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A Simurelay-Supported Project-Based Jobsheet to Enhancing Learning Outcomes in Vocational Education

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Abstract: Vocational education plays a crucial role in preparing skilled graduates to meet workforce demands. However, SMKN 1 Pariaman faces challenges such as low student motivation, poor learning outcomes, and a mismatch between teaching approaches and students' dominant kinesthetic learning style. This study aims to develop a project-based learning (PjBL) jobsheet supported by Simurelay to improve the learning process in the subject of Electromechanical and Electronic Control Systems. Simurelay is utilized to help students understand practical concepts through simulation. The research follows a 4D development model—Define, Design, Develop, and Disseminate. The product was evaluated for validity, practicality, and effectiveness. The results indicate that the developed jobsheet is valid, practical, and improves student learning outcomes. This study concludes that a PjBL-based jobsheet assisted by Simurelay can effectively support practical learning in vocational education.

Keywords: Electronics; Jobsheet; Learning outcomes student; Project based learning; Simurelay; System control electro mechanics

Introduction

Education plays a role role crucial in tom source Power quality human resources (Arifah & Noor, 2025). Progress a country is very dependent on the quality system education (Spindelman & Crouch, 2025). Success system education reflected from individuals who have competence, knowledge, and harmonious characters with development of the times (Al Awwaby et al., 2025). Currently, education No only focus on mastery theory, but also on development competencies that can applied in a way directly (Velmurugan et al., 2025). Vocational education become track strategic in prepare participant educate To jump direct to the world of work (Odilovna, 2025).

School Intermediate Vocational (SMK) is institution education designed vocation To print graduate of Ready work (Wibowo, 2025). The vocational school curriculum is more emphasize on skills practice and mastery skill certain areas (Cañavate et al., 2025). Expected participant educate capable implement theory become skills appropriate technical with need industry (Garay-Rondero & Issa-Zadeh, 2025). This matter requires a capable learning model connect material academic with situation real in the field (Isaeva et al., 2025). The success of the learning process influenced by strategy, media, and environment appropriate learning with characteristics students (Çeken & Taşkın, 2025).

Non- cognitive assessment conducted at SMKN 1 Pariaman show that part big student own style Study kinesthetic learning style. This show that student more easy understand material moment involved active in practice (Alisah et al., 2025). Approach activity - based learning physical fitness is very necessary To support style Study (Simamora et al., 2025). However, the condition This has not been fully accommodated by the current learning method being implemented (Hafiz et al., 2025). Learning conventional Still dominate and yet capable interesting involvement student in a way maximum (Quyen & Chanh, 2025). The low motivation Study become indicator lack of participation active in the learning process (Perlman et al., 2025).

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Based on data from the Guidance teacher Counseling, in part big student classified as in category motivation currently until low. Low level of motivation This impact on low activity and results Study students (Kusmawan et al., 2025). Conditions the to signify the need innovation more learning interesting, contextual, and harmonious with need students (Rohmah et al., 2025). Other obstacles faced school is limitations facility practice (Mohammad et al., 2025). In fact, vocational schools should provide adequate facilities, to support development skills technical participant educate (Irwanto, 2025). In the field, still Lots activity practices that are not can run optimally as a result lack of equipment (Basinun et al., 2025). As a result, the learning process No evenly and only part students who get experience practice direct (Ekahidayatullah et al., 2025).

Digital technology opens up opportunity to overcome limitations (Mexhuani, 2025). Digital simulation becomes alternative moment facility practice No available in a way physical (Sari et al., 2025). Application Simurelay allow student design and test series control virtually without depends on the tool laboratory (Mahardika et al., 2025). This media help student understand draft in a way more efficient and precise (Dani & Erivainto, 2025). Application flexibility support learning independent in accordance at their own pace of learning (Setianingrum et al., 2022). To clarify step Work during use Simurelay, jobsheet play a role important as guide structured. With jobsheet, activities study become more systematically (Pandia et al., 2023). In addition, the jobsheets developed based project capable grow attitude independent, responsible responsibility and involvement active in the learning process (Amalia & Sipayung, 2025). The application of the Project Based Learning (PjBL) model provides chance to student To finish task in a way contextual through creation product or project real (Sánchez-García et al., 2025).

