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The effect of *Two Stay Two Stray* learning model assisted by wordwall application on student learning outcomes

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ABSTRACT

This study employs a quantitative approach, utilizing a quasi-experimental design known as a non-equivalent control group design. The research instruments consist of validated test items in the form of multiple-choice questions. These instruments undergo preliminary trials and subsequent analysis, including assessments of validity, reliability, differentiating power, and difficulty, ensuring the production of valid and reliable research tools. Twenty-six validated questions were utilized, demonstrating a high reliability coefficient of 0.8973, meeting stringent reliability criteria and indicating the trustworthiness of the test questions. Data analysis was conducted using a t-test, with a significance level set at 5% (0.05). Post-test results revealed a higher average score in the experimental group (80.22) compared to the control group (71.00). The t-test analysis yielded a t-count of 2.8089, exceeding the critical t-value of 2.0106. Additionally, the N-gain scores showed a significant average increase in the experimental group (31.49%) compared to the control group (24.35%). The study findings indicate a noteworthy disparity in learning outcomes between the two groups subjected to different treatments. Specifically, learning outcomes in the experimental group surpassed those in the control group following the intervention. Thus, it can be inferred that the implementation of the *Two Stay Two Stray* cooperative model, supported by the Wordwall application, positively impacts student learning outcomes.

1. Introduction

Integrated thematic learning prioritizes the involvement of students in the learning process so that students get direct experience and are trained in finding various knowledge independently through the process of interacting with the environment and collaborating with friends in class in exploring information, building meaning, and finding solutions from different perspectives. Learning experiences experienced directly by students will help increase understanding of learning concepts so that it will be seen in student learning outcomes. Integrated thematic learning aims to provide a deeper understanding of learning material because it provides opportunities for students to become the main actors in the learning process so that in its application appropriate and varied learning models and media are needed. The choice of learning models is essential because it acts as a roadmap for carrying out learning, which is necessary to meet learning objectives. According to Ivy, a learning model is a methodical process for structuring educational opportunities and presenting them as a conceptual framework in order to meet learning objectives.

It also acts as a manual for educators creating, organising, and carrying out educational activities [1]. Therefore, the selection of learning models must be appropriate by considering the characteristics of learners and learning objectives. The learning model serves as a tool to channel learning to students through teachers as the channel [2]. The application of the model in learning will make students more actively participate so that the learning process becomes more interesting [3]. Therefore it is important for teachers to determine the appropriate learning model before starting learning activities. The learning model will be more effective if supported by the right learning media. In the implementation of learning, the use of media can increase motivation, stimulation, cause attraction, and have a good psychological impact on students as a young generation [4].

Technology-based audio and visual learning media are more interesting and effective to use because students not only see but also listen and listen while interacting with learning media [5]. One of the media innovations using technology that can be used in learning is the wordwall application. Wordwall is a website-based application that can be used to create learning media such as quizzes, matchmaking, pairing, and others then can be downloaded and shared with students [6]. According to Savira *et al.* wordwall learning media is an interactive application based on the official website that is useful for creating student practice questions in which there are quizzes, word searches, chasing in the maze, true or false, matching games, correcting sentences and others [7]. Wordwall applications have advantages because they are interactive in the form of games so that they are fun and interesting for students.

2. Method

This research is a quantitative research with a quasi-experimental design. This is because the experimenter cannot artificially create groups for the experiment. That gives the understanding that researchers cannot randomize participants in groups or artificially create groups for experimentation. The form of research design used is non-equivalent control group design that has an experimental group and a control group, but the two groups are not randomized or randomized then given a pre-test before treatment and post-test after treatment. The population in this research is all grade V students of Elementary School Cluster I, Pauh, Padang City. Based on the normality test of midterm examination results of fifth grade in integrated thematic learning, $L_{count} < L_{table}$ was obtained so that all populations were normally distributed. The homogeneity test is obtained $\chi^2_{calculate} < \chi^2_{table}$ then H_a is accepted and the population has a homogeneous variance. The research sample is determined by a simple random sampling technique.

