



Journal of Economics Education and Entrepreneurship

Vol. 7, No. 2, August 2026, pp. 369-384

<https://ppjp.ulm.ac.id/journals/index.php/jee/issue/view/1059>

ISSN: 2746-5438 (Print) | 2745-729X (Online)



Enhancing Students' Conceptual Understanding through Interactive Teaching Materials in a Blended Learning Environment

^{1*}Dwi Puji Astuti, ²Kardiyem Kardiyem, ³Ahmad Jaenudin, ⁴Ita Nuryana, ⁵Masfufati Azizah,

⁶Laila Arini Almihrab

^{1,2,3,4,5,6} Universitas Negeri Semarang, Indonesia

Article Info

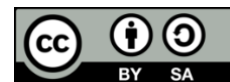
Keywords:

Conceptual understanding
Blended learning
Interactive teaching materials
Higher education

ABSTRACT

Conceptual understanding is a fundamental stage in the learning process. However, the teaching materials currently used are not fully aligned with curriculum requirements and remain less effective in facilitating student learning outcomes. This study aims to develop, assess the feasibility, and examine the effectiveness of interactive teaching materials based on a blended learning approach to improve students' conceptual understanding in the Introduction to Accounting course. This study employed a Research and Development (R&D) method using the Borg and Gall development model, combined with an effectiveness test through a quasi-experimental design. The population consisted of 120 Accounting Education students from the 2022 cohort, while 60 students participated in the effectiveness test from two intact classes, with 30 students assigned to the experimental group and 30 to the control group. The experimental group received instruction using the developed interactive teaching materials based on a blended learning approach, whereas the control group used conventional teaching materials. Data were collected through observation, interviews, questionnaires, document analysis, and student learning outcome tests. Data analysis included descriptive and inferential statistics to assess the feasibility and effectiveness of the developed teaching materials. The findings revealed that: (1) the developed interactive teaching materials were declared feasible based on validation by media experts, material experts, language experts, and practitioners; and (2) the implementation of the blended learning-based interactive teaching materials demonstrated an improvement in students' learning outcomes compared with conventional teaching materials. These findings indicate that blended learning-based interactive teaching materials can serve as an effective and innovative instructional strategy for strengthening students' conceptual understanding in Introduction to Accounting courses in higher education.

This is an open access article under the CC-BY-SA 4.0



*Corresponding Author:

Dwi Puji Astuti

Faculty of Economics and Business, Universitas Negeri Semarang

Jl. Raya Banaran, Sekaran, Kec. Gn. Pati, Kota Semarang, Jawa Tengah 50229, Indonesia

Email: tutiunnes@gmail.com

Submitted 21 July 2026; Accepted 18 August 2026; Published 30 August 2026

How to cite: Astuti, D. P., Kardiyem, K., Jaenudin, A., Nuryana, I., Azizah, M., & Almihrab, L. A. (2026). Enhancing Students' Conceptual Understanding through Interactive Teaching Materials in a Blended Learning Environment. *Journal of Economics Education and Entrepreneurship*, 7(2), 369-384. <https://doi.org/10.20527/jee.v7i2.20115>.

1. INTRODUCTION

The rapid advancement of knowledge and technology in the era of globalization has increased the demand for high-quality human resources capable of adapting to change and competing in an increasingly globalized environment, (Abdulah et al., 2021). Recognizing the high demand for human resources, the national education system and model have also undergone changes. This perspective is in line with the goals of 21st-century education, which emphasize the development of individuals and societies capable of adapting to global changes and participating effectively in an increasingly interconnected world, (Sukmayadi & Yahya, 2020). Wang et al. (2026) stated that the quality of education can be seen from the teaching and learning process that occurs in the classroom. Understanding the concept is a basic stage that is very important in a series of learning processes because mastering the concept will make it easier for students to learn something (Daryanto, 2013). Understanding the concept is also the key to the success of a learning. Students who have a good understanding of a material means that students are able to master the material.

One of the subjects that requires an understanding of concepts to support students' thinking processes is Introduction to Accounting. The process of thinking in learning is useful so that students can develop their understanding of concepts to become individuals who are smart, creative, critical and able to apply knowledge to solve problems related to everyday life (Novita & Jumadi, 2022). In the accounting learning process, material is presented in stages from the easiest to the most difficult. The ability to understand concepts in depth is the main provision for students in building a logical, critical, and analytical mindset so that they are able to interpret information and apply it in various situations (Wolcott & Sargent, 2021). Understanding the concept is very important and must be mastered first so that students have a strong basic provision to achieve basic abilities to a higher level.

The inability of students to understand basic concepts will have an impact on difficulties in connecting the next concept, so that the learning process becomes less effective and has the potential to cause misunderstandings (Sugahara & Cilloni, 2021). As a result, students tend to only memorize procedures to solve problems without understanding the meaning and relationship between the underlying concepts (Wolcott & Sargent, 2021). In fact, learning accounting requires not only the ability to record transactions, but also the ability to analyze, interpret, and apply accounting concepts in various contexts and real situations. Therefore, a learning process is needed that can facilitate students to actively build a concept understanding through a meaningful learning experience (Chiang et al., 2021). Mastery of concepts does not stop at theoretical aspects, but also develops into critical thinking and problem-solving skills.