Study This focus self in development job sheet assisted Simurelay in learning eye lesson System Control Electromechanics Electronics. Subject development is student Class XI Industrial Automation Engineering at SMKN 1 Pariaman. The goal is produce device proven learning validity, practicality and effectiveness in increase results study students (Ananda & Usmeldi, 2023). It is hoped that this media capable increase understanding and skills student as well as become solution on various challenges that arise in learning research techniques this also aims give contribution to improvement quality learning in vocational schools (Chairatunnisa et al., 2023). Teachers can using this media as suitable alternative with characteristics students and availability facility school (Widiasanti, 2023). Research results This describe utilization technology as Supporter learning based practice (Dwiningsih et al., 2024). Integration between approach based digital projects and simulations provide experience learn more meaningful and relevant with demands of the industrial world (Puspita et al., 2024).

Method

Study This including in type Research and Development (R&D). The main objective from R&D approach is produce something quality products more Good as well as capable increase effectiveness in the learning process (Fathuloh et al. 2025). Developed products in study This in the tom of integrated jobsheet with application Simurelay on the eyes lesson System Control Electromechanics Electronics. Development process following the 4D model introduced by Thiagarajan, which includes four stages main: Define, Design, Develop, and Disseminate (Dewi et al., 2024). Fourth stages the designed in a way systematic and mutual continuous To produce valid, practical, and effective learning media (Susilawati et al., 2021). The 4D model was chosen because rated appropriate To development of learning media, considering his ability in facilitate the start-up process from identification need until distribution product. Visualization channel development using the 4D model presented in Figure 1 as guide in implementation every stages carried out in study.

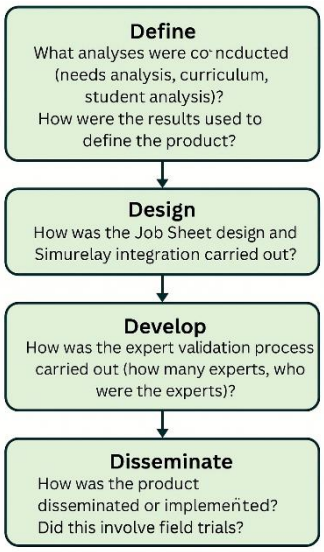

Figure 1. Stages study

Subject study is 49 students Class XI Industrial Automation Engineering, consisting of on group experimental (XI TOI 1) and control (XI TOI 2). Research use quasi-experimental non-equivalent control group design. Instrument in the tom of questionnaire validity and practicality (Likert scale) and test choice double (20 questions). Validity instrument tested with Aiken's V,

and reliability tested with Cronbach's Alpha. Effectiveness tested using paired sample t-test. Analysis level difficulty and power differentiator questions are also done to ensure quality test results learning. Validity and practicality data analyzed in a way descriptive. Result data Study tested its normality, then analyzed using the t-test to know significance difference between pretest and posttest results.

Result and Discussion

Simurelay-Based Circuit Simulations

As part of the practical learning supported by the jobsheet and Simurelay, four types of control circuits were developed and simulated by students during the study. These circuits represent common motor control systems in industrial settings. The aim was to help students visualize, assemble, and test circuits digitally to deepen their understanding of electromechanical control concepts.

Direct-On-Line (DOL) Starter

The DOL circuit is the simplest method to start an induction motor. It directly connects the motor to the power supply using a contactor. In the Simurelay simulation, Students designed the control circuit using push-button switches (Start and Stop), a contactor (K1), and overload protection. They observed the motor start immediately when the Start button was pressed and stopped when the Stop button was activated. The concept of latching using a normally open auxiliary contact was emphasized.

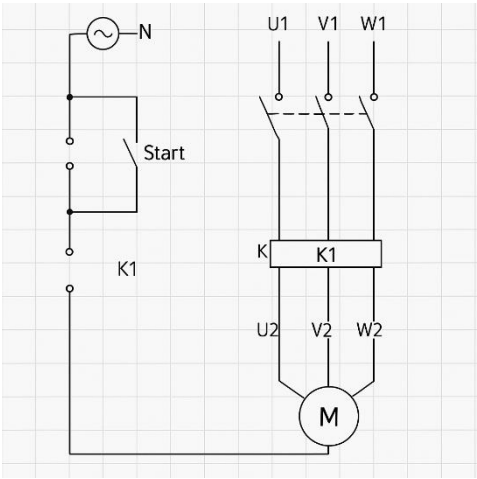

Figure 2. DOL motor control simulation in Simurelay

Forward-Reverse Motor Control

This circuit allows a motor to rotate in both forward and reverse directions by interchanging two of the motor's supply lines. In Simurelay: Students used two contactors (K1 for forward, K2 for reverse) with interlocking circuits to prevent simultaneous activation. Simulations showed the motor rotating in one direction when K1 was energized and in the opposite direction when K2 was activated. The use of both mechanical and electrical interlocks was highlighted for safety.