According to Loveday *et al.,* simple random sampling is a straightforward approach that uses a random process to choose every member of the population. Sampling is done without favouring any one level over another within the population, but it must comply with the requirement that the population's data be homogeneous [8]. According to Zickar *et al.*, there are three ways to choose the sample for the basic random sampling technique: by computer randomization, by lottery, or by using random number tables [9]. In this study, a lottery method was used to produce a simple and random sample. In particular, little pieces of paper were used to write the names of population representatives from primary schools, and these names were then chosen at random. The control group was represented by the group chosen in the second draw, whereas the experimental group was represented by the group chosen in the first. This preserved population homogeneity and guaranteed random sample selection independent of strata, giving every individual in the population an identical chance of being selected [10]. There are two samples used in quantitative research with this experimental method, namely as an experimental group and as a control group, Public Elementary School 08 Pisang as an experimental group and Public Elementary School 08 Pisang as a control group.

The research instrument used is a multiple-choice test instrument with four alternative answers (a, b, c, and d) consisting of 24 items. This instrument was developed by first designing an instrument grid which starts from writing down basic competencies, formulating learning indicators and then derived into question indicators. Before giving birth to a question, it is first determined the cognitive level and operational verb to be used which is then also used to determine the introduction to the question. To test the effectiveness of the instrument, validity and reliability tests were carried out. Test validity using a rough number product moment correlation formula. Question items that have good validity are question items with sufficient to

very high criteria between 0.400 to 1,00, thus questions with low and very low validity should not be used, from the 40 questions tested for validity there are 26 valid questions and 14 invalid items. The reliability test uses the Spearmen-Brown formula so that the reliability of the question is 0.8973 with very strong reliability criteria and this shows that the test questions can be trusted. Type of data in this research is quantitative data. Data collection was obtained through test techniques from the results of pre-test and post-test in the control group and experimental group. Data analysis in this research is a t-test that is carried out after the prerequisite test of t-test analysis has been met, namely the normality test and homogeneity test then continued with the n-gain score test. Hypothesis testing performed with a t test at a significant level of 0.05 H_a will be accepted if obtained $t_{count} > t_{table}$, otherwise Ha is rejected if $t_{count} > t_{table}$.

3. Results and Discussion

This research was conducted with three sessions. The first session was to give a pre-test to the experimental group and the control group with the same questions to find out the initial conditions of both sample groups. The next step is to treat the experimental group by applying learning using a cooperative model type *Two Stay Two Stray* assisted by the wordwall application. Furthermore, post-tests were carried out on both groups of samples so that the final test results will be analyzed.

3.1. Data Descriptive

Data collection in this study was carried out by carrying out pre-test and post-test in the experimental group and in the control group. Before the pre-test and post-test are performed, the test instrument is validated first by the validator. Furthermore, a trial of the research instrument was carried out to see the feasibility of the problem as a research instrument. as explained by Reinita *et al,* that the trial function is to find out whether questions the tests suitable for use. After the trial was carried out, researchers analyzed the questions by testing the validity, reliability, discriminating power, and difficulty level of the questions then obtained question items that would be used as research instruments in carrying out the pre-test and post-test [11].

1) Pre-Test Results Data

Pre-test was given to a control group with 23 students. While the experimental group was given with the number of students as many as 27 people. The following pre-test results from the control group and experiments are seen from the recapitulation Table 1.

Table 1. Descriptive Statistic of Pre-Test Results Data

Statistic	Control Group	Experimental Group
Mean	62,35	73,26
Variance	258,2372	33,507
Standard Deviation	16,070	5,7885
Median	67	75
Maximum	79	88
Minimum	29	63

Based on the Table 1, it was obtained that in the control group with 23 students, the highest score was 79 and the lowest score was 29 with an average of 62.35 and a standard deviation of 16.070 and the variance was 258.2372. While in the experimental group with the number of students 27 people obtained the highest value of 88 and the lowest value of 63 with an average of 73.26 and standard deviation of 5.7885 and the variance was 33.507. A clearer comparison between the control group's pre-test results and the experimental group is presented in the Fig. 1. Based on the graph above, it can be concluded that there is a significant difference between the average pre-test of the experimental group and the control group. After the prerequisite test on the pre-test results, normal and homogeneous distributed data were obtained. So it can be concluded that the treatment given to each group begins with the same conditions.
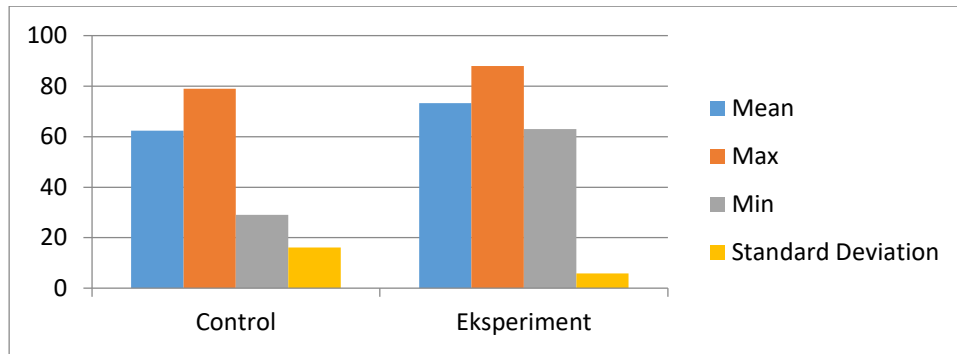
Fig. 1. Comparison of Pre-Test Results of Control and Experimental Group

