E D U N O M I A
Jurnal Ilmiah Pendidikan Ekonomi

Vol. 7, No. 1, 2026. 19-36
https://doi.org/10.24127/edunomia.v7i1.11628

P-ISSN 2746-5578
E-ISSN 2746-5586

THE EFFECT OF *THE PROJECT-BASED LEARNING MODEL* ASSISTED BY THE ACCOUNTING APPLICATION ON LEARNING OUTCOMES

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Received May 20, 2026; Received in revised form May 30, 2026; Accepted June 05, 2026

ABSTRACT
This study addresses the low accounting learning outcomes at SMKN 1 Pekalongan, which stem from teacher-centered instruction and suboptimal integration of digital applications. The research **aims** to analyze the effect of the Project-Based Learning (PJBL) model assisted by the Akuntansiku application on student learning outcomes and to determine its significant difference compared to Microsoft Excel. Utilizing a quantitative quasi-experimental nonequivalent pretest-posttest control group design, the study involved 63 Class X Accounting students (32 in the experimental class, 31 in the control class). Data were collected through tests, observations, and interviews, then analyzed using paired and independent sample t-tests. **The results** revealed that Project-Based Learning (PJBL) assisted by the Akuntansiku application significantly improved learning outcomes (Sig. 0.000 < 0.05). Furthermore, a significant difference existed between the two groups (Sig. 0.001 < 0.05), with the experimental class achieving a higher average score (77.79) than the control class (74.79). In **conclusion**, integrating the Project-Based Learning (PJBL) model with the Akuntansiku application is more effective than Microsoft Excel in improving student's accounting learning outcomes. This research **contributes** to the application of digital-based accounting education through the integration of Project-Based Learning (PJBL) and digital accounting applications to improve student learning outcomes in cognitive, affective, and psychomotor aspects.

Keywords: accounting learning outcomes; digital learning; microsoft excel; my accounting application; project based learning (PJBL)

ABSTRAK
*Penelitian ini dilatarbelakangi oleh rendahnya hasil belajar akuntansi di SMKN 1 Pekalongan akibat dominasi pembelajaran yang berpusat pada guru dan belum optimalnya integrasi aplikasi digital. Penelitian ini **bertujuan** untuk menganalisis pengaruh model Project-Based Learning (PJBL) berbantuan aplikasi Akuntansiku terhadap hasil belajar siswa, serta mengetahui perbedaan signifikannya dibandingkan dengan penggunaan Microsoft Excel. Menggunakan **metode kuantitatif** dengan desain quasi-experiment bentuk nonequivalent pretest-posttest control group, subjek penelitian ini adalah 63 siswa kelas X Akuntansi (32 kelas eksperimen, 31 kelas kontrol). Pengumpulan data dilakukan melalui tes, observasi, dan wawancara, kemudian dianalisis menggunakan paired sample t-test dan independent sample t-test. **Hasil penelitian** menunjukkan bahwa Project Based Learning (PJBL) berbantuan aplikasi Akuntansiku berpengaruh signifikan terhadap hasil belajar (Sig. 0,000 < 0,05). Selain itu, terdapat perbedaan yang signifikan antara kedua kelompok (Sig. 0,001 < 0,05), di mana rata-rata hasil belajar kelas eksperimen (77,79) lebih tinggi dibandingkan kelas kontrol (74,79). Kesimpulannya, integrasi model Project Based Learning (PJBL) dengan aplikasi Akuntansiku lebih efektif dibandingkan Microsoft Excel dalam meningkatkan hasil belajar akuntansi siswa. Penelitian ini **berkontribusi** pada penerapan ilmu pendidikan*

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https://doi.org/10.24127/edunomia.v7i1.11628

P-ISSN 2746-5578
E-ISSN 2746-5586

akuntansi berbasis digital melalui integrasi Project Based Learning (PJBL) dan aplikasi akuntansi digital untuk meningkatkan hasil belajar siswa pada aspek kognitif, afektif, dan psikomotorik.
***Kata kunci**: aplikasi akuntansiku; hasil belajar akuntansi; microsoft excel; pembelajaran digital; project based learning (PJBL)*

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Introduction

In the modern era, rapid technological progress requires an educational approach that goes beyond basic conceptual understanding, focusing instead on developing essential workplace competencies like digital literacy, effective communication, collaborative abilities, and innovative problem-solving (Afandi & Christantyawati, 2026; Mantau & Talango, 2023). Vocational school (SMK) accounting students are expected to blend theoretical knowledge with hands-on capabilities, ensuring their skills remain relevant to current technological trends in the accounting field (Romadhon et al., 2025; Windayani et al., 2025). Therefore, optimizing student achievement demands an instructional framework that provides immersive, practical, and context-driven learning experiences (Mantau & Talango, 2023; Melinda & Zainil, 2020; Undari et al., 2023).