Anderson & Krathwohl (2010) argued that students are said to understand if they can construct the meaning of learning messages both verbal, written and graphic delivered in learning. Understanding the concept can be a provision for students in constructing new knowledge with previous knowledge. Research result by Yurniwati & Yarmi (2020) stated that understanding the concept of knowledge is indeed very important. Conceptual understanding is a key aspect of learning (Tong et al., 2022; Janse van Rensburg & Oguttu, 2022). The same result was also expressed by Zhu et al. (2021) who stated that one of the important goals of teaching is to help students understand the main concepts in the subject matter rather than just remembering isolated facts. Based on preliminary observations conducted during the Introduction to Accounting course, the teaching materials used by lecturers were primarily commercially available materials rather than materials specifically developed in accordance with the course curriculum. The contents of the teaching materials are not in accordance with the curriculum requirements of the Accounting Education Department and are less interactive because there is only one-way communication. This

pattern certainly gives students a narrow view of lecture material. This condition may hinder students' understanding of the learning material because the existing teaching materials provide limited opportunities for students to actively engage with the content and do not adequately visualize abstract accounting concepts. The predominantly one-way presentation of the material may also make it difficult for students to connect theoretical explanations with examples and practice activities. Consequently, students may have difficulty constructing a comprehensive understanding of the accounting concepts presented in the course. In addition, the teaching materials used so far do not emphasize conceptual understanding, are not visual in nature, the appearance and color of the images presented are not attractive. Therefore, lecturers and students need an interactive teaching material that is complete both in terms of material, sample questions and practice questions, especially for abstract and visual material, making it easier for students to understand the concepts of the material presented. Based on these facts, we need a teaching material that is able to explain material in more detail, visualize abstract material, train students to easily understand accounting concepts and be able to solve problems. One of the teaching materials that are felt to be able to help lecturers and students in overcoming these problems is interactive teaching materials (Adeyele, 2024; Ustun & Tracey, 2020; Bhagat et al., 2026).

Interactive teaching materials are a type of learning media that combines material text with other supporting media such as images, animations, videos, and ease of navigation. Such characteristics of the media can help students understand abstract accounting concepts. The use of digital-based interactive learning materials has not been widely used by lecturers. Heilporn et al. (2021) One of the ways that lecturers can do is to develop learning media in the form of teaching materials. Development of teaching materials in the learning process needs to be done, in order to create effective and efficient learning (Pattaufi et al., 2023; Ali et al., 2022). Materials that when developed (innovation) can be adapted to the needs, characteristics, and developmental stages of students so that they can achieve learning objectives.

The use of interactive teaching materials can be used on laptops and cellphones with a blended learning approach. This is an alternative in supporting online learning which is still being carried out, especially in the course of introduction to accounting that requires visualization. Blended learning is a hybrid learning concept that integrates traditional classroom sessions and e-learning elements in an effort to combine the benefits of both in this form of learning (Rensburg & Oguttu, 2022). Blended learning provides flexibility in learning for lecturers and students. Virtual and physical integration allows lecturers and students to continue to carry out effective learning in various ways of delivery with support from related institutions (Anthony Jnr, 2022; Antwi-Boampong & Bokolo, 2022). Teaching models and learning styles carried out in an interactive meaningful learning environment in an optimal way will improve learning outcomes and be able to overcome important problems in education (Bouilheres et al., 2020; Prasetya et al., 2020). This interactive teaching material is complete, practical, and makes it easy for students to study the material anywhere and anytime to make it easier for students to understand accounting concepts. Based on the identified problems and the need for learning materials that are aligned with curriculum requirements, provide interactive learning experiences, and facilitate students' understanding of abstract accounting concepts, the development of interactive teaching materials using a blended learning approach is considered necessary. Previous studies have indicated that blended learning can provide flexibility by integrating face-to-face and online learning activities, (Atwa et al., 2022; C. Müller & Mildenberger, 2021). Therefore, this study aims to develop interactive teaching materials using a blended learning approach, assess their feasibility, and examine their

effectiveness in improving students' conceptual understanding in the Introduction to accounting course.

2. METHOD

This research was research and development (R&D) which aims to determine the eligibility and test the effectiveness of interactive teaching materials with a blended learning approach to improve the concept understanding of introduction to accounting. The research and development design employed the Borg and Gall development model (Borg & Gall, 1983). This research and development procedure consisted of ten steps, namely Research and Information Collecting, Planning, Develop Preliminary Form of Product, Preliminary Field Testing, Main Product Revision, Main Field Testing, Operational Product Revision, Operational Field Testing, Final Product Revision, and Dissemination and Implementation. The research strategy used experimental research procedures for the pre-test and post-test control group design, with the treatment given in the form of teaching material media in the experimental class, while the control class was not given treatment with teaching material media.

The population comprised 120 students from the 2022 cohort of the Accounting Education Program. The effectiveness test involved 60 students from two intact classes, with 30 students in each class. Accounting Education Class A was assigned to the experimental group, while Accounting Education Class B was assigned to the control group. The use of intact classes was intended to maintain the existing classroom structure and facilitate the implementation of the learning intervention within the regular instructional setting. Data were collected through observation, interviews, questionnaires, document analysis, and student learning outcome tests. Data analysis consisted of descriptive and inferential statistical analyses. Descriptive analysis was used to assess the feasibility of the developed teaching materials, while inferential analysis was used to examine their effectiveness in improving students' learning outcomes.

The criteria for determining the feasibility of the developed teaching materials and questionnaire responses were based on percentage scores, with 100% representing the maximum possible score. The interpretation criteria were divided into five categories and are presented in Table 1.