2) Post-Test Results Data

Posttest is carried out after the implementation of learning to determine the abilities and learning outcomes of students after being given treatment. The treatment given was the implementation of learning by applying a cooperative model type *Two Stay Two Stray* with the help of wordwall applications in the experimental group and conventional learning with wordwall applications in the control group. Table 2, it can be seen that the control group. The control group obtained lower results than the experimental group.

Table 2. Descriptive Statistic of Post-Test Results Data

Statistic	Control Group	Experimental Group
Mean	69,83	80,22
Variance	111,97	119,56
Standard Deviation	10,582	10,935
Median	71	75
Maximum	83	100
Minimum	54	63

The mean difference between the two groups was 10.39. The standard deviation from the learning outcomes variable in the experiment group is 10,935 and standard deviation in the control group is 10, 582. The maximum score obtained in the control group was only 83 while in the experimental group obtained 100, meaning that there were students who could answer the question instrument with the criteria of all correct answers after learning was carried out by applying the *Two Stay Two Stray* model assisted by the wordwall application. The conclusion that can be drawn based on Table 2 is that there is a difference between the posttest results in the experimental group and the posttest results in the control group, where the posttest results in the experimental group are higher than the control group, see Fig. 2.
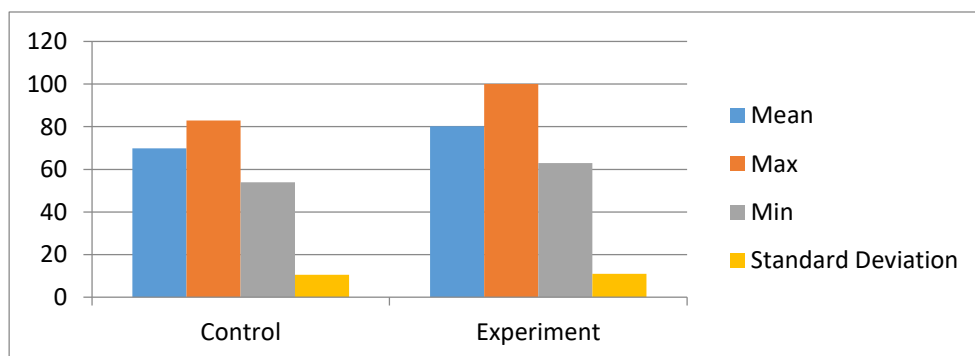

Fig. 2. Comparison of Post-Test Results of Control and Experimental Group

3.2. Analysis Prerequisites Test

The prerequisite test of analysis is carried out on the posttest results, namely the normality test with the Liliefors test and the homogeneity test with the Fisher test so that normal and homogeneous distributed data are obtained so that the hypothesis test is continued with data analysis using parametric statistics to prove the research hypothesis.

1) Normality Test

A normality test is performed to determine whether the research data is normally distributed or not. . The normality test used is the Liliefors test because the data to be tested is a single data. The following Table 3 of normality test calculation results using the Liliefors test, the data is said to be normal if $L_{calculate} < L_{tabel}$ in the significance level is 0,05.

Table 3. Pre-Test and Post-Test Normality Test Calculation of Sample Group

	Sample Groups	L calculate	L table	Conclusion
Pre-Test	Eksperiment Group	0,1596	0,1665	Normal
	Control Group	0,1664	0,1798	Normal
Post-Test	Eksperiment Group	0,1427	0,1665	Normal
	Control Group	0,1598	0,1798	Normal

2) Homogeneity Test

The homogeneity test uses the Fisher test, the data is said to be homogeneous if $F_{calculate} < F_{table}$. The results of the homogeneity test calculation are presented in the following Table 4.

