



IMPROVING ENGLISH STUDENTS' MATERIAL DEVELOPMENT SKILLS THROUGH PBL-BASED FLIPBOOK PRODUCTION: AN EXPERIMENTAL RESEARCH

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Abstract

Many English education students still rely on printed textbooks and lack sufficient skills to develop interactive digital learning materials. This limitation results in low digital literacy and minimal experience in transforming printed resources into multimodal formats. This study investigates the effect of Project-Based Learning (PBL) on students' digital material development performance by converting printed English books into interactive flipbooks. An experimental design was employed involving 32 undergraduate English students, divided into an experimental group ($n = 16$) and a control group ($n = 16$). The experimental group developed flipbooks through a PBL-based project, while the control group worked with conventional printed materials. Data were collected through pretest-posttest assessments and analyzed statistically. The results show notable improvement in the experimental group, with mean scores rising from 67.42 to 86.37, compared to the control group's increase from 66.81 to 74.25. An independent t-test confirmed a significant difference between groups ($t = 3.52 > t\text{-table} = 2.04$, $p < 0.05$), with a high effect size (Cohen's $d = 0.86$). Students also reported increased motivation and digital literacy. In conclusion, PBL effectively enhances students' digital material development skills and facilitates the shift from printed to interactive multimodal learning resources.

Keywords:

Project-Based Learning; Flipbook; Digital learning materials; Experimental study; English education.

A. INTRODUCTION

The rapid development of digital technology has changed the way higher education works. Both lecturers and students now need to adjust to new ways of accessing, creating, and sharing information. In language education, digital learning materials have become increasingly important because today's learners expect interactive, visually engaging, and multimodal content that suits their needs as digital natives. Mayer (2021) explains that multimedia learning environments improve understanding by presenting information through both visual and auditory channels, helping learners engage more deeply. This transition to interactive digital resources has also been accelerated by online and blended learning trends that emphasize accessibility, flexibility, and personalization (Bond et al., 2021).

In English language teaching (ELT) programs, digital materials are essential for supporting different learning styles, building students' multimodal literacy, and preparing them for technology-rich teaching environments. However, many English education students still depend on printed textbooks and have limited experience in creating digital learning materials that include multimedia elements such as audio, video, hyperlinks, or interactive features (Setiawan & Utami, 2022). This lack of experience affects their readiness to use technology in future teaching. The challenge becomes even greater when students are required to transform printed materials into digital formats, because this process not only requires language and pedagogical knowledge but also skills in visual communication, layout design, and multimedia editing (Hashim, 2020). Therefore, there is a strong need for instructional approaches that involve hands-on digital production and help students build stronger digital competence.

In hence, Project-Based Learning (PBL) is considered one of the most suitable approaches to address these needs. PBL engages students in meaningful projects that promote active exploration, creativity, and higher-order thinking (Thomas, 2020). In digital literacy and multimodal learning contexts, PBL helps students develop practical design skills, work collaboratively, and create real digital products that reflect authentic communication needs (Krajcik & Shin, 2022). This makes PBL highly relevant for material development courses in English education programs, where students must learn to design, evaluate, and transform instructional materials effectively.

The development of digital learning materials has received considerable attention in recent educational research. Studies have shown that digital tools such as Canva, e-modules, and interactive presentation platforms significantly enhance student engagement, comprehension, and motivation (Unun Pratiwi et al., 2024; Aini &

Rachman, 2023). Flipbooks, in particular, are gaining popularity because they allow traditional printed content to be transformed into multimedia-rich, interactive digital books that support user-friendly navigation and multimodal learning experiences (Sanchez et al., 2020). Flipbooks integrate images, text, audio, video, and hyperlinks, making them suitable for both autonomous learning and digital classrooms (Abdullahi et al., 2022). Their compatibility with mobile learning further increases their relevance in today's educational contexts.

Parallel to the growth of digital learning tools, Project-Based Learning (PBL) has also been widely studied in many countries. Research shows that PBL can improve students' creativity, digital literacy, collaboration, and problem-solving skills because it involves them in real-world tasks that require exploration and the creation of a final product (Carvalho et al., 2021; Rahiem, 2020). In Indonesia, similar findings have been reported, showing that PBL increases student engagement and helps them take more responsibility for their own learning (Anggraini & Wulandari, 2020; Prastyo et al., 2024). Overall, these studies highlight that PBL is useful not only for strengthening content knowledge but also for building students' technological and creative abilities.

Despite these developments, several research gaps still remain. First, many studies on digital material development use R&D or descriptive methods and focus only on the product or students' perceptions, instead of measuring learning outcomes through controlled experiments. Second, only a few studies examine how PBL directly improves students' digital material development skills; most research focuses on writing, speaking, or general English abilities. Third, studies that explore how printed English textbooks can be turned into interactive flipbooks using PBL are still very limited, especially in Southeast Asian ELT settings. Fourth, very few studies combine PBL, flipbook creation, and digital literacy measurement in one experimental study.

These gaps are also found in international research, where many scholars point out that more empirical evidence is needed to understand how digital material production and multimodal design actually affect learning in ELT programs (Şad & Göktas, 2022; Khan et al., 2023). Ebadi and Shakoory (2021) also stress that multimodal digital projects should be evaluated based on measurable learning gains, not only on students' opinions. Therefore, this study helps fill these gaps by offering controlled and statistically tested evidence on how PBL supports the development of digital learning materials through flipbook creation. This experimental approach provides methodological novelty and adds stronger academic value to the study.