Table 1. Decision Making for Development Revision

Achievement of learning objectives	Qualification	Description
81-100 %	Very good	No revision needed
61-80 %	Good	No revision needed
41-60 %	Fair	Revised
21-40 %	Poor	Revised
0%-20%	Bad	Revised

Inferential statistical analysis was used to determine the effectiveness of the developed interactive teaching materials (Putra, 2014). Inferential statistical analysis was used to examine the effectiveness of the developed interactive teaching materials. An independent-samples t-test was conducted to compare the mean scores of the experimental and control groups. The analysis was conducted at a significance level of $\alpha = .05$. Before interpreting the independent-samples t-test, the assumptions of normality and homogeneity of variance were examined.

3. RESULTS AND DISCUSSION

3.1 Results

3.1.1. Product Validation

The initial teaching material product was evaluated to determine its feasibility for use in the learning process. The feasibility assessment began with expert judgment involving media experts, material experts, language experts, and practitioners. The experts assessed the developed teaching materials and provided suggestions and feedback, which were used as a basis for revising and improving the product. The results of the expert validation are presented below.

Table 2. Recapitulation of Validation Results by Media Experts

No	Indicator of Media Assessment	Assessment Scale				
		Obtained Score	Maximum Score	%	Score	Criteria
1	Display of teaching materials	44	48	100	91.7	Very good
2	Technical Aspects	30	32	100	93.7	Very good
Total score		74	80	100	92.5	Very good

The technical aspects refer to the technical characteristics and operation of the developed teaching materials as assessed by the media experts. These aspects concern the technical quality of the media and its suitability for use as an interactive learning resource. Based on Table 2, the media experts' assessment indicated that the display aspect of the teaching materials received a score of 91.7%, categorized as very good. The technical aspects received a score of 93.7%, which is also categorized as very good. Overall, the developed teaching materials obtained a score of 92.5%, indicating that they were categorized as very good.

Table 3. Recapitulation of Validation Results by Material Experts

No	Aspect	Assessment Scale				
		Obtained Score	Maximum Score	%	Score	Criteria
1	Content eligibility	33	44	100	75	Good
2	Presentation eligibility	37	40	100	92.5	Very good
Total score		70	84	100%	83.3	Very good

Based on table 3, the results of validation of teaching materials by learning material experts were obtained, namely, the assessment of the eligibility aspect of the content scored 75% with good criteria, the assessment of the eligibility aspect of the presentation of learning scored 92.5%, with very good criteria, and the total score of the teaching material assessment scored 83.3% with very good criteria. The results of this assessment indicated that it was eligible to use in the learning process.

Table 4. Recapitulation of Validation Results by Linguists

No	Aspect	Assessment Scale				
		Obtained Score	Maximum Score	%	Score	Criteria
1	Language Assessment	48	48	100	100	Very good
Total score		48	48	100	100	Very good

Based on Table 4, the results of linguists' validation of the teaching materials were obtained: the language assessment scored 100%, meeting the very good criteria. The results of this assessment indicated that the media was eligible to use in the learning process.

Table 5. Recapitulation of Validation Results by Practitioners

No	Aspect	Assessment Scale				
		Obtained Score	Maximum Score	%	Score	Criteria
1	Content eligibility	19	20	100	95	Very good
2	Eligibility on learning	36	40	100	90	Very good
Total score		55	60	100	91,7	Very good

Based on Table 5, the results of the validation of teaching materials by practitioners were obtained, namely the acquisition of a score on the eligibility aspect of the content scored 95% with very good criteria, the assessment of the eligibility aspect of learning scored of 90% with very good criteria. The total score for the assessment of teaching materials scored 91.7% with very good criteria. The results of the assessment showed that the media was eligible to use in the learning process.

3.1.2. Student Questionnaire

Before the questionnaire was used for research, the validity of the questionnaire was carried out first. The instrument is said to be valid, meaning that the measuring instrument used to obtain data was valid or can be used to measure what should be measured (Sugiyono, 2019). Thus, a valid instrument is an instrument that is truly appropriate for measuring what is to be measured, in this case the instrument in question was a research questionnaire. Based on the results of the questionnaire validity test that was conducted on 20 students in UNNES Cooperative Education, there were 4 of the 18 questions that were invalid. because $r\text{-count} < r\text{-table}$, so these question items was not used in research. The reliability test of the questionnaire was analyzed by using the Alpha formula (Cronbach's Alpha) using the IBM SPSS 27 application. If the value of r_{11} (Cronbach's Alpha) is equal to/greater than .70, it can be concluded that the instrument has high reliability (reliable). Based on these calculations, an $r\text{-count}$ of .867 was obtained, so that $r\text{-count} > r\text{-table}$, and it can be concluded that the questionnaire was reliable and can be used to obtain data in research.

3.1.3. Test Question

The test items were used as an instrument to measure students' learning outcomes before and after the implementation of the teaching materials. Prior to being administered to the students, the test items were reviewed by experts to assess their content validity. The items were subsequently tested empirically to examine their validity, reliability, difficulty level, and discrimination power. The results of the item validity analysis showed that, of the 25 test items, 5 items were classified as invalid because their $r\text{-count}$ values were lower than the $r\text{-table}$ value. Therefore, the five invalid items were not used in the subsequent analysis. The reliability analysis produced a Cronbach's Alpha coefficient of .869, indicating a high level of internal consistency. Thus, the test instrument was considered reliable for measuring students' learning outcomes. The analysis of item difficulty showed that 1 item was categorized as difficult, 21 items as moderate, and 3 items as easy. Thus, most of the test items were classified as having a moderate level of difficulty. Furthermore, the item discrimination analysis showed that 12 items had very good discrimination, 10 items had good discrimination, 1 item had fair discrimination, and 2 items had poor discrimination. These

results were taken into consideration in determining the suitability of the test items for measuring students' learning outcomes in the effectiveness test.