Table 4. Calculation Results of the Sample Group Pretest Homogeneity Test

	Variable 1	Variable 2
Mean	73,25925926	62,34783
Variance	33,50712251	258,2372
Observations	27	23
df	26	22
F	0,129753298	
P(F<=f) one-tail	1,24875E-06	
F Critical one-tail	0,508545415	

Based on the results of the analysis, it can be concluded that the pretest data is homogeneous because Fcalculate < Ftable, which is 0.12975 < 0.50854. While the homogeneity test of posttest results is presented in the following Table 5.

Table 5. Calculation Results of the Sample Group Posttest Homogeneity Test

	Variable 1	Variable 2
Mean	80,22222222	69,82609
Variance	119,5641026	111,9684
Observations	27	23
df	26	22
F	1,067838109	
P(F<=f) one-tail	0,441587352	
F Critical one-tail	2,011572495	

The results of the Fisher test analysis showed that the posttest result data was homogeneous because $F_{calculate} < F_{table}$ were 1.06783 < 2.01157.

3) Hypothesis Test

After the prerequisite test is met, namely normal and homogeneous distributed data, the mka is continued with a hypothesis test to see the effect of the application of the *Two Stay Two Stray* type cooperative model assisted by wordwall applications on student learning outcomes. According to Yulianah *et al,* learning outcomes are an achievement of competence to obtain information from knowledge of learning outcomes as an active process [12]. The data to be tested is obtained from the learning outcomes of students after completing the test instrument. According to Rapono *et al,* test is a method used or procedure taken in the framework of measurement and assessment in the field of education [13]. Furthermore Hayati *et al,* learning outcomes from the cognitive realm are seen from the ability of students to do test questions individually [14]. The hypotheses tested are; (1) H_0, There is no effect of the cooperative model type *Two Stay Two Stray* assisted by wordwall application on the learning outcomes of grade V students at Elementary School Cluster I Pauh District, Padang City. (2) H_a, There is an influence of the *Two Stay Two Stray* type cooperative model assisted by wordwall application on the learning outcomes of grade V students of Elementary School Cluster I Pauh District, Padang City. Hypothesis testing performed with a t test at a significant level of 0.05 H_a will be accepted if obtained $t_{count} > t_{table}$, otherwise Ha is rejected if $t_{count} > t_{table}$. Processing hypothesis test data using the t test obtained $t_{count} > t_{table}$, namely 2.8089 > 2.0106 so that it is concluded that there is an influence of the application of the *Two Stay Two Stray* type cooperative model assisted by wordwall applications on student learning outcomes in integrated thematic learning.

The results of the research were strengthened by conducting an n-gain test to determine the percentage of improvement in student learning outcomes after being given treatment. After the n-gain test, the average percentage increase in the experimental group was higher than the control group, namely 31.49% in the experimental group and 24.35% in the control group, so it can be concluded that the *Two Stay Two Stray* type cooperative model assisted by wordwall application is effective to be applied in learning to improve student activities and learning outcomes in integrated thematic learning. The application of the *Two Stay Two Stray* type cooperative model assisted by the wordwall application has a significant impact on student learning outcomes in integrated thematic learning. The *Two Stay Two Stray* learning model provides opportunities for learners to share knowledge and experiences with different groups in one class. Students solve problems through collaboration with other group members, two students stay in the group and two others visit another group [15].

According to Yusuf *et al,* The *Two Stay Two Stray* type cooperative learning model provides opportunities for students through their groups to share and receive information from other groups so that each individual in the group has a sense of responsibility towards their group [16]. The *Two Stay Two Stray* type cooperative learning model provides lessons to students that humans need each other, thus in addition to cognitive learning outcomes, students' social attitudes are also improved. Furthermore Denensi *et al,* explaining that the presence of friends as peer tutors in the group will help other students in increasing understanding because they exchange opinions and share information without having to be afraid so that learning becomes more flexible [17]. According to Liebech *et al,* students' social and academic skills can improve with the implementation of cooperative learning model through collaboration in structured groups [18].