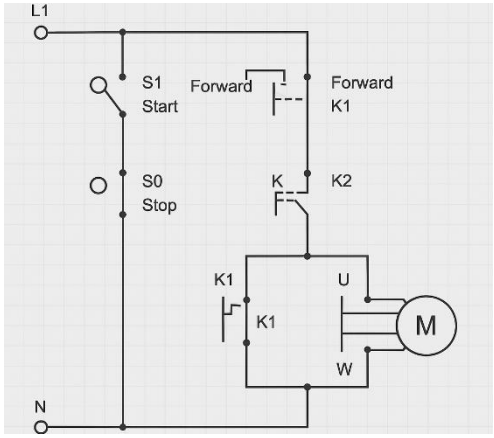

Figure 3. Forward-reverse control circuit simulated in Simurelay

Sequential Start

This circuit is used when multiple motors must be turned on in a specific order, with time delays or condition-based triggers. In Simurelay, Students simulated a system where Motor 1 starts first, followed by Motor 2, then Motor 3, each after a delay. Timers (T1, T2) and auxiliary contacts were configured to manage the sequence automatically. This exercise helped students understand cascading control logic and delay timing.

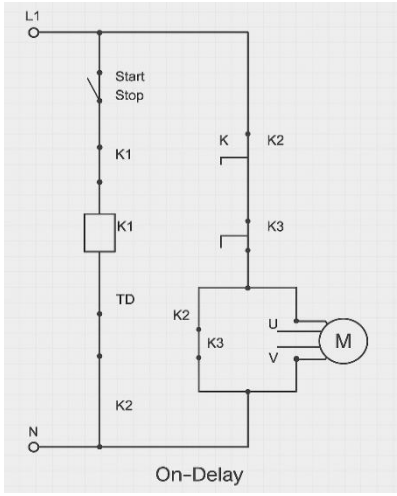

Figure 4. Sequential start circuit simulation in Simurelay

Sequential Stop

The reverse of sequential start, this circuit allows all motors to stop in a specific sequence instead of simultaneously. In Simurelay, Students simulated a condition where pressing the Stop button begins a sequence: Motor 3 stops first, followed by Motor 2, and

finally Motor 1. Timer-off delay configurations were used to achieve this logic. This simulation demonstrated advanced control logic using normally closed contacts and delay relays.

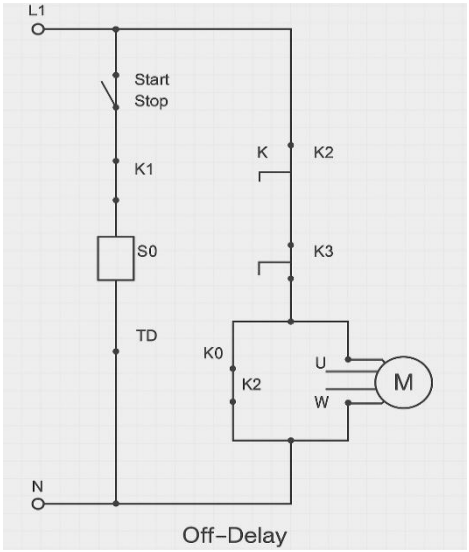

Figure 5. Sequential stop circuit simulation in Simurelay

All circuits were simulated independently by students in the experimental class using guided instructions from the jobsheet. Students reported a better understanding of, Circuit logic and safety interlocks, The function of timers and relays, The sequence and flow of operations in industrial control systems. By visualizing and testing each circuit interactively, students developed confidence in applying their theoretical knowledge to practical industrial scenarios—even without direct access to physical components.