3.1.4. Product Trial

The developed teaching materials were first validated by experts in media, content, and language, as well as by practitioners as part of the internal validation process. After being declared feasible based on the expert validation results, the teaching materials were subjected to a limited trial involving students as part of the external validation process. The limited trial involved 12 students. The number of participants was determined based on the Borg and Gall development model, as described by (Sugiyono, 2019), which recommends involving 6–12 subjects in an initial field test. The results of the student questionnaire administered during the limited trial are presented below.

Table 6. Recapitulation of Assessment Results in Limited Trial

No	Aspect	Obtained Score	Maximum Score	%	Score	Criteria	Description
1	Media Aspect	262	288	100	91.0	Very good	Eligible without revision
2	Media Effectiveness Aspect	356	384	100	92.7	Very good	Eligible without revision
	Total Score	618	672	100	91.9	Very good	Eligible without revision

Based on Table 6, it can be seen that the results obtained from the limited trial through a questionnaire of student responses in providing an assessment related to aspects of the media teaching materials scored 91.0% with very good criteria, the results of the assessment of aspects of the media effectiveness for students scored 92.7 % with very good criteria, so the total score was 91.9%. Thus, the media teaching materials were eligible to use in the learning process. Furthermore, the extensive trial assessment involved 32 students of Cooperative Education Study Program. This extensive trial was carried out to find out students' responses to the learning media teaching materials that had been developed. At the end of the meeting, students evaluated the product using a questionnaire. The following will present a recapitulation of the results of the student questionnaire during the extensive trial.

Table 7. Recapitulation of Assessment Results in Extensive Trial

No	Aspect	Obtained Score	Maximum Score	%	Score	Criteria	Description
1	Media Aspect	699	768	100	91.0	Very good	Eligible without revision
2	Media Effectiveness Aspect	925	1024	100	90.3	Very good	Eligible without revision
	Total score	1,624	1,792	100	90.6	Very good	Eligible without revision

Based on Table 7 it can be seen that the results obtained from the extensive trial through a questionnaire of student responses in providing an assessment related to the media aspect of teaching materials scored 91.0% with very good criteria, the results of the assessment of the aspect of media effectiveness for students scored 90.3 % with very good criteria, so that the total score was 90.6% thus the teaching material was declared eligible to use in the learning process. Questionnaires given to students in limited and extensive trials were equipped with a

column of suggestions and comments that students can give for improvement and refinement of the media in the resulting teaching materials. The developed interactive teaching materials were designed to provide students with an accessible and interactive learning environment. The interface contains the main learning components that allow students to access accounting materials and learning activities through a blended learning approach. The main interface of the developed teaching materials is presented in Figure 1.

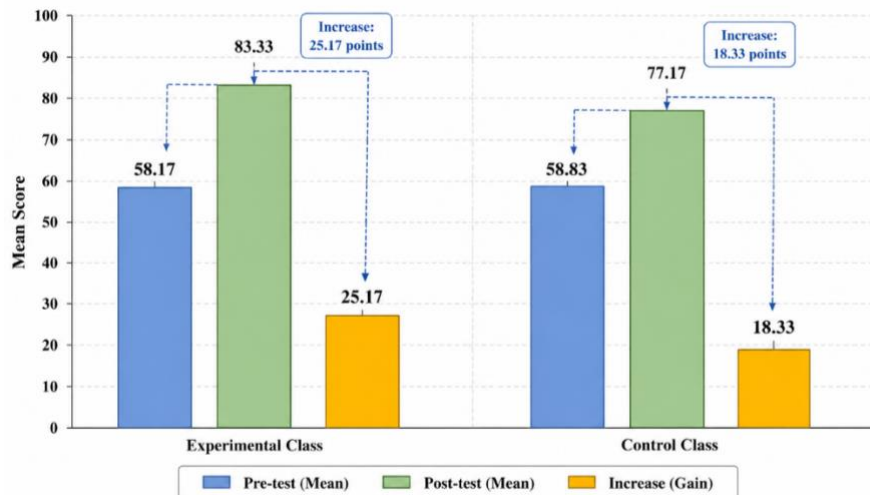


Figure 1. Main Interface of the Interactive Teaching Materials

Figure 1 shows the main interface of the developed interactive teaching materials for the Introduction to Accounting course. The interface provides access to accounting learning content and interactive learning activities related to fundamental accounting concepts. It includes organized learning components that allow students to navigate the materials, access key accounting concepts, and engage in activities designed to strengthen their understanding of basic accounting principles. The materials are presented through an interactive digital interface rather than conventional text-based materials, enabling students to access and revisit the learning resources according to their learning needs. The interface was designed to facilitate students' independent learning while also supporting lecturer-guided activities during face-to-face sessions. Thus, the main interface serves as an important component in implementing the blended learning approach by connecting classroom instruction with students' independent learning through accessible and interactive digital resources in the Introduction to accounting course.