The learning model will be more effective if supported by the right learning media. Media acts as a tool in delivering learning materials to students. It is supported by Deev *et al,* that the application of models in learning must be prepared in an educational environment with the help of supporting tools or media [19]. Media that uses technology has appeal to learners as well as supports the educational goals of today's modern times. As explained by Sofiasyari *et al,* learning will be more effective and fun if accompanied by the use of supportive media, which makes students actively learn in a pleasant atmosphere [20]. As described by Salmerón *et al.* that watching and listening while students gives a message provides a richer pragmatic context than just reading the message because it involves not only the voice, but also the physical context where the communication takes places [21]. Furthermore Teslo explained that active learning will be created if thre is interaction and communication between students [22]. One of the media innovations using technology that can be used in learning is the wordwall application. Wordwall is a website-based application that can be used to create learning media such as quizzes, matchmaking, pairing, and others then can be downloaded and shared with students [23]. According to Lestari wordwall is an application in the form of educational games that are interesting for students and can be used as a learning resource, media, and assessment tool that is fun for students [24].

The application of the *Two Stay Two Stray* model has seven steps consisting of group division, problem discovery, working in groups, visiting other groups, receiving guests, discussing information from guests, group presentations [25]. Meanwhile, according to Sari, The *Two Stay Two Stray* model has four stages, namely preparation, group activities, presentations, and evaluations [26]. The first stage is preparation. At this stage the teacher prepares assessments, learning designs, student worksheets and divides students into groups with 4 students [27]. Each group member must be heterogeneous based on student and ethnic academic achievement, then each group is given a topic or problem that will be discussed with its own group members and other groups [26]. The second stage is group activities. Students carry out learning activities using worksheets containing problems related to the concept of the material and its classification then studied in small groups to find solutions in their own way. Then two of the four members from each group leave the group and visit another group, while two members who stay in the group are in charge of conveying the results of the group discussion to guests from other groups. After obtaining information, guests return to their respective groups and report the findings obtained and then matched with the results of their group work.

The third stage is the presentation. After completing group tasks and finding solutions to the problems given, group members present the results of their group discussions to be discussed

with other group members. Other group members respond to the results of the group discussion presentation, either adding, correcting, or providing criticism and suggestions. Then the teacher discusses and directs student discussions and gives emphasis and explanation on the topic of the problem. The fourth stage is evaluation. Evaluation is very necessary in learning to know and look back at the quality and quantity of a steel treatment carried out in the learning process [28]. Evaluation is carried out to review students' understanding of learning material. At this stage the teacher uses a wordwall application that contains questions about the results of the discussion that has been learned. Each group is given one device to access the wordwall application, then answer questions in the application together in groups. This evaluation is continued by giving awards to the group that obtains the highest score in the shortest time. The use of wordwall applications as a medium in this evaluation process provides direct experience of using technology for students, this is very helpful in the process of transferring learning information to students because it is communicated through technology [29].

The findings in this reserarch show that the application of the *Two Stay Two Stray* type cooperative model assisted by wordwall applications has an influence on student learning outcomes. There was a significant difference in student learning outcomes between the experimental group and the control group that applied conventional learning with wordwall applications. The experimental group applied learning with a cooperative model type *Two Stay Two Stray* assisted by the wordwall application, each group was facilitated by a laptop in accessing the wordwall application to work on evaluation tasks. After students discuss in groups, two group members will visit other groups while the other two remain in groups to provide information about learning materials to other groups. Thus learning is active and fun so that the interest, understanding, and learning outcomes of students increase. It is also supported by Mutaqin *et al,* that in integrated thematic learning students become the center of learning so as to provide direct experience and learning is in a pleasant atmosphere [30]. Meanwhile, the control group applied conventional learning with the same material but teacher-centered learning as the main source of information while students were passive in learning so that student motivation and learning outcomes were not optimal.

The results of this research are supported by previous research findings such as research Putri [31], retrieved $t_{count} > t_{table}$ which shows the influence of the application of the *Two Stay Two Stray* learning model on the learning outcomes and learning interests of students. Then research by Juniantari *et al,* showed a significant difference in average learning outcomes between the experimental group that applied learning with the Mind Mapping-assisted *Two Stay Two Stray* type cooperative model and the control group that applied conventional learning [32]. Wordwall applications that are used as media in learning have a positive impact on increasing learning activities. Some research findings show good results in the application of wordwall applications in learning. As the findings of research conducted by Frisilia, it was found that the learning outcomes of students increased after implementing learning using the Wordwall application, where the average learning increased from 53.33 to 80.93 [33]. Then research Agusti *et al,* shows that learning using the Wordwall application as a learning medium has a good impact on student learning outcomes [34]. This is evidenced by the results of the hypothesis test analysis with the t test obtained $t_{count} > t_{table}$, which is 3.203 > 2.039 so that it is concluded that the wordwall application has an influence on student learning outcomes and is effective to be applied in learning.