Study This aiming develop job sheet based Project Based Learning assisted Simurelay and testing validity, practicality, and its effectiveness in increase results Study students on the material system control electromechanics electronics. This section serve results findings research obtained through a validity testing process by experts, practicality testing by teachers and students, and effectiveness testing through pretest and posttest results of students in class experiments and controls.

Data Description

This section serve results data processing from various stages testing to product job sheet Project Based Learning- based assistance Simurelay. Data obtained through the validation process, practicality test, validity test instrument questions, and results Study student from pretest and posttest. Each aspect analyzed to know to what extent is it feasible and effective? developed products in support the learning process system control electromechanics electronics in vocational schools.

Validity Results Product Jobsheet

Validity job sheet assessed by three expert validators use instrument evaluation with Likert scale 1 to 5. Aspects assessed covers substance, construction, and language. Calculation results validity use Aiken's V tomula shows that all items obtained V value is above 0.80 so that including in category "valid". Summary mark validity of each aspect presented in the following table:

Table 1. Validity Test Product Jobsheet

Aspects on the Jobsheet	Aiken's V Average	Caption
Substance	0.89	Valid
Construction	0.88	Valid
Language	0.90	Valid
Total	0.89	Valid

In a way detailed, average value validity in aspects substance is 0.89, aspect construction get average value 0.88, while aspect Language get average value 0.90. All aspect has fulfil criteria eligibility and can used in the learning process practice system control electromechanics electronics. With Thus, the jobsheet that was developed declared valid and worthy To implemented in the learning process.

Practical Results

Practicality test done to know to what extent the product (jobsheet) has been developed can used in a way practical by users, in matter This is a teacher (Ketaren et al., 2025). Practicality rated based on three aspect main, namely convenience usage, efficiency time, and aspects benefits. Assessment carried out by two teachers with use Likert scale 1–5. Average percentage practicality in every variable is above 90%, which indicates that job sheet very practical To used. Summary results teacher practicality can seen in the following table:

Table 2. Teacher Practicality Test

Aspect Practicality	Average Score	Percentage (%)	Category
Convenience Use	52	86.67	Very Practical
Time Efficiency	45	92.50	Very Practical
Benefit Aspects	45	90.00	Very Practical
Total	134	89.93	Very Practical

After get results evaluation from the teacher, stage next is conduct practical tests to student as users direct job sheet in the learning process. evaluation this important done to know to what extent the product is developed can used in a way effective and efficient from corner view students. Response student reflect experience factual they moment use jobsheet, so that can become base evaluation acceptance product in a way comprehensive. The following This served results practicality based on response student to jobsheet used.

Table 3. Practicality Test Student

Aspect Practicality	Percentage (%)	Category
Convenience Use	88.33	Very Practical
Time Efficiency	92.50	Very Practical
Benefit Aspects	89.67	Very Practical
Total	89.93	Very Practical

Based on results questionnaire given to 24 students, practicality data was obtained product job sheet from three aspects, namely convenience usage, efficiency time, and aspects benefits. If you look at in a way overall, total average rating student is 4.65 with percentage practicality as big as 89.93%, which includes in category very practical.

Question Validity Results

Validity test question done to know to what extent each grain question can measure what it should be measured (Luzyawati et al., 2025). Analysis validity done on every activity learning use tomula Product Moment correlation and compared with mark critical r table (r = 0.344; n = 33; sig 5%). Analysis results validity each grain questions on the fourth activity learning served in the following table. Presentation This aiming give description Details about amount valid and invalid questions based on comparison between r- count and r-table values. Out of the total 40 questions analyzed, it was found that 32 items were valid (r-count > r-table), while 8 items were declared invalid (r-count < r-table). These invalid items indicate that they did not meet the required correlation threshold and therefore need to be revised or eliminated to ensure that the test instrument reliably measures student competence.

Learning Outcomes

Statistics descriptive done to describe distribution of pretest and posttest data to each activity learning (Trisnawati et al., 2025). The results of data processing show that average value of results Study student increase in a way consistent from pretest to posttest to each activity. Presentation summary statistics descriptive results Study student every activities. Consisting of on mark average, median, standard deviation, minimum, maximum values, and range pretest and posttest scores. Compiled to show change achievements results Study during learning takes place on the Table 4.