3.1.5. Data collection results

The pre-test and post-test results were analyzed descriptively to examine changes in students' learning outcomes following the learning intervention. The analysis compared the mean scores of the experimental and control groups before and after the learning process, as well as the magnitude of the increase in each group. The comparison of the mean scores and learning outcome improvement is presented in Figure 2. Figure 2 presents the comparison of students' mean pre-test and post-test scores in the experimental and control groups, along with the improvement in learning outcomes. The experimental group increased from 58.17 to 83.33, representing an improvement of 25.17 points, while the control group increased from 58.83 to 77.17, representing an improvement of 18.33 points. The figure shows that the experimental group demonstrated a greater improvement than the control group following the implementation of the developed interactive teaching materials.



Note. Increase (Gain) = Post-test Mean – Pre-test Mean.

Figure 2. Comparison of Pre-test, Post-test, and Learning Outcome Improvement

3.1.6. Hypothesis testing

Hypothesis testing was conducted using IBM SPSS Statistics 27 to examine the differences in students' pre-test and post-test scores between the experimental and control groups and to evaluate the effectiveness of the developed interactive teaching materials. The hypothesis was tested at a significance level of $\alpha = .05$. For the independent-samples t-test, the critical t-value (t-table) was determined based on the degrees of freedom and a two-tailed significance level of .05. With 30 students in each group, the degrees of freedom were 58 and the critical t-value was 2.001. The null hypothesis (H_0) was rejected when the Sig. (2-tailed) value was less than .05. Conversely, H_0 was not rejected when the Sig. (2-tailed) value was greater than .05. The t-value and critical t-value were reported as supporting statistics for interpreting the test results.

The hypothesis on the proposed pre-test is H_0 : there is no difference in the average pre-test scores of students in the experimental class and control class and H_1 : there is a difference in the average pre-test scores of students in the experimental class and control class. Before examining the effectiveness of the developed teaching materials, an independent-samples t-test was conducted to determine whether there was a statistically significant difference in the initial learning outcomes between the experimental and control groups. The results of the pre-test comparison are presented in Table 8.

Table 8. Results for the Mean Difference test in the Pre-test Scores for the Experimental Class and the Control Class

	Group	N	Mean	Std. Deviation	Std. Error Mean
Pretest	Experimental class	30	58.17	9.33	1.70
	Control class	30	58.83	10.40	1.90

Based on Table 8, the experimental group obtained a mean pre-test score of 58.17, while the control group obtained a mean score of 58.83. The independent-samples t-test showed no statistically significant difference between the two groups, $t(58) = -.261$, $p = .795 > .05$. Therefore, H_0 was not rejected, indicating that the experimental and control groups had comparable initial learning outcomes before the intervention. This result provides a baseline

for examining differences in post-test outcomes following the implementation of the developed interactive teaching materials.

Table 9. Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2- tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Pretest	Equal variances assumed	6.188	.461	-.261	58	.795	-.667	2.550	-5.772	4.438
	Equal variances not assumed			-.261	57.33	.795	-.667	2.550	-5.773	4.439

The post-test analysis was subsequently conducted to determine whether there was a statistically significant difference in learning outcomes between the experimental and control groups after the intervention. The null hypothesis (H_0) stated that there was no significant difference in the mean post-test scores between the two groups, whereas the alternative hypothesis (H_1) stated that there was a significant difference. The post-test comparison between the experimental and control groups is presented in Table 9.

Table 10. Results for the Mean Difference test in the Post-test Scores for the Experimental Class and the Control Class

	Group	N	Mean	Std. Deviation	Std. Error Mean
Posttest	Experimental class	30	83.33	7.350	1.342
	Control classa	30	77.17	7.953	1.452

Table 11. Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2- tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Posttest	Equal variances assumed	.130	.720	3.119	58	.003	6.167	1.977	2.209	10.124
	Equal variances not assumed			3.119	57.643	.003	6.167	1.977	2.209	10.124

Based on Table 10, the experimental group obtained a mean post-test score of 83.33, whereas the control group obtained a mean score of 77.17. The experimental group therefore achieved a mean score 6.16 points higher than that of the control group. Levene's test

indicated that the variances were homogeneous ($p = .720 > .05$); therefore, the equal-variances-assumed result was used for interpretation. The independent-samples t-test showed a statistically significant difference in post-test scores between the two groups, $t(58) = 3.119$, $p = .003$. The effect size was large (Cohen's $d = .82$), indicating that the difference was not only statistically significant but also practically meaningful. Therefore, H_0 was rejected, indicating that the experimental group achieved significantly higher post-test learning outcomes than the control group after the intervention.

3.2 Discussion

The findings of this study should be interpreted not merely as evidence of higher post-test scores, but in relation to the characteristics of the developed interactive teaching materials and the learning context of Introduction to Accounting. The development process was initiated from the identified limitations of existing teaching materials, particularly their limited visual and interactive features and their insufficient support for students in connecting accounting concepts with examples and learning activities. The developed materials addressed these limitations by integrating interactive content within a blended learning environment, allowing students to access learning resources and engage with learning activities both during and beyond face-to-face instruction.

The higher improvement observed in the experimental group can therefore be understood in relation to the instructional affordances of the developed materials. In Introduction to Accounting, students are required to understand fundamental concepts before applying them to accounting problems and transactions. Interactive presentation can provide opportunities to connect explanations, examples, and learning activities more coherently, while the blended learning arrangement provides greater flexibility for students to revisit learning resources independently. Thus, the contribution of the product extends beyond providing digital content; it lies in structuring digital learning resources to support conceptual learning within a blended instructional environment.

