyper, H., & van der Werf, G. (2015). The Relation Between Students' Math And Reading Ability And Their Mathematics, Physics, And Chemistry Examination Grades In Secondary Education. *International Journal of Science and Mathematics Education*, *13*(5), 1013–1037. https://doi.org/10.1007/s10763-014-9534-0

Kusumawati, Y., Umar, U., & Hakim, L. (2022). The Application of Blended Learning Using Edmodo Media to Increase Learning Motivation and Achievement in Learning Physics. *Empiricism Journal*, *3*(2), 264–276. https://doi.org/10.36312/ej.v3i2.1014

Maghfiroh, N., Maslikhah, M., & Widhyahrini, K. (2020). The Teaching Technique Of Indonesian In Madrasah Ibtidaiyah: Learning From Mi Suruh 1 Plus, Miftahul Ulum And Ma'arif Pulutan. *ELEMENTARY: Islamic Teacher Journal*, *8*(2), 225. https://doi.org/10.21043/elementary.v8i2.8109

Mayarni, M., Hadawiyah, W., Irdalisa, I., & Nisa, R. A. (2021). Keterampilan Berpikir Kreatif Biologi Siswa Kelas X Melalui Penerapan Media Pembelajaran Berbasis Google Sains (Audiovisual): Bahasa Indonesia. *Reflection Journal*, *1*(2), 52–62. https://doi.org/10.36312/rj.v1i2.646

Mufidah, M. (2021). Perkembangan Karakter Siswa dalam Pembelajaran Matematika di Kelas Rendah Sekolah Dasar. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, *6*(3), 1133–1146. https://doi.org/10.31004/obsesi.v6i3.1652

Mufidah, M., Akina, A., Khairunnisa, K., Nuraini, N., & Idris, I. (2021). Hubungan Intensitas Belajar dengan Hasil Belajar Matematika Siswa. *Jurnal Kreatif Online*, *9*(1), 106-112. https://doi.org/10.22487/jko.v9i1.777

Muhali, M. (2019). Pembelajaran Inovatif Abad Ke-21. *Jurnal Penelitian Dan Pengkajian Ilmu Pendidikan: E-Saintika*, *3*(2), 25-50. https://doi.org/10.36312/e-saintika.v3i2.126

Nasruddin, N., Mashuri, S., & Nafiah, U. (2020). Peningkatan Hasil Belajar Matematika pada Materi Segitiga Melalui Pendekatan Penemuan Terbimbing Siswa SMP. *Jurnal Penelitian Dan Pengkajian Ilmu Pendidikan: E-Saintika*, *4*(2), 80-94. https://doi.org/10.36312/e-saintika.v4i2.169

Nisa, E. K., Koestiari, T., Habibbulloh, M., & Jatmiko, B. (2018). Effectiveness of guided inquiry learning model to improve students' critical thinking skills at senior high school. *Journal of Physics: Conference Series*, *997*, 012049. https://doi.org/10.1088/1742-6596/997/1/012049

Nurhidayah, N., Jumaeri, J., & Susilaningsih, E. (2021). Development of Video Based on Pop Up Questions Integrated Religious Character Human Digestive System Materials. *Jurnal Penelitian Pendidikan IPA*, *7*(SpecialIssue), 250–255. https://doi.org/10.29303/jppipa.v7iSpecialIssue.1055

Pertiwi, D. E., Samsuri, T., & Muliadi, A. (2019). Peningkatan Hasil Belajar Kognitif Siswa Menggunakan Model Pembelajaran Kooperatif Tipe Group Investigation. *Jurnal Penelitian Dan Pengkajian Ilmu Pendidikan: E-Saintika*, *2*(2), 135-141. https://doi.org/10.36312/e-saintika.v2i2.114

Praheto, B. E., & Sayekti, O. M. (2018). *P*op Up "Aksara" In The Learning Of Javanese Alphabets In Primary School. In *PGSD UST International Conference on Education, 1,* 37-41. Retrieved from https://jurnal.ustjogja.ac.id/index.php/ICE/article/view/4198

Prastiti, T. D., Mairing, J. P., & Dwikoranto, D. (2023). Tuweb (Web-Based Tutorial) with Scrapbooks and Videos to Improve Students' Learning Outcomes. *Jurnal Penelitian Dan Pengkajian Ilmu Pendidikan: E-Saintika*, *7*(1), 103-114. https://doi.org/10.36312/esaintika.v7i1.829