This research is theoretically grounded in constructivism, which posits that knowledge is constructed through active learning experiences and interactions (Julia et al., 2024). Theory of student-centered learning Positioning students at the core of education to facilitate their active engagement in the acquisition and advancement of knowledge (Princess, 2023). The experiential learning hypothesis underscores the significance of practical experience in fostering a deeper comprehension (Made et al., 2022; Windayani et al., 2025). The three ideas align with the concept of active learning, that is promotes student engagement in thinking, discussing, problem-solving, and creating significant work (Alviasari et al., 2025; Dilonia et al., 2025).

Project-Based Learning is a learning methodology that aligns with these criteria (Budianto, 2024; Rahayu, 2019). Project-Based Learning is a student-centered educational strategy that involves the execution of projects addressing real-world issues (Anggraini & Wulandari, 2020; Banjarnahor et al., 2025; Ismail, 2022; Nabila, 2023). Key characteristics of this model include formulating critical inquiries, investigating authentic challenges, fostering learner involvement, and developing tangible outputs to showcase educational mastery (Joseph, 2024). This paradigm offers numerous advantages, including enhanced engagement, critical thinking abilities, creativity, teamwork, and problem-solving capabilities (Lestari et al., 2025; Mantau & Talango, 2023; Melinda & Zainil, 2020; Undari et al., 2023; Wijayanti, 2024). In accounting education, Project-Based Learning is pertinent as it enables students to directly engage in the process of documenting transactions and preparing financial statements that reflect real-world conditions (Budianto, 2024).

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Numerous research indicate that Project-Based Learning positively influences student learning results. Investigation (Dwi Amarthia & Aryani, 2023) discovered that Project-Based Learning substantially enhances students' accounting learning outcomes (Anggono et al., 2022) Furthermore, it demonstrates that optimised Project-Based Learning is favourably connected with enhanced learning results. Concurrently, (Budianto, 2024; Putra & Hanggara, 2024) discovered the incorporation of Project-Based Learning Digital accounting tools enhance students' comprehension of ideas and analytical thinking abilities. Nevertheless, prior research possesses certain limitations. The majority of research primarily concentrates on cognitive learning outcomes, neglecting a thorough examination of emotional and psychomotor dimensions, and continues to employ generic digital learning media that lack integration with accounting systems relevant to workforce requirements.

Under these circumstances, a research gap exists due to the scarcity of studies that amalgamate Project-Based Learning with a digital accounting program specifically tailored to enhance accounting education in vocational schools. Integrations in Project-Based Learning for accounting applications are crucial as they link project activities with contemporary technology-driven accounting procedures prevalent in the workforce. This study utilises the Akuntansiku application because of its integrated functionality for transaction recording, general journals, ledgers, balance sheets, and financial statements (Tink & Astuty, 2024). In contrast to Microsoft Excel, which necessitates manual data processing and is susceptible to formula errors, Akuntaniku provides a more systematic, practical, and professional accounting application procedure, hence enhancing its relevance in supporting the attainment of students' accounting competencies.

Initial observations at SMKN 1 Pekalongan revealed that accounting classes rely heavily on traditional lecturing, which significantly reduces learner interactivity and enthusiasm. Consequently, academic performance suffers, as demonstrated by the high proportion of learners who do not achieve the minimum passing grade (KKTP) of 75. To resolve this, educators must adopt teaching strategies that simultaneously boost participation and provide industry-relevant practical exposure. This study employs the Project-Based Learning (PJBL) methodology facilitated by the Akuntansiku application. This research is innovative due to the amalgamation of project-based learning with the Akuntaniku application and the assessment of learning outcomes encompassing cognitive, emotional, and psychomotor dimensions.