This interpretation is consistent with recent research on technology-supported learning. Abdul-Wasiu et al., (2024) for example, highlighted the role of teaching and learning materials in supporting student engagement and comprehension, while also emphasizing that their effectiveness depends on appropriate resources and technological preparedness. Similarly, Maqbool et al., (2024) emphasized the potential of emerging e-learning approaches to support student engagement and more effective learning environments. These findings are relevant to the present study because the developed materials were designed not simply as digital repositories but as interactive resources integrated into the learning process.

The present findings also extend previous research by providing empirical evidence from the context of Introduction to Accounting. While previous studies have discussed the potential of digital learning resources, e-learning, and teaching materials to support engagement and learning, this study combines product development and effectiveness testing within a single research design. The development process involved expert and practitioner validation followed by systematic product trials and classroom implementation. This provides a stronger connection between the identified instructional need, the design of the learning product, and its subsequent classroom use.

An important implication is that the effectiveness of digital teaching materials should not be attributed solely to the use of technology. Rather, their instructional value depends on the alignment among content, interactive design, learning activities, and the pedagogical approach in which they are implemented. In the present study, the integration of interactive teaching materials with blended learning provided a structured environment for students to access accounting concepts and learning activities in a more flexible manner. This may

explain why the experimental group demonstrated greater improvement than the control group.

Nevertheless, the findings should be interpreted within the scope of the study. The effectiveness test involved 60 students from two intact classes in one study program. Therefore, the findings provide contextual evidence rather than broad generalization across higher education settings. Future studies should examine the developed materials with larger and more diverse student populations, different institutional contexts, and longer implementation periods. Further development may also incorporate adaptive features, richer feedback mechanisms, and additional accounting topics to strengthen the learning value of the materials.

The findings of this study are consistent with previous research demonstrating the potential of technology-supported teaching materials to facilitate learning and improve students' learning experiences. Abdul-Wasiu et al., (2024) found that teaching and learning materials can support student engagement and comprehension, highlighting their importance in facilitating effective learning. The study also indicated that teaching materials can facilitate learning activities and stimulate students' interest in reading. These findings provide support for the present study, in which the developed interactive teaching materials received a high feasibility rating and were implemented to support students' learning in the Introduction to Accounting course.

Similarly, Heilporn & Lakhal, (2021) highlighted the potential of digital media as a learning resource that can support educators in delivering instructional content and creating more interactive learning activities. The use of digital media can provide opportunities for students to engage with learning materials in a more flexible manner. This perspective is relevant to the present study because the developed teaching materials were designed not only to present accounting content but also to facilitate student engagement through a blended learning environment.

The findings are also consistent with Tong et al., (2022) who examined the effectiveness of blended learning in relation to students' academic achievement, self-study skills, and learning attitudes. Their findings suggest that blended learning can provide a learning environment that supports students' independent learning activities. In the present study, the integration of interactive teaching materials with a blended learning approach similarly provided students with opportunities to access and engage with learning resources beyond conventional classroom activities. The greater improvement in the experimental group, from a mean score of 58.17 in the pre-test to 83.33 in the post-test, provides empirical support for the potential of this approach in the context of Introduction to Accounting.

The findings can further be understood from the characteristics of multimedia-supported learning. Ramírez-Donoso et al., (2023) and Du et al., (2025) emphasized the potential of multimedia-supported learning to increase students' involvement and facilitate learning through more varied forms of information presentation. Multimedia can also support interaction, stimulate students' interest and motivation, and facilitate communication during the learning process. In the context of the present study, these characteristics are reflected in the development of interactive teaching materials that combine learning content with digital and interactive elements.

Feng, (2021) and Byukusenge et al., (2024) further explained that computer technology can support the development of learning programs that are more focused and flexible and can help students visualize or concretize abstract concepts through modeling, animation, and simulation. This perspective is particularly relevant to Introduction to Accounting because students need to develop an understanding of fundamental accounting concepts before applying them to accounting problems and transactions. Interactive presentation of learning

content can therefore provide additional support for students in constructing their understanding of these concepts.

The findings are also supported by Müller & Wulf, (2021), who identified benefits of e-learning for both students and educators. For students, e-learning provides opportunities for more flexible and independent learning beyond classroom activities, while for educators it can support the integration of technology into instructional practices. Maqbool et al., (2024) emphasized the potential of e-learning and collaborative digital learning approaches to enhance student engagement and learning effectiveness. These perspectives are consistent with the blended learning orientation of the present study, in which technology-supported teaching materials were integrated into the learning process rather than being used solely as supplementary digital resources.

Taken together, the findings suggest that the instructional value of the developed materials lies not merely in their digital format, but in the integration of interactive content, structured learning activities, and blended learning. The high feasibility ratings indicate that the materials were considered appropriate in terms of media, content, language, and learning implementation, while the significant difference in post-test outcomes provides empirical support for their instructional potential. Thus, the contribution of the present study lies in linking the systematic development and validation of interactive teaching materials with their empirical implementation in an Introduction to Accounting course.

Therefore, the contribution of this study lies not simply in the use of digital teaching materials, but in the development and implementation of interactive teaching materials integrated with a blended learning approach specifically for the Introduction to Accounting course. The combination of high product feasibility and statistically significant differences in post-test outcomes provides complementary evidence of the product's instructional potential. Nevertheless, further implementation across different student cohorts and learning contexts is needed to examine the consistency and generalizability of these findings.