Prayogi, S., & Asy'ari, M. (2013). Implementasi Model Pbl (Problem Based Learning) Untuk Meningkatkan Hasil Belajar dan Kemampuan Berpikir Kritis Siswa. *Prisma Sains: Jurnal Pengkajian Ilmu Dan Pembelajaran Matematika Dan IPA IKIP Mataram*, *1*(1), 80-88. https://doi.org/10.33394/j-ps.v1i1.521

Rahmawati, H. (2022). Pengaruh metode demonstrasi terhadap daya nalar dan hasil belajar siswa sekolah menengah. *Journal of Authentic Research*, *1*(1), 39-45. https://doi.org/10.36312/jar.v1i1.652

Ranjitkar, S., Hysing, M., Kvestad, I., Shrestha, M., Ulak, M., Shilpakar, J. S., Sintakala, R., Chandyo, R. K., Shrestha, L., & Strand, T. A. (2019). Determinants of Cognitive Development in the Early Life of Children in Bhaktapur, Nepal. *Frontiers in Psychology*, *10,* 2739. Retrieved from https://www.frontiersin.org/articles/10.3389/fpsyg.2019.02739

Retnawati, H., Arlinwibowo, J., Wulandari, N. F., & Pradani, R. G. (2018). Teachers' Difficulties And Strategies In Physics Teaching And Learning That Applying Mathematics. *Journal of Baltic Science Education*, *17*(1), 120–135. https://doi.org/10.33225/jbse/18.17.120

Riawan, M. R. I., Sukamto, S., & Subekti, E. E. (2020). Keefektifan Media Pembelajaran Buku Aktivitas Peta Si Pintar dalam Meningkatkan Motivasi Belajar Siswa. *Jurnal Penelitian Dan Pengkajian Ilmu Pendidikan: E-Saintika*, *4*(2), 95. https://doi.org/10.36312/e-saintika.v4i2.193

Safri, M., Sari, S. A., & Marlina, M. (2017). Pengembangan Media Belajar Pop-Up Book Pada Materi Minyak Bumi. *Jurnal Pendidikan Sains*

Indonesia (Indonesian Journal of Science Education), *5*(1), 107-113. Retrieved from https://jurnal.usk.ac.id/JPSI/article/view/8431/6812

Sani, H., Jaidin, J. H., Shahrill, M., & Jawawi, R. (2022). Comics as a Teaching and Learning Strategy in Primary Social Studies Lessons. *Jurnal Penelitian Dan Pengkajian Ilmu Pendidikan: E-Saintika*, *6*(3), 137–156. https://doi.org/10.36312/esaintika.v6i3.941

Sudarsih, A. (2021). Penerapan Model Pembelajaran Kooperatif Tipe TPS (Think Pair Share) Terhadap Peningkatan Motivasi Dan Hasil Belajar Matematika Siswa Kelas VI B SDN 19 Cakranegara. *Reflection Journal*, *1*(2), 93-99. https://doi.org/10.36312/rj.v1i2.682

Sukaisih, R., Muhali, M., & Asy'ari, M. (2020). Meningkatkan keterampilan metakognisi dan berpikir kritis siswa melalui pembelajaran model pemecahan masalah dengan strategi konflik-kognitif. *Empiricism Journal*, *1*(1), 37-50. https://doi.org/10.36312/ej.v1i1.329

Suryati, S., Ihsan, M. S., & Huliadi, H. (2021). Pengembangan E-Modul Interaktif Menggunakan Adobe Flash Untuk Menumbuhkan Literasi Sains. *Reflection Journal*, *1*(2), 82–92. https://doi.org/10.36312/rj.v1i2.671

Suryati, S., Surningsih, S., & Mashami, R. A. (2022). Pengembangan E-Modul Interaktif Reaksi Redoks Dan Elektrokimia Berbasis Nature Of Science Untuk Penumbuhan Literasi Sains Siswa. *Reflection Journal*, *2*(1), 26-33. https://doi.org/10.36312/rj.v2i1.847

Syafari, Y., & Montessori, M. (2021). Analisis Pembelajaran Daring Terhadap Motivasi Belajar Dan Prestasi Belajar Siswa Dimasa Pandemi Covid-19. *Jurnal Basicedu*, *5*(3), 1294–1303. https://doi.org/10.31004/basicedu.v5i3.872

Verawati, N. N. S. P., Handriani, L. S., & Prahani, B. K. (2022). The Experimental Experience of Motion Kinematics in Biology Class Using PhET Virtual Simulation and Its Impact on Learning Outcomes. *International Journal of Essential Competencies in Education*, *1*(1), 11-17. https://doi.org/10.36312/ijece.v1i1.729