The primary goal of this study is to elevate digital accounting instruction by combining the PJBL framework with the Akuntansiku platform, offering a comprehensive guide to boosting cognitive, psychomotor, and affective achievements. Specifically, this investigation evaluates how the PJBL approach paired with the Akuntansiku software influences academic success, while also comparing these results against traditional Microsoft Excel usage among accounting students at SMKN 1 Pekalongan.

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Research Methods

1. Research Design

A quasi-experimental quantitative approach was adopted for this investigation. Specifically, it utilized a nonequivalent control group structure, dividing participants into experimental and control cohorts. The experimental and control classes both utilized the project-based learning (PJBL) approach, albeit with distinct learning media; the experimental class employed an accounting application, whilst the control class utilized Microsoft Excel. This study used a nonequivalent pretest-posttest control group design, as illustrated in Table 1.

Table 1. Pretest-posttest control group design

Classes	Pretest	Treatment	Posttest
Experiments	P1	X1	P2
Controls	P1	X2	P2

Source : (Sugiyono, 2022: 76)

P1 : Pretest for experiment and control classes
P2 : Posttest for experiment and control classes
X1 : Application of learning models Project Based Learning (PJBL) to help me with my accounting application
X2 : Application of learning models Project Based Learning (PJBL) with Microsoft Excel

Table 1. illustrates the Pretest-Posttest Control Group Design, indicating that the study has two groups: the experimental class and the control class, both of which undergo pretesting and posttesting but receive distinct learning media interventions. This design aims to assess the impact of the Akuntansiku application within the project-based learning model on student academic performance.

2. Population and Sample

Data collection took place in February 2026, corresponding to the even semester of the 2025/2026 academic calendar at SMKN 1 Pekalongan. The sample consisted of 63 tenth-grade accounting students, distributed into an experimental cohort of 32 individuals (XAK1) and a control cohort of 31 individuals (XAK2). The study population comprises all class X students of SMKN 1 Pekalongan, totaling 253 individuals.

The sampling method employs purposive sampling. The sample selection was conducted with the stipulation that both classes belong to the same major, possess comparable academic abilities, and study identical content, specifically the accounting cycle of a service company. The content was selected for its compatibility with the project-based learning (PJBL) model, facilitated by accounting application

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media, enabling students to practice transaction recording for the preparation of financial statements in a contextual and practical manner.

3. *Research Stages*

The research phase is executed methodically through several steps: the preparatory phase, which encompasses initial observations, interviews with Accounting educators, the development of instructional materials, and the creation of research instruments; the implementation phase, which involves administering pretests in both groups, applying the project-based learning (PJBL) model supported by the Accounting application in the experimental group, and utilizing project-based learning (PJBL) facilitated by Microsoft Excel in the control group, concluding with a posttest; and the final phase, which entails processing, analyzing, and deriving conclusions from the research data.

4. *Variable Operational Definition*

The independent variable of this study is Project-based learning (PJBL) model facilitated by my accounting application, whereas the dependent variable is the students' accounting learning results, encompassing cognitive, affective, and psychomotor dimensions.

5. *Research Instruments*

The research instruments employed comprise observation sheets to assess students' affective and psychomotor dimensions during the learning process; interview guidelines utilized in the pre-survey phase to gather information regarding the state of accounting education in schools; and multiple-choice pretest and posttest questions to evaluate students' cognitive learning outcomes in the accounting cycle material of service companies.

6. *Data Collection Techniques*

Data gathering methods are conducted by observation, interviews, documentation, and assessments. Observation is employed to gather data on students' learning activities concerning affective and psychomotor dimensions throughout the educational process. Interviews were administered to educators and students during the pre-survey phase to identify the accounting learning challenges present in schools. Documentation is utilized to acquire data regarding student enrollment, daily test scores, and further supporting research data. Pretests and posttests were employed to gather data on students' cognitive learning results prior to and during the intervention.