4. CONCLUSION

This study concludes that the developed interactive teaching materials based on a blended learning approach are feasible and effective for use in the Introduction to Accounting course. The product achieved an overall feasibility score of 91.9%, categorized as very good, based on assessments by media experts, material experts, language experts, and practitioners. The effectiveness test showed that the experimental and control groups had comparable initial learning outcomes, while the experimental group achieved significantly higher post-test learning outcomes after the intervention ($t(58) = 3.119$, $p = .003$). The experimental group also demonstrated a greater increase in learning outcomes than the control group, with an improvement of 25.17 points compared with 18.33 points. These findings indicate that the integration of interactive teaching materials with a blended learning approach provides a feasible learning resource and supports improved learning outcomes in Introduction to Accounting. Further research involving larger and more diverse groups is recommended to examine the applicability of the developed materials across different learning contexts.

ACKNOWLEDGEMENTS

The authors would like to thank the experts, practitioners, and students who contributed to the validation, trial, and implementation of the developed teaching materials. The authors also express their gratitude to the Bachelor of Accounting Education, Universitas Negeri Semarang, for supporting this research.

AI USE DECLARATION

Artificial intelligence (AI) tools were used solely to assist in creating visual illustrations included in this manuscript. The authors reviewed and approved the generated visuals and remain fully responsible for the accuracy, originality, and final content of the manuscript.

REFERENCES

- Abdul-Wasiu, R., Brilliant Essuman, I., Offei Kwakye, D., & Alhassan, I. (2024). Descriptive Survey of Preservice Mathematics Teachers' Perceived Knowledge and Use of Teaching and Learning Materials. *Journal of Mathematics Instruction, Social Research and Opinion*, 3(2 SE-Articles), 251–264. <https://doi.org/10.58421/misro.v3i2.284>
- Abdulah, M. H. A. Bin, Gardi, B., & Darmawan, D. (2021). Innovation in Human Resource Management to enhance Organizational Competitiveness in the Era of Globalization. *Journal of Social Science Studies*, 1(1), 51–58. <https://jos3journals.id/index.php/jos3/article/view/30>
- Adeyele, V. O. (2024). Relative effectiveness of simulation games, blended learning, and interactive multimedia in basic science achievement of varying ability pupils. *Education and Information Technologies*, 29(11), 14451–14470. <https://doi.org/10.1007/s10639-023-12414-z>
- Ali, M., Disman, Permanasari, A., Hadiapurwa, A., Risdiyanto, & Lestari, H. (2022). Blended Learning in the Implementation of Environment Dimension of ESD Infused into Junior High School Science. *Journal of Hunan University Natural Sciences*, 49(2), 139–149. <https://doi.org/10.55463/issn.1674-2974.49.2.14>
- Anderson, L. W., & Krathwohl, D. R. (2010). *Kerangka Landasan untuk Pembelajaran, Pengajaran, dan Asesmen*. Pustraka Pelajar.
- Anthony Jnr, B. (2022). An exploratory study on academic staff perception towards blended learning in higher education. *Education and Information Technologies*, 27(3), 3107–3133. <https://doi.org/10.1007/s10639-021-10705-x>
- Antwi-Boampong, A., & Bokolo, A. J. (2022). Towards an Institutional Blended Learning Adoption Model for Higher Education Institutions. *Technology, Knowledge and Learning*, 27(3), 765–784. <https://doi.org/10.1007/s10758-021-09507-4>
- Atwa, H., Shehata, M. H., Al-Ansari, A., Kumar, A., Jaradat, A., Ahmed, J., & Deifalla, A. (2022). Online, Face-to-Face, or Blended Learning? Faculty and Medical Students' Perceptions During the COVID-19 Pandemic: A Mixed-Method Study. *Frontiers in Medicine*, 9. <https://doi.org/10.3389/fmed.2022.791352>
- Bhagat, K. K., Mishra, S., & Wang, T. (2026). Blended learning in Commonwealth countries: a comparative analysis of implementation and impact. *Journal of Computers in Education*, 13(1), 193–223. <https://doi.org/10.1007/s40692-025-00356-z>
- Borg, W. R., & Gall, M. D. (1983). *Educational Research: An Introduction*. Longman.
- Bouilheres, F., Le, L. T. V. H., McDonald, S., Nkhoma, C., & Jandug-Montera, L. (2020). Defining student learning experience through blended learning. *Education and Information Technologies*, 25(4), 3049–3069. <https://doi.org/10.1007/s10639-020-10100-y>
- Byukusenge, C., Nsanganwimana, F., & Tarmo, A. P. (2024). Investigating the effect of virtual laboratories on students' academic performance and attitudes towards learning biology. *Education and Information Technologies*, 29(1), 1147–1171. <https://doi.org/10.1007/s10639-023-12351-x>
- Chiang, C., Wells, P. K., & Xu, G. (2021). How does experiential learning encourage active