The descriptive analysis of the pretest and posttest scores reveals an improvement in student learning outcomes across both the experimental and control classes. In the experimental class, the average score (mean) increased from 50.00 in the pretest to 81.64 in the posttest. The minimum score rose from 25.00 to 56.25, while the maximum score improved from 78.13 to 100.00. Meanwhile, in the control class, the mean score progressed from 47.53 to 69.88. The minimum score increased from 25.00 to 59.38, and the maximum score moved up from 71.88 to 87.50.

Table 4. Description of Learning Outcomes Student

	Mean		Min		Max	
	Pre	Post	Pre	Post	Pre	Post
E	50.00	81.64	25.00	56.25	78.13	100.00
K	47.53	69.88	25.00	59.38	71.88	87.50

These results demonstrate that both groups experienced positive learning gains, with the experimental class achieving a higher increase in average and maximum scores. This suggests that the applied learning intervention in the experimental group was more effective in enhancing student performance compared to the conventional methods used in the control group.

Data Analysis

Data analysis was carried out to test effectiveness treatment the learning provided through approach quantitative inferential. Stages analysis includes normality tests, paired t-tests, and intergroup t-tests group. The results of these three tests become base in conclude influence treatment to results Study participant educate.

Normality Test

Normality test aiming to know data distribution in each pretest and posttest groups to each activity. Testing done with two approaches, namely Kolmogorov-Smirnov and Shapiro-Wilk (Yagin et al., 2024). The data is said to be normally distributed if mark significance (Sig.) more big of 0.05 (Cardoso et al., 2025). The following table serve normality test results.

Table 5. Normality Test

Data	Shapiro-Wilk Sig.	Result
Pre test TOI 1	0.694	Normal
Post test TOI 1	0.555	Normal
Pre test TOI 2	0.215	Normal
Post test TOI 2	0.118	Normal

Based on results in the table, all mark the Shapiro-Wilk significance level is above 0.05. This is show that the pretest and posttest data on the activity normally distributed. With Thus, the data meets assumption normality and worthiness used to analysis Next, namely the homogeneity test, paired t-test and intergroup t-test. group.

Homogeneous Test

Homogeneity test variance done to know whether the data in the group experiments and groups control

own same variance. Testing this important as prerequisite in use of the two- sample t-test independent (independent samples t-test), which requires that the data on both group originate from population that has homogeneous variance. The results of the homogeneity test to each activity can seen in the Table 6.

Table 6. Homogeneity Test

Variables	Sig.	Conclusion
Pretest	0.166	Homogeneous
Posttest	0.191	Homogeneous

Based on table above, significance the more big from 0.05, so that can concluded that No there is difference significant variance between group experiments and groups control. This means that the data on both group can considered own homogeneity variances are met. With Thus, the assumption homogeneity still can accepted and the use of the two-sample t-test independent in a way parametric still legitimate to done on all posttest variables. In overall, results This show that condition homogeneity variance has fulfilled in study this, so that analysis comparison between group can to be continued with approach parametric.

Independent T-Test

Independent t-test analysis group used to know difference results Study between group experiments and groups control after treatment given to each activities. This test aiming measure effectiveness intervention learning Project Based Learning- based assistance Simurelay to improvement results Study If compared to with method learning conventional. The following table show results independent t-test testing between group experimental and control groups.

Table 7. Independent t-Test

	t	Sig. (2-tailed)	Mean Difference	Result
Equal variances assumed	4.437	0.000	11.77	Different significant

Based on the table above, significance (Sig. 2-tailed) < 0.05. This means that there is significant difference between group posttest results experiments and groups control on all four activities. Mean difference value show that group experiment always get higher average score tall compared to group control.

Conclusion

This study developed and tested a Project-Based Learning (PjBL) jobsheet supported by Simurelay for vocational students studying electromechanical control systems. The jobsheet was declared valid with an average Aiken's V of 0.89, meeting all content, construction, and language criteria. It was considered very practical, receiving a mean practicality score of 89.93% from both teachers and students. Some variation in question validity was found across activities, but overall the instrument functioned effectively. Learning outcomes showed significant improvement, indicated by higher posttest scores and paired t-test results ($p < 0.05$). The experimental group outperformed the control group, with intergroup t-tests confirming the effectiveness of the Simurelay-assisted jobsheet. Integration of Simurelay into PjBL proved to be an effective strategy for enhancing student understanding and performance in vocational education.