7. *Data Analysis Techniques*

The data analysis method was conducted quantitatively utilizing SPSS 26 for Windows. The test result data underwent investigation via a normality assessment utilizing the Shapiro-Wilk test and a homogeneity evaluation employing Levene's

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Test as preliminary analyses for the study. Additionally, hypothesis testing was conducted utilizing a paired sample t-test to examine the impact of the project-based learning (PJBL) model, facilitated by the Akuntansiku application, on student learning outcomes in the experimental group, alongside an independent sample t-test to evaluate the disparity in learning outcomes between the experimental and control groups. The observation data on affective and psychomotor dimensions were evaluated by percentage descriptive techniques to assess the progression of student learning activities throughout the educational process

Results and Discussion

1. *Validity Test*

Prior to the application of the measuring instrument by the researcher to the research sample, it is first evaluated on students not included in the research sample. The researcher administered a questionnaire to 30 pupils, of whom 19 participated. The validity test results of the student learning outcome assessment tool are presented in Table 2.

Table 2. Results of instrument test validity

No Question	Pearson Corelation (R-Count)	Sig Value	R-Table	Conclusion
1.	0.301	0.210	0.456	Invalid
2.	0.a	.	0.456	Invalid
3.	0.533	0.019	0.456	Valid
4.	0.314	0.190	0.456	Invalid
5.	0.549	0.015	0.456	Valid
6.	0.534	0.019	0.456	Valid
7.	0.591	0.008	0.456	Valid
8.	0.536	0.018	0.456	Valid
9.	0.365	0.124	0.456	Invalid
10.	0.301	0.210	0.456	Invalid
11.	0.591	0.008	0.456	Valid
12.	0.606	0.006	0.456	Valid
13.	0.682	0.001	0.456	Valid
14.	0.496	0.031	0.456	Valid
15.	0.478	0.039	0.456	Valid
16.	0.539	0.017	0.456	Valid
17.	0.460	0.047	0.456	Valid
18.	0.567	0.011	0.456	Valid
19.	0.777	0.000	0.456	Valid
20.	0.466	0.044	0.456	Valid
21.	0.573	0.010	0.456	Valid
22.	0.462	0.046	0.456	Valid
23.	0.186	0.445	0.456	Invalid
24.	0.460	0.047	0.456	Valid

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No Question	Pearson Corelation (R-Count)	Sig Value	R-Table	Conclusion
25.	0.353	0.138	0.456	Invalid
26.	0.513	0.025	0.456	Valid
27.	0.159	0.516	0.456	Invalid
28.	0.478	0.039	0.456	Valid
29.	0.466	0.044	0.456	Valid
30.	0.466	0.044	0.456	Valid

Source: Data processing results using SPSS 26 for Windows

According to Table 2, the validity assessment of the instrument revealed that, among 30 questions administered to 19 students not included in the sample, 22 questions were deemed valid while 8 questions were deemed invalid. The question item is deemed genuine as it satisfies the requirement r_hitung ≥ r_tabel (0.456). Invalid questions arise from certain items failing to accurately assess competency indicators, exhibiting insufficient clarity, and presenting inconsistencies between the indicators and the provided alternative solutions.

The test instruments exhibit high quality, as the majority of the question items satisfy the validity criteria and effectively assess student learning outcomes in the accounting cycle material of service companies. Consequently, 8 invalid questions were excluded from the study, but 22 valid questions were retained and utilized as pretest and posttest instruments in both experimental and control groups. Consequently, the study utilized a total of 22 final questions.

2. *Reliability Test*

The reliability test results indicated a Cronbach's Alpha score of 0.879, categorizing it as "high" reliability, therefore demonstrating the instrument's strong internal consistency in assessing student learning outcomes. This indicates that each question item yields relatively consistent and reliable measurement outcomes. Consequently, test instruments are appropriate for utilization as a data gathering technique due to their capacity to provide precise and dependable research data.

3. *Difficulty Benchmark*

The difficulty level assessment was conducted to ascertain the complexity of each question item utilized in the research instrument. The findings of the difficulty level study are displayed in Table 3.

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Table 3. Test question difficulty level results

Categories	Number of Questions	Question Number	Percentage
Easy (P > 0.70)	9	1,2,3,9,10,20,27,29,30	30%
Medium (0.30 ≤ P ≤ 0.70)	21	4,5,6,7,8,11,12,13,14, 15,16,17,18,19,21,22, 23,24, 25,26,28	70%
Difficult (P < 0.30)	0	-	0%
Quantity	30		100%

Source: Data processing results using SPSS 26 for Windows

According to Table 3. The results on the difficulty level might provide insight into the criteria for the question items utilized, encompassing both easy and medium categories. If the question item falls within the range of 0.30 to 0.70, it is classified as medium; if it is between 0.71 and 1.00, it is categorized as easy. According to the distribution of questions presented to students, 9 questions are categorized as easy, 21 questions are classified as moderate, while 0 questions meet the threshold for being deemed challenging.