4. Conclusion

The results of the analysis and discussion show the influence of the application of the cooperative model type *Two Stay Two Stray* assisted by wordwall application on student learning outcomes in integrated thematic learning. This can be seen from the average value of the experimental group is higher than the control group after being given treatment, namely the implementation of learning using the *Two Stay Two Stray* model assisted by the wordwall application in the experimental group while in the control group carrying out conventional model learning with the wordwall application. This is also evidenced by the results of the hypothesis test using the t test and the n-gain score test. The calculation result of the $t_{calculate} > t_{table}$ so that H_a is accepted and H_0 is rejected. The results of the n-gain score test obtained the average increase in learning outcomes in the experimental group was greater than the average increase in learning outcomes in the control group. The research findings showed a significant difference

in learning outcomes in the two sample groups with different treatments, where the learning outcomes in the experimental group after being given treatment were higher than those in the control group. Therefore, it can be concluded that the cooperative model type *Two Stay Two Stray* assisted by wordwall application has a significant influence on the learning outcomes of grade V students in integrated thematic learning. The quasi-experimental design used as the design of this study has limitations where the low control of variables due to the absence of randomization. The research findings were limited to the learning outcomes of grade V elementary schools in one cluster only. External factors that affect research also cannot be fully controlled so that it affects the results of the study, external factors such as the background of students, they come from families with different social statuses besides that the school environment also affects where in one area there are two schools so that there are two learning shifts, namely morning and afternoon. It is hoped that this research can be developed and refined by increasing the population, expanding, adding other variables.

Declarations

References

[1] I. I. Irvy, "Understanding the Learning Models Design for Indonesian Teacher," *Int. J. Asian Educ.*, vol. 1, no. 2, pp. 95–106, Sep. 2020, doi: 10.46966/ijae.v1i2.40.

[2] M. R. Hardiyana and Maemonah, "The Effect of The Application of Albert Bandura's Behaviorism Theory on the Motivation and Learning Outcomes," *J. Fundadikdas (Fundamental Pendidik. Dasar)*, vol. 6, no. 2, pp. 93–110, 2023. doi: 10.12928/fundadikdas.v6i2.8191

[3] E. Brada, R. Ananda, and I. Aprinawati, "Penerapan model pembelajaran paired story telling untuk meningkatkan keterampilan berbicara siswa sekolah dasar," *J. Fundadikdas (Fundamental Pendidik. Dasar)*, vol. 5, no. 3, pp. 149–159, 2022, doi: 10.12928/fundadikdas.v5i3.6486.

[4] L. D. Putra and N. Afrina, "The development of genially-based interactive learning multimedia for elementary school students," *J. Fundadikdas (Fundamental Pendidik. Dasar)*, vol. 6, no. 2, pp. 138–151, Sep. 2023, doi: 10.12928/fundadikdas.v6i2.8413.

[5] G. Santoso, A. Abdulkarim, B. Maftuh, Sapriya, M. Murod, and L. Retnasari, "Increasing Learning Outcomes for Citizenship Education Courses Based on Google Application at PGSD FIP UMJ in 2022," *J. Fundadikdas (Fundamental Pendidik. Dasar)*, vol. 4, no. 2, pp. 60–75, 2023. doi: 10.12928/fundadikdas.v6i1.7591

[6] L. L. Novia, H. K. Wardani, A. Alimin, and S. M. Nasim, "Developing Web-Based Media for Teaching Writing Through Wordwall," *J. Educ.*, vol. 6, no. 3, pp. 16344–16358, 2024, doi: https://doi.org/10.31004/joe.v6i3.5329.

[7] A. Savira and R. Gunawan, "Pengaruh Media Aplikasi Wordwall dalam Meningkatkan Hasil Belajar Mata Pelajaran IPA di Sekolah Dasar," *Edukatif J. Ilmu Pendidik.*, vol. 4, no. 4, pp. 5453–5460, 2022, doi: 10.31004/edukatif.v4i4.3332.

[8] L. Conquest, R. Burr, R. Donnelly, J. B. Chavarría, and V. Gallucci, "Sampling Methods for Stock Assessment for Small-Scale Fisheries in Developing Countries," in *Stock Assessment*, Boca Raton: CRC Press, 2023, pp. 179–225. doi: 10.1201/9781003421252-4

[9] M. J. Zickar and M. G. Keith, "Innovations in Sampling: Improving the Appropriateness and Quality of Samples in Organizational Research," *Annu. Rev. Organ. Psychol. Organ. Behav.*, vol. 10, no. 1, pp. 315–337, Jan. 2023, doi: 10.1146/annurev-orgpsych-120920-052946.