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References

Al Awwaby, M. S., Ardhianto, Y., Rokhimawan, M. A., & Hayad, Z. (2025). Implementation of islamic education curriculum development at stitma madani yogyakarta: A practical and theoretical review. *Amorti: Jurnal Studi Islam Interdisipliner*. https://doi.org/10.59944/amorti.v4i2.439

Alisah, S., Sajidan, S., & Muzzazinah, M. (2025). Development of STEM ethnoscience electronic module on environmental preservation material to improve students' science process skills. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, *11*(2), 683–692. https://doi.org/10.22219/jpbi.v11i2.40955

Amalia, R., & Sipayung, R. (2025). A Project-Based Learning Approach for Chemical Engineering Students Involving Waste Cooking Oil Biodiesel Production for Portable Stove Application. *Jurnal Penelitian Pendidikan IPA*, *11*(6), 555–567. https://doi.org/10.29303/jppipa.v11i6.11134

Ananda, P. N., & Usmeldi, U. (2023). Validity and practicality of e-module model inquiry based online learning to improve student competence.

Jurnal Penelitian Pendidikan IPA, *9*(4), 2010–2017. https://doi.org/10.29303/jppipa.v9i4.3563

Arifah, E. K., & Noor, T. R. (2025). Analysis of Supporting and Inhibiting Factors in Learning at Community Learning Activity Centers. *IJEMR: International Journal of Education Management and Religion*, *2*(1), 36–45. https://doi.org/10.71305/ijemr.v2i1.158

Basinun, B., Sartika, D., Putri, J. K., & Sarika, A. (2025). Eksplorasi Kendala dan Solusi dalam Pembelajaran Praktik Kejuruan di SMKN 2 Kota Bengkulu. *Jurnal Ilmu Pendidikan Islam*, *23*(2), 477–483. https://doi.org/10.36835/jipi.v23i2.7

Cañavate, J., Martínez-Marroquín, E., & Colom, X. (2025). Engineering a sustainable future through the integration of generative AI in engineering education. *Sustainability*, *17*(7), 3201. https://doi.org/10.3390/su17073201

Cardoso, F. C., Berri, R. A., Lucca, G., Borges, E. N., & de Mattos, V. L. D. (2025). Normality tests: a study of residuals obtained on time series tendency modeling. *Exacta*, *23*(1), 134–158. https://doi.org/10.5585/2023.22928

Çeken, B., & Taşkın, N. (2025). Examination of multimedia learning principles in augmented reality and virtual reality learning environments. *Journal of Computer Assisted Learning*, *41*(1), e13097. https://doi.org/10.1111/jcal.13097

Chairatunnisa, A., Marlina, L., & Wiyono, K. (2023). Improvement of critical thinking skills of junior high school students on heat transfer material. *Jurnal Penelitian Pendidikan IPA*, *9*(11), 10377–10386. https://doi.org/10.29303/jppipa.v9i11.5681

Dani, A., & Erivainto, D. (2025). Penggunaan Aplikasi Android untuk Meningkatkan Keterampilan Guru dalam Bidang Teknik Instalasi Motor Listrik: Pengabdian. *Jurnal Pengabdian Masyarakat Dan Riset Pendidikan*, *3*(4), 1234–1241. https://doi.org/10.31004/jerkin.v3i4.577

Dewi, R. K., Wati, D. D. E., Lasmana, O., Ahda, Y., & Alberida, H. (2024). Development research in science education: a systematic literature review of trends in development models and instruments used. *Jurnal Penelitian Pendidikan IPA*, *10*(5), 250–261. https://doi.org/10.29303/jppipa.v10i5.6876

Dwiningsih, K., Sukarmin, S., Lutfi, A., Hidayah, R., Suyono, S., Azizah, U., & Alya, A. (2024). Development of e-learning based PBL-STEM learning tools on students' science process skills and critical thinking ability. *Jurnal Penelitian Pendidikan IPA*, *10*(9), 7171–7178. https://doi.org/10.29303/jppipa.v10i9.7106