The results indicate that the research instrument possesses a commendable level of difficulty in assessing students' fundamental comprehension of the accounting cycle material for service organizations. The prevalence of medium category questions indicates that the majority of question items effectively assess students' abilities in a balanced manner. The lack of challenging category items suggests that the instrument has not effectively assessed students' Higher Order Thinking Skills (HOTS). Nonetheless, the instrument remains appropriate for utilization as a data collection tool, as it aligns with the competency level of class X SMK students and the research objectives aimed at assessing learning objectives after the application of the project-based learning (PJBL) model.

4. *Differentiating Power Test*

Alongside the difficulty level assessment, the researcher administered a differentiating power test to evaluate the efficacy of each question item in discriminating between students with high and low skills. The outcomes of the distinguishing power test are displayed in Table 4.

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Table 4. Differentiating power test results

Categories	Number of Questions	Question Number	Percentage
Ugly (D < 0.20)	3	2,23,27	10%
Fair (0.21 ≤ D ≤ 0.40)	8	1,4,9,10,17,22,24,25	26,7%
Good (0.41 ≤ D ≤ 0.70)	18	3,5,6,7,8,11,12,13, 14,15,16,18,20,21, 26,28,29,30	60%
Very Good (D > 0.70)	1	19	3,3%
Quantity	30		100%

Source : Data processing results using SPSS 26 for Windows

According to Table 4, the results of the distinguishing power test are categorized as poor, adequate, good, and excellent. The research employs questions categorized as sufficient, good, and very good. Simultaneously, the criteria for inadequate questions were not employed in the study. Consequently, the majority of the question items exhibit strong distinguishing power, indicating that the instrument may effectively distinguish between students with a solid grasp of the content and those with limited proficiency, thereby rendering the questions beneficial for research purposes.

5. *Normality Test*

This normality test employs the Shapiro-Wilk method due to the sample size being fewer than 100 pupils. Control group (n = 31) and experimental group (n = 32). The data is considered regularly dispersed if the importance value (Sig.) exceeds 0.05. Prior to hypothesis testing, a normality test is conducted to ascertain whether the study data follows a normal distribution. Table 5 displays the results of the Shapiro-Wilk normality test.

Table 5. Normality test results

Data	N	Cognitive		Psychomotor	Affective	Remarks
		Pretest	Posttest			
XAK2_Kontrol	31	0,086	0,056	0,176	0,071	Normal
XAK1_Eksperimen	32	0,172	0,103	0,140	0,060	Normal

Source : Data processing results using SPSS 26 for Windows

The findings of the normalcy test, as presented in Table 5, were derived from the cognitive, psychomotor, and affective normality assessments. The cognitive test findings for the control class indicated significance value at the pretest of 0.086 and a posttest significance level of 0.055, whereas the experimental class results revealed a pretest significance value of 0.172 and a posttest significance value of

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https://doi.org/10.24127/edunomia.v7i1.11628
P-ISSN 2746-5578
E-ISSN 2746-5586

0.103. The psychomotor test results in the control class were 0.176, whereas in the experimental grade they were 0.140. The emotional testing results for the control class were 0.071, whereas the experimental class yielded 0.060.

The normality test findings for the control and experimental classes on cognitive, psychomotor, and affective values exceeded 0.05, indicating that the data for these values is normally distributed. Consequently, the data has been deemed suitable for parametric statistical analysis via the T test.

6. Homogeneity Test

Subsequent to the execution of the normality test, the following phase involves a homogeneity test to ascertain the comparability of variance between the experimental group and the control group. The outcomes of the homogeneity assessment utilizing Levene's Test are presented in Table 6.