- learning in auditing education? *Journal of Accounting Education*, 54, 100713. <https://doi.org/10.1016/j.jaccedu.2020.100713>
- Daryanto. (2013). *Menyusun modul, bahan ajar untuk persiapan guru dalam mengajar*. Yogyakarta: Gava Media.
- Du, L., Tang, X., & Wang, J. (2025). Different types of textual cues in educational animations: Effect on science learning outcomes, cognitive load, and self-efficacy among elementary students. *Education and Information Technologies*, 30(3), 3573–3596. <https://doi.org/10.1007/s10639-024-12929-z>
- Feng, C. (2021). An intelligent virtual reality technology in the teaching of art creation and design in colleges and universities. *Journal of Intelligent & Fuzzy Systems*, 40(2), 3699–3710. <https://doi.org/10.3233/JIFS-189404>
- Heilporn, G., & Lakhal, S. (2021). Fostering student engagement in blended courses: A qualitative study at the graduate level in a business faculty. *The International Journal of Management Education*, 19(3), 1–13. <https://doi.org/10.1016/j.ijme.2021.100569>
- Heilporn, G., Lakhal, S., & Bélisle, M. (2021). An examination of teachers' strategies to foster student engagement in blended learning in higher education. *International Journal of Educational Technology in Higher Education*, 18(1). <https://doi.org/10.1186/s41239-021-00260-3>
- Maqbool, M. A., Asif, M., Imran, M., Bibi, S., & Almusharraf, N. (2024). Emerging E-learning trends: A study of faculty perceptions and impact of collaborative techniques using fuzzy interface system. *Social Sciences & Humanities Open*, 10, 101035. <https://doi.org/10.1016/j.ssaho.2024.101035>
- Müller, C., & Mildemberger, T. (2021). Facilitating flexible learning by replacing classroom time with an online learning environment: A systematic review of blended learning in higher education. *Educational Research Review*, 34, 100394. <https://doi.org/10.1016/j.edurev.2021.100394>
- Müller, F. A., & Wulf, T. (2021). Blended learning environments that work: An evidence-based instructional design for the delivery of qualitative management modules. *International Journal of Management Education*, 19(3), 1–12. <https://doi.org/10.1016/j.ijme.2021.100530>
- Novita, R. R., & Jumadi. (2022). Students' Conceptual Understanding and Self-Directed Learning on Blended Learning. *Journal of Education Technology*, 6(4), 617–624. <https://doi.org/10.23887/jet.v6i4.49229>
- Pattaufi, P., Aswan, D., & Hakim, A. (2023). The Development of Teaching Material for Blended Learning: A Strategy to Improve Students' Creativity and Innovation in the 21st Century. *Journal of Educational Science and Technology (EST)*, 9(1), 19. <https://doi.org/10.26858/est.v9i1.37916>
- Prasetya, D. D., Wibawa, A. P., Hirashima, T., & Hayashi, Y. (2020). Designing rich interactive content for blended learning: A case study from Indonesia. *Electronic Journal of E-Learning*, 18(4), 276–287. <https://doi.org/10.34190/EJEL.20.18.4.001>
- Ramírez-Donoso, L., Pérez-Sanagustín, M., Neyem, A., Alario-Hoyos, C., Hilliger, I., & Rojas, F. (2023). Fostering the use of online learning resources: results of using a mobile collaboration tool based on gamification in a blended course. *Interactive Learning Environments*, 31(3), 1564–1578. <https://doi.org/10.1080/10494820.2020.1855202>
- Rensburg, E. D. J. van, & Oguttu, J. W. (2022). Blended teaching and learning: Exploring the concept, barriers to implementation and designing of learning resources. *South African Journal of Higher Education*, 36(6), 285–298. <https://doi.org/10.20853/36-6-4595>
- Sugahara, S., & Cilloni, A. (2021). Mediation effect of students' perception of accounting on

- the relationship between game-based learning and learning approaches. *Journal of Accounting Education*, 56, 100730. <https://doi.org/10.1016/j.jaccedu.2021.100730>
- Sugiyono. (2019). *Metode Penelitian dan Pengembangan = Research and Development (R&D)*. Alfabeta.
- Sukmayadi, V., & Yahya, A. (2020). Indonesian Education Landscape and the 21st Century Challenges. *Journal of Social Studies Education Research*, 11(4), 219–234. <https://www.learntechlib.org/p/218538/>.
- Tong, D. H., Uyen, B. P., & Ngan, L. K. (2022). The effectiveness of blended learning on students' academic achievement, self-study skills and learning attitudes: A quasi-experiment study in teaching the conventions for coordinates in the plane. *Heliyon*, 8(12), e12657. <https://doi.org/10.1016/j.heliyon.2022.e12657>
- Ustun, A. B., & Tracey, M. W. (2020). An effective way of designing blended learning: A three phase design-based research approach. *Education and Information Technologies*, 25(3), 1529–1552. <https://doi.org/10.1007/s10639-019-09999-9>
- Wang, L., van der Rijst, R., Wilfried, A., & de Jonge, M. (2026). Factors related to student engagement in blended learning in higher education: A narrative synthesis based on a systematic review. *Computers and Education*, 250(March), 105625. <https://doi.org/10.1016/j.compedu.2026.105625>
- Wolcott, S. K., & Sargent, M. J. (2021). Critical thinking in accounting education: Status and call to action. *Journal of Accounting Education*, 56, 100731. <https://doi.org/10.1016/j.jaccedu.2021.100731>
- Yurniwati, Y., & Yarmi, G. (2020). Promoting prospective teachers' conceptual knowledge through web-based blended learning. *JRAMathEdu (Journal of Research and Advances in Mathematics Education)*, 5(2), 187–201. <https://doi.org/10.23917/jramathedu.v5i2.10418>
- Zhu, M., Berri, S., & Zhang, K. (2021). Effective instructional strategies and technology use in blended learning: A case study. *Education and Information Technologies*, 26(5), 6143–6161. <https://doi.org/10.1007/s10639-021-10544-w>