Ekahidayatullah, M., Azriansah, M., & Juryatina, J. (2025). Kolaborasi Social Emotional Learning (SEL) dan Experiential Learning: Dampaknya Terhadap Keterlibatan Belajar Siswa Sekolah Menengah Atas. *JUPEIS: Jurnal Pendidikan Dan Ilmu Sosial*, *4*(3), 576–584. https://doi.org/10.57218/jupeis.Vol4.Iss3.1788

Garay-Rondero, C. L., & Issa-Zadeh, S. B. (2025). Integrating sustainability thinking in maritime education. *Cogent Education*, *12*(1), 2479205. https://doi.org/10.1080/2331186X.2025.2479205

Hafiz, M., Mirza, F. F., & Kurniawan, W. (2025). Reconstruction of Islamic Religious Education Curriculum in Building Moderate Student Character in the Digital Era. *Edusoshum: Journal of Islamic Education and Social Humanities*, *5*(2), 119–127. https://doi.org/10.52366/edusoshum.v5i2.142

Irwanto, I. (2025). Proses Pembelajaran TEFA di Sekolah Menengah Kejuruan Berbasis Teknologi Industri. *Jurnal Pendidikan Indonesia: Teori, Penelitian, Dan Inovasi*, *5*(3). https://doi.org/10.59818/jpi.v5i3.1422

Isaeva, R., Karasartova, N., Dznunusnalieva, K., Mirzoeva, K., & Mokliuk, M. (2025). Enhancing learning effectiveness through adaptive learning platforms and emerging computer technologies in education. *Jurnal Ilmiah Ilmu Terapan Universitas Jambi*, *9*(1), 144–160. https://doi.org/10.22437/jiituj.v9i1.37967

Ketaren, M. A., Mailani, E., Kharismayanda, M., Rarastika, N., & Saragih, D. I. (2025). Praktikalitas LKPD Digital Berbasis Live Worksheet pada Pelajaran Matematika Materi Pecahan di Kelas V SD 101836: Penelitian. *Jurnal Pengabdian Masyarakat Dan Riset Pendidikan*, *3*(4), 5309–5314. https://doi.org/10.31004/jerkin.v3i4.1385

Kusmawan, A., Rahman, R., Anis, N., & Arifudin, O. (2025). The Relationship Between Teacher Involvement in Curriculum Development and Student Learning Outcomes. *International Journal of Educatio Elementaria and Psychologia*, *2*(1), 1–12. https://doi.org/10.70177/ijeep.v2i1.1890

Luzyawati, L., Hamidah, I., Fauzan, A., & Husamah, H. (2025). Higher-order thinking skills-based science literacy questions for high school students. *Journal of Education and Learning (EduLearn)*, *19*(1), 134–142. https://doi.org/10.11591/edulearn.v19i1.21508

Mahardika, D., Haryudo, S. I., Wrahatnolo, T., & Sumbawati, M. S. (2025). The Impact of Critical-Creative Thinking and Simurelay-Based Motivation on Motor Installation Learning Outcomes. *Edukasi: Jurnal Pendidikan Dan Pengajaran*, *12*(01), 208–219. https://doi.org/10.19109/wqd80810

Mexhuani, B. (2025). Adopting Digital Tools in Higher Education: Opportunities, Challenges and

Theoretical Insights. *European Journal of Education*, *60*(1), e12819. https://doi.org/10.1111/ejed.12819

Mohammad, S. I. S., Panda, S. K., Singh, R., Raja, N., & Vasudevan, A. (2025). Digital competency in rural schools of Jammu and Kashmir: A case study of Paddar Sub-division. *International Journal of Innovative Research and Scientific Studies*, *8*(2), 2559–2566. https://doi.org/10.53894/ijirss.v8i2.5736

Odilovna, O. F. (2025). Factors Affecting the Increase of Professional Skills of Vocational Education Graduates. *Academia Open*, *10*(1), 10–21070. https://doi.org/10.21070/acopen.10.2025.10662

Pandia, E. S., Wahyuni, A., Nursamsu, N., & Manurung, N. (2023). Validity and practicality of Ecology Project Based Practicum Worksheets to Improve Science Process Skills. *Jurnal Penelitian Pendidikan IPA*, *9*(9), 6918–6924. https://doi.org/10.29303/jppipa.v9i9.4950

Perlman, H., Bryk, A. S., & Russell, J. L. (2025). Measuring Educators' Perceived Benefits of Participation in Educational Improvement Networks. *Peabody Journal of Education*, *100*(1), 82–99. https://doi.org/10.1080/0161956X.2025.2444844