Table 6. Homogeneity test results

Data	Living Stataistic	Sig.	Remarks
Pretest-Posttest	2,378	0,072	Homogeneous
Psychomotor	0,909	0,344	Homogeneous
Affective	0,711	0,403	Homogeneous

Source : Data processing results using SPSS 26 for Windows

According to Table 6, the outcomes of homogeneity test from Levene's Test for pretest-posttest indicated a significant value of 0.072, a psychomotor result of 0.344, and an affective result of 0.403. The test findings exceeded the significance threshold of 0.05. Consequently, pretest-posttest, psychomotor, and emotional data were determined to exhibit homogeneous variance. This indicates that both groups possess analogous data features and are suitable for hypothesis testing comparison.

7. Hypothesis Test (T Test)

a) Uji Paired Sample T-Test

The impact of the project-based learning (PJBL) paradigm facilitated by the Akuntansiku program on student learning outcomes was assessed using hypothesis testing utilizing a paired sample t-test. The test results are presented in table 7.

Table 7. Test results paired sample t-test

Variable	Red	Std. Deviation	Std. Error Mean	t-count	df	Sig. (2-tailed)	Remarks
Pretest-Posttest Experimental Class	-24,375	11,241	1,987	-12,266	31	0,000	There is a significant influence

Source : Data processing results using SPSS 26 for Windows

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According to Table 7, the paired sample t-test findings for the experimental class yielded a Sig. (2-tailed) value of 0.000, which is less than 0.05, at a significance level of 5% with a degree of freedom (df) of 31 (32-1), a t-table value of 2.039, and a t-count value of 12.266. If the t-value from the t-calculation exceeds the t-table value, then $H0_1$ is rejected and Ha_1 is approved. The results indicated a substantial difference between the pre-treatment and post-treatment values in the experimental group. This indicates that the project-based learning (PJBL) approach, facilitated by the Akuntansiku program, impacts student learning results in class X accounting at SMKN 1 Pekalongan.

b) Uji Independent Sample T-Test

Additionally, to ascertain the disparity in learning results between An independent sample t-test was conducted between the experimental group and the control group. The test results are presented in Table 8.

Table 8. Test results independent sample t-test

Variable	Classes	t-count	df	Sig. (2-tailed)	Mean Difference	Remarks
Learning Outcomes	Experiments and Controls	-3,522	61	0,001	-2,700	There is a significant difference

Source: Data processing results using SPSS 26 for Windows

As shown in Table 8, the results of the independent sample t-test demonstrated a significance value (2-tailed) of 0.001 ($p < 0.05$), analyzed at a 5% alpha level with 61 degrees of freedom. The t-table value is 1.999, and the t-count value is 3.522. If the t-calculated value exceeds the t-table value, then $H0_2$ is rejected and Ha_2 is approved. It may be concluded that a considerable disparity exists between the average scores of Accounting learning results in the experimental group and the control class. The analysis of the independent sample t-test results indicates a significant disparity in Accounting learning outcomes between students utilizing the project-based learning (PJBL) model with the Akuntansiku application and those employing Microsoft Excel media.

The independent sample t-test was employed to compare the average learning results between the two research classes, in addition to evaluating the significance of the difference in learning outcomes. The analysis findings are presented in Table 9.

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https://doi.org/10.24127/edunomia.v7i1.11628
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Table 9. Test results independent sample t-test

Variable	Classes	N	Red	Std. Deviation	Std. Error Mean
Learning Outcomes	X Accounting 1 (Experiment)	32	77,79	3,121	0,552
	X Accounting 2 (Control)	31	74,79	2,959	0,531

Source : Data processing results using SPSS 26 for Windows

According to Table 9. of the independent sample t-test results, the average student learning outcomes in the experimental class were 77.49, surpassing the control class average of 74.79, resulting in a difference of 2.70. An Independent Sample t-test was used to determine statistical significance of the difference. The test results indicated a significance (2-tailed) value of 0.001, which is less than 0.05, therefore confirming a big difference in learning outcomes between the experimental and control classes. The implementation of the project-based learning (PJBL) model, facilitated by the Akuntansiku program, is more effective in enhancing student learning outcomes compared to the utilization of Microsoft Excel.