[10] W. Brannath, C. Hillner, and K. Rohmeyer, "The population-wise error rate for clinical trials with overlapping populations," *Stat. Methods Med. Res.*, vol. 32, no. 2, pp. 334–352, Feb. 2023, doi: 10.1177/09622802221135249.

[11] R. Reinita and A. El Fitri, "The Effect of Cooperative *Two Stay Two Stray* Model on Civics Learning Outcomes of Primary School Students," *Atl. Press*, vol. 382, pp. 433–437, 2019, doi: 10.2991/icet-19.2019.109.

[12] N. Yulianah, W. Winarsih, U. Solehah, E. S. Maruti, and N. Irawan, "The implementation of matching games to improve Indonesian learning outcomes for the first-grade students at SDN 1 Crj," *Prim. J. Pendidik. Guru Sekol. Dasar*, vol. 12, no. 3, p. 604, Jun. 2023, doi: 10.33578/jpfkip.v12i3.9748.

[13] M. Rapono, Safrial, and C. Wijaya, "Urgensi Penyusunan Tes Hasil Belajar: Upaya Menemukan Formulasi Tes Yang Baik dan Benar," *Jupiis J. Pendidik. Ilmu-Ilmu Sos.*, vol. 11, no. 1, p. 95, 2019, doi: 10.24114/jupiis.v11i1.12227.

[14] F. Hayati, F. Firman, and D. Desyandri, "Analisis hasil belajar tematik siswa dengan strategi pembelajaran berbasis masalah di sekolah dasar," *JRTI (Jurnal Ris. Tindakan Indones.*, vol. 6, no. 1, pp. 46–50, 2021, doi: 10.29210/3003725000.

[15] K. J. A. Purnama, I. G. N. Japa, and I. M. Suarjana, "Efektivitas Model Pembelajaran *Two Stay Two Stray* (TSTS) Dalam Meningkatkan Hasil Belajar Matematika," *J. Penelit. dan Pengemb. Pendidik.*, vol. 4, no. 3, p. 343, 2020, doi: 10.23887/jppp.v4i3.27413.

[16] V. H. Yusuf, S. Sutiarso, and S. H. Noer, "Pengaruh Model Pembelajaran Kooperatif Tipe *Two Stay Two Stray* (TSTS) Terhadap Pemahaman Konsep Matematis Siswa," *J. Pendidik. Mat.*, vol. 8, no. 1, pp. 22–33, 2020. doi: 10.26418/educhem.v1i1.36794

[17] F. Denensi, B. Gunur, and E. Jehadus, "Efektivitas Model Pembelajaran Kooperatiftipe Two Stay-Two Stray Dengan Numbered Heads Together Terhadap Kemampuan Berpikir Kritis Matematika Siswa," *JIPMat*, vol. 5, no. 1, pp. 49–61, 2020, doi: 10.26877/jipmat.v5i1.5725.

[18] B. Liebech-Lien, "Teacher teams – A support or a barrier to practising cooperative learning?," *Teach. Teach. Educ.*, vol. 106, p. 103453, 2021, doi: 10.1016/j.tate.2021.103453.

[19] M. Deev and A. Finogeev, "Application of The Convergent Education Model in The Development of a Amart Learning Environment," *Telemat. Informatics Reports*, vol. 10, no. February, p. 100051, 2023, doi: 10.1016/j.teler.2023.100051.

[20] I. Sofiasyari, I. Kurniawati, and M. Guntur, "Pengaruh Penggunaan Media Ajar IPS Berbasis Video Interaktif Terhadap Hasil Belajar Siswa Sekolah Dasar," *J. Inov. Pendidik. dan Pembelajaran Sekol. Dasar*, vol. 6, no. 2, pp. 174–183, 2022, doi: 10.24036/jippsd.v6i2.119820.

[21] L. Salmerón, A. Sampietro, and P. Delgado, "Using Internet videos to learn about controversies: Evaluation and integration of multiple and multimodal documents by primary school students," *Comput. Educ.*, vol. 148, no. 1–14, 2019, doi: 10.1016/j.compedu.2019.103796.