Puspita, D. A. D. Dela, Doyan, A., & Harjono, A. (2024). The Influence of the Project Based Learning Model Assisted by PhET Simulation on Students' Critical Thinking and Problems Solving Abilities in Sound Wave Material. *Jurnal Penelitian Pendidikan IPA*, *10*(9), 6490–6496. https://doi.org/10.29303/jppipa.v10i9.8472

Quyen, C. T., & Chanh, N. H. (2025). Perceptions and Dominant Factors of Blooket as a Game-based Learning Tool among Vietnamese Non-English Majored Students. *Dinamika Ilmu*, *25*(1), 123–144. https://doi.org/10.21093/di.v25i1.10268

Rohmah, F. N., Istiq'faroh, N., & Subrata, H. (2025). Analysis of the Development Needs of E-Book Story Media'BUCETAR'(Picture Story Books) for Elementary School Students in Indonesian Schools Riyadh. *Journal of Innovation and Research in Primary Education*, *4*(3), 714–723. https://doi.org/10.56916/jirpe.v4i3.1441

Sari, R. A., Arifin, M., Fairuza, S., Julizar, A., & Utama, E. C. (2025). Pelatihan Penyusunan Modul Praktikum Fisika Pada Guru SMK Gutama Jakarta dengan Memanfaatkan Artificial Intelligence. *Jurnal Bakti Dirgantara*, *2*(1), 65–71. https://doi.org/10.35968/h7saky24

Setianingrum, D. A., Pratiwi, S., & Jumadi, J. (2022). Development of science module based on flipbook about physics in the respiratory system to improve studentsâ€™ learning independence. *Jurnal Penelitian Pendidikan IPA*, *8*(6), 2621–2628. https://doi.org/10.29303/jppipa.v8i6.1923

Simamora, J. A., Iskandar, I., Weda, S., & Tahir, M. (2025). Student's Perceptions and Experiences in Kinesthetic Learning: Challenges and Benefits. *Klasikal: Journal of Education, Language Teaching and Science*, *7*(1), 15–28. https://doi.org/10.52208/klasikal.v7i1.1266

Spindelman, D., & Crouch, L. (2025). Purpose of education in former British African colonies: From contestation to bureaucratization. *International Journal of Educational Development*, *113*, 103226. https://doi.org/10.1016/j.ijedudev.2025.103226

Susilawati, S., Doyan, A., Artayasa, P., Soeprianto, H., & Harjono, A. (2021). Analysis of validation development science learning tools using guided inquiry model assisted by real media to improve the understanding concepts and science process skills of students. *Jurnal Penelitian Pendidikan IPA*, *7*(1), 41–44. https://doi.org/10.29303/jppipa.v7i1.473

Trisnawati, D., Sumarno, S., & Sulianto, J. (2025). Efektivitas penggunaan media pembelajaran Dakota untuk materi FPB dan KPK kelas IV SDN 12 Kendari. *Primatika: Jurnal Pendidikan Matematika*, *14*(1), 63–72. https://doi.org/10.30872/primatika.v14i1.4733

Velmurugan, P. R., Catherine, S., Vettriselvan, R., EP, J., & Rajesh, D. (2025). Innovative Intercultural Communication Training in Translator Education: Cultivating Cultural Competence. In *Cutting-Edge Approaches in Translator Education and Pedagogy* (pp. 217–244). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-6463-5.ch008

Wibowo, N. R. (2025). The Impact of Vocational High School Collaboration with Creative Industries on Graduate Job Readiness in the Digital Era. *Didaktika: Jurnal Kependidikan*, *14*(Mei), 3103–3118. https://doi.org/10.58230/27454312.2147

Widiasanti, I. (2023). Utilization of multimedia facilities and internet media as effective learning tools. *Jurnal Penelitian Pendidikan IPA, 9*(6), 148-153. https://doi.org/10.29303/jppipa.v9i6.3805

Yagin, F. H., Yagin, B., & Pinar, A. (2024). Normality distributions commonly used in sport and health sciences. *Journal of Exercise Science & Physical Activity Reviews*, *2*(1), 124–131. https://doi.org/10.5281/zenodo.11544808