The study's results indicate that the implementation of the project-based learning (PJBL) paradigm, facilitated by the Akuntansiku application, significantly impacts student learning outcomes in accounting for class X at SMK Negeri 1 Pekalongan. The results of the paired sample t-test indicate a significance (2-tailed) value of 0.000, which is less than 0.05, and a t-count of 12.266, above the t-table value of 2.039. The independent sample t-test results indicated a significant difference in learning outcomes between the experimental and control classes, with a Sig. (2-tailed) value of 0.001, which is less than 0.05, and a t-count of 3.522, exceeding the t-table value of 1.999. The mean score of student learning outcomes in the experimental class surpassed that of the control class. The findings indicate that the Akuntansiku application utilized inside the project-based learning (PJBL) model enhances student learning outcomes more effectively than Microsoft Excel.

The enhancement in learning outcomes in the experimental class resulted from the project-based learning (PJBL) approach, which facilitated active student engagement in the educational process. Students acquire knowledge not just from instructors but also via project activities directly pertinent to accounting practice. This state facilitates students' comprehension of concepts by enabling contextual learning grounded in genuine events. When students engage in transaction recording projects for the creation of financial accounts via the Akuntansiku program, they inadvertently undertake processes of critical thinking, discussion, problem-solving, and independent or collaborative decision-making. These activities enhance student engagement and motivation during the learning process, hence positively influencing academic achievement.

The enhancement of learning outcomes is influenced not only by the learning model but also by the utilization of the Akuntansiku program as a digital learning

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P-ISSN 2746-5578
E-ISSN 2746-5586

tool. The Akuntansiku application has numerous advantages over Microsoft Excel, including transaction recording capabilities, account categorization, and the automated and systematic generation of financial statements. This convenience enables students to concentrate on comprehending accounting principles rather than merely performing manual computations. Learning becomes more engaging as students may directly observe the outcomes of their efforts. This state engenders greater enthusiasm in students and mitigates feelings of boredom during learning. Conversely, in the control group utilizing Microsoft Excel, students require greater precision in inputting and assembling reports, resulting in difficulty for some when encountering errors in formulas and data entry.

The findings of this study indicate that the utilization of the Akuntansiku application enhances students' Higher Order Thinking Skills (HOTS). This is evident when students can independently examine transactions, ascertain the appropriate recording procedures, produce financial statements, and assess recording faults. The test instruments employed in the study assess not only the capacity to recall and comprehend but also the ability to analyze and apply accounting ideas in project execution. This indicates that the quality of the assessment instruments has facilitated the evaluation of students' higher-order thinking skills in the accounting cycle content of service enterprises.

The effect size study indicates that the project-based learning (PJBL) approach, facilitated by the Akuntansiku program, significantly impacts student learning outcomes. The effect size indicates that the enhancement in student learning outcomes is both statistically and practically significant in the educational process. The implementation of the project-based learning (PJBL) model, facilitated by the Akuntansiku program, significantly enhances conceptual comprehension, practical abilities, and student engagement in comparison to instruction utilizing Microsoft Excel.

From a pedagogical perspective, the findings of this study reinforce the constructivist approach, which posits that knowledge is acquired through direct learning experiences. Project-based learning (PJBL) enables students to acquire knowledge through project activities pertinent to real-world scenarios in accounting. The Akuntansiku application facilitates 21st-century learning by enhancing students' critical thinking, teamwork, communication, and digital literacy abilities. Consequently, the integration of the project-based learning (PJBL) paradigm with digital accounting tools becomes a pertinent educational method for vocational training.

This study's findings indicate that the integration of the project-based learning (PJBL) paradigm with the Akuntansiku application enhances cognitive learning outcomes and positively influences students' affective and psychomotor dimensions. In the emotional dimension, students exhibit increased engagement in posing inquiries, participating in discussions, collaborating, and assuming responsibility for the completion of group assignments. Concurrently, in the psychomotor domain, students enhance their proficiency in utilizing accounting software and systematically preparing financial reports. Consequently, education is

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directed not only towards the comprehension of theory but also towards the cultivation of practical skills pertinent to the demands of the accounting profession.

The outcomes of this study are affected by other factors. The primary element is the implementation of a student-centered learning paradigm, which affords students enhanced opportunities to engage with the material and participate actively in the learning process. The second aspect is the utilization of the Akuntansiku application, which offers a technology-driven learning experience aligned with contemporary digital advancements. The third component is the presence of collaborative engagement inside the project-based learning (PJBL) model, enabling students to assist one another and share insights while executing projects. Another factor is that the accounting cycle material for service organizations is particularly conducive to project-based learning, as it allows students to directly engage in the recording process and the creation of financial statements.