[22] S. Teslo *et al.*, "Teachers' sensemaking of physically active learning: A qualitative study of primary and secondary school teachers participating in a continuing professional development program in Norway," *Teach. Teach. Educ.*, vol. 127, pp. 104–113, 2023, doi: 10.1016/j.tate.2023.104113.

[23] S. Sudarsono and Mulyani, "Pengembangan Media Pembelajaran Game Interaktif Berbasis Aplikasi Web Wordwall Pada Pelajaran Matematka Materi Bilangan Ganik Genap Kelas II SD," *J. Penelit. Pendidik. Guru Sekol. Dasar*, vol. 9, no. 8, pp. 3059–3068, 2021.

[24] R. D. Lestari, "Upaya Meningkatkan Motivasi Belajar Peserta Didik dalam Pembelajaran Daring Melalui Media Game Edukasi Wordwall Di Kelas IV SDN 01 Tanahbaya Tahun Pelajaran 2020/2021," *J. Ilm. Profesi Guru*, vol. 2, no. 2, pp. 111–116, 2021, doi: 10.30738/jipg.vol2.no2.a11309.

[25] T. P. Aji and S. S. Wulandari, "Analisis Model Pembelajaran Kooperatif Tipe *Two Stay Two Stray* (TSTS) Terhadap Hasil Belajar Siswa," *J. Off. Adm. Educ. Pract.*, vol. 1, no. 3, pp. 340–350, 2021, doi: 10.26740/joaep.v1n3.p340-350.

[26] S. Y. Sari, "Penerapan Model Pembelajaran Kooperatif Tipe *Two Stay Two Stray* dalam Meningkatkan Kemampuan Literasi Siswa Madrasah Ibtidaiyah," *Pros. Konf. Nas. PD-PGMI Se Indones.*, no. September, pp. 43–56, 2022.

[27] Rofiqoh, "Model *Two Stay Two Stray* (TSTS) dalam Pembelajaran Matematika Sekolah Dasar," *J. Uns.Ac.Id*, vol. 3, no. 3, pp. 2037–2042, 2020. doi: 10.31004/basicedu.v3i4.260

[28] E. Garira, "Needs assessment for the development of educational interventions to improve quality of education: A case of Zimbabwean primary schools," *Soc. Sci. Humanit. Open*, vol. 2, no. 1, p. 100020, 2020, doi: 10.1016/j.ssaho.2020.100020.

[29] M. L. O. Safitri, A. Fathurohman, R. Hermawan, and V. A. Suganda M, "Knowledge sharing between elementary teacher education students in online discussion," *J. Fundadikdas (Fundamental Pendidik. Dasar)*, vol. 6, no. 2, pp. 111–120, Aug. 2023, doi: 10.12928/fundadikdas.v6i2.7480.

[30] E. jenal Mutaqin, L. Asyari, N. N. Muslihah, and W. S. Nugraha, "Implementasi Pembelajaran Tematik di Sekolah Dasar," *J. PEKEMAS*, vol. 3, no. 1, pp. 18–22, 2020, doi: 10.17977/jptpp.v4i6.12527.

[31] P. K. Putri, Achmad Hidayatullah, and Shoffan Shoffa, "Pengaruh Model Pembelajaran Kooperatif Tipe *Two Stay Two Stray* terhadap Hasil Belajar dan Minat Belajar," *JUMLAHKU J. Mat. Ilm. STKIP Muhammadiyah Kuningan*, vol. 6, no. 1, pp. 24–36, 2020, doi: 10.33222/jumlahku.v6i1.885.

[32] I. G. A. S. Juniantari and N. N. Kusmariyatni, "Pengaruh Model Pembelajaran Kooperatif *Two Stay Two Stray* Berbantuan Mind Mapping terhadap Hasil Belajar IPA," *J. Ilm. Sekol. Dasar*, vol. 3, no. 3, p. 378, 2019, doi: 10.23887/jisd.v3i3.19478.

[33] M. Frisilia, "Pengaruh Penggunaan Media Wordwall terhadap Minat dan Hasil Belajar Siswa SD Kanisius Kadirojo Yogyakarta Kelas IV Materi KPK dan FPB," Universitas Sanata Dharma, 2022.

[34] N. M. Agusti and A. Aslam, "Efektivitas Media Pembelajaran Aplikasi Wordwall Terhadap Hasil Belajar IPA Siswa Sekolah Dasar," *J. Basicedu*, vol. 6, no. 4, pp. 5794–5800, 2022, doi: 10.31004/basicedu.v6i4.3053.