The findings of this study align with the studies undertaken by (Dwi Amarthia & Aryani, 2023) The model of Project Based Learning (PJBL) significantly influences students' accounting learning outcomes and enhances conceptual understanding. This study corroborates the findings of the previous research (Budianto, 2024) This demonstrates that the integration of Project-Based Learning (PJBL) with an Android-based accounting application substantially enhances student learning outcomes in comparison to traditional educational methods. This research aligns with existing studies (Anggono et al., 2022) It asserts that the more effectively Project Based Learning (PJBL) is implemented, the greater the learning outcomes attained by pupils. This study corroborates the findings of the previous research (Putra & Hanggara, 2024) This suggests that the implementation of Project Based Learning (PJBL) facilitated by accounting apps enhances students' analytical thinking abilities.

Nonetheless, this research has some advantages and disadvantages. The value of this research is in the application of the Akuntansiku program, which is rarely utilized in accounting education studies, hence providing innovative advancements in digital-based learning. This study evaluates learning effects across cognitive, affective, and psychomotor aspects, hence enhancing the comprehensiveness of the research findings. This research provides a contextual learning experience wherein students participate in accounting procedures via projects that replicate real-world scenarios.

The limitation of this study is that it was conducted at a single school with a restricted sample size, rendering the findings non-generalizable. This research exclusively focuses on the accounting cycle pertaining to service companies, hence excluding other accounting topics. The restricted research duration results in the absence of long-term observations of student development. The development of learning tools, such as LKPD, has been suboptimal, and not all functionalities of the Akuntansiku program are fully exploited. Furthermore, several students require support in utilizing the Akuntansiku application due to their unfamiliarity with digital accounting software.

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This study indicates that the implementation of the project-based learning (PJBL) paradigm, facilitated by the Akuntansiku application, serves as an innovative alternative for enhancing students' accounting learning outcomes. Project-based learning integrated with digital technology has demonstrated the capacity to foster a more dynamic, interactive, and contextual educational environment. This research further advances digital-based accounting education, particularly in enhancing students' cognitive, affective, and psychomotor competencies concurrently. This research provides teachers with a reference for selecting appropriate learning methods and media that cater to students' demands in the digital age. This research can assist schools in advancing technology-based learning to improve the quality of vocational education, particularly in accounting.

This research theoretically advances technology-based accounting education, particularly through the integration of the project-based learning (PJBL) model with digital accounting tools. This research further substantiates that the appropriate utilization of digital media can enhance student engagement, educational quality, and overall academic results. Consequently, the implementation of the project-based learning (PJBL) paradigm, facilitated by the Akuntansiku application, serves as an innovative alternative for enhancing the quality of accounting education in vocational schools

Conclusion and Suggestion

The research Results demonstrate that the execution of project-based learning (PJBL) paradigm, facilitated by the Akuntansiku application, significantly impacts student learning outcomes in Accounting for class X at SMKN 1 Pekalongan. Furthermore, a notable disparity in learning outcomes was observed between students utilizing the Akuntansiku application and those employing Microsoft Excel, with the experimental group achieving superior results in cognitive, emotional, and psychomotor domains. These results suggest that combining digital accounting tools with project-centric learning statistically boosts academic scores while simultaneously cultivating a highly interactive, practical, and context-rich study environment. The findings of this study corroborate the principles of constructivism, student-centered learning, and experiential learning, highlighting the significance of students' active engagement in knowledge construction through authentic experiences. This research further enhances the implementation of digital accounting education by demonstrating that the Akuntansiku application serves as a pertinent alternative medium to facilitate the attainment of accounting abilities aligned with industry requirements.

Teachers specializing in accounting should consider adopting this project-oriented framework alongside digital applications as an innovative strategy to elevate both student participation and overall grades. Educational institutions must also facilitate the utilization of learning technologies by providing sufficient resources and training. Future researchers are advised to apply this model to diverse accounting materials, utilizing a broader sample, and to incorporate

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https://doi.org/10.24127/edunomia.v7i1.11628
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E-ISSN 2746-5586

variables such as learning motivation, digital literacy, or critical thinking skills to enhance the investigation of the efficacy of technology-based accounting education

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Vol. 7, No. 1, 2026. 19-36
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