Based on the theoretical foundation and gaps identified in prior research, this study aims to examine the effect of Project-Based Learning on students' ability to develop digital learning materials by converting printed English textbooks into interactive flipbooks. The study expects that students who participate in PBL-based digital production will demonstrate higher performance in content adaptation, organization, visual design, multimodal integration, and technical usability compared to those who receive conventional printed-material instruction. Additionally, PBL is expected to enhance students' digital literacy, technological confidence, and creative problem-solving skills, consistent with findings from previous international studies (Fauzi & Anisa, 2022; Ebadi & Shakoori, 2021).

The results of this study are anticipated to offer pedagogical implications for integrating project-based digital material development activities into English education programs, supporting the broader movement toward digital and multimodal teaching environments. By empirically testing the impact of PBL within an experimental framework, this research aims to contribute both theoretical and practical insights to the fields of ELT, instructional design, and digital learning innovation.

B. RESEARCH METHOD

This study used an experimental research design to examine whether Project-Based Learning (PBL) could improve students' ability to develop digital learning materials from printed English textbooks. A total of 32 English education students were selected through purposive sampling and divided into two equal groups: an experimental group ($n = 16$) and a control group ($n = 16$). Both groups had similar academic backgrounds and initial levels of digital literacy. The study was conducted over four weeks with eight class meetings. Before the treatment, all students completed a pretest, and after the treatment, they completed a posttest to measure changes in performance.

The experimental group followed a PBL-based project, which included four stages: planning, development, revision, and presentation. Students selected a chapter from a printed textbook, analyzed its content, and designed a storyboard. They then converted the content into a digital flipbook using Flip PDF Professional, Canva, and basic multimedia tools. During the revision stage, students improved their work based on peer and instructor feedback, focusing on content accuracy, layout, navigation, and multimodal elements. Meanwhile, the control group learned through traditional

printed-textbook activities, such as reading, summarizing, and classroom discussions, without digital tools or project-based tasks.

Data were collected using a pretest–posttest performance task and a digital literacy questionnaire. The performance task was assessed with a rubric that measured content accuracy, organization, visual design, multimodal integration, and technical usability. The rubric was reviewed and approved by two experts, and both experts gave highly consistent scores, showing that the rubric was reliable. The digital literacy questionnaire included 12 items, and it was also tested to ensure that all items were consistent and measured the same construct. For data analysis, the Lilliefors test was used to check normality, and the F-test was used to confirm that the two groups had similar variance. After both assumptions were met, an independent sample t-test was conducted to determine whether the posttest differences between the groups were statistically significant at the 0.05 level. The effect size was also calculated to determine how strong the impact of the treatment was. These procedures were applied to evaluate how effectively PBL improved students' digital material development skills.

C. FINDINGS AND DISCUSSION

The findings of this experimental study are presented through five tables supported by detailed explanations. These results describe the improvement in students' digital learning material development performance after receiving different instructional treatments.

Table 1. Pretest and Posttest Performance Scores

Group	n	Pretest Mean	Posttest Mean	Mean Gain
Experimental	16	67.42	86.37	+18.95
Control	16	66.81	74.25	+7.44

Table 1 shows that both groups started with comparable abilities; the pretest difference was only 0.61 points, indicating equivalent baseline competence. After the treatment, the experimental group achieved a mean gain of 18.95 points, which is more than **twice the improvement** of the control group (7.44 points). This indicates that the PBL-assisted flipbook project produced **substantially greater progress** compared to conventional instruction.

Students in the experimental group demonstrated stronger skills in content restructuring, visual design, and multimodal integration because the project required them to reformat printed content into interactive digital formats. In contrast, the control group remained limited to linear text summaries with minimal creativity and no multimedia features. This significant difference suggests that PBL provides richer cognitive engagement and more opportunities for higher-order thinking.

Table 2. Digital Literacy Improvement

Group	Pre-DL Mean	Post-DL Mean	Increase
Experimental	68.4	89.1	+20.7
Control	67.9	72.3	+4.4

The experimental group experienced a dramatic improvement in digital literacy **(+20.7 points)**, while the control group improved only **4.4 points**. These activities are central to modern digital literacy. According to Mayer (2021), such tasks activate deeper cognitive processing, which explains the substantial improvement. Meanwhile, the control group's minimal increase is typical of passive, text-based instruction.

Table 3. Normality and Homogeneity Tests

Test	Experimental	Control	Criteria	Result
Normality (Lilliefors)	$L_0 = 0.112 < 0.173$	$L_0 = 0.128 < 0.173$	$L_0 < L_{table}$	Normal
Homogeneity (F-test)	$F = 1.21$	$F_{table} = 2.35$	$F < F_{table}$	Homogeneous

The normality test indicates that both groups' posttest scores were normally distributed. The homogeneity test shows $F_{observed}$ (**1.21**) lower than F_{table} (**2.35**), meaning both groups had equal variance. Meeting these two assumptions ensures that the subsequent t_{test} is statistically valid. This is essential in experimental research because it confirms that group differences originate from the treatment, not from data irregularities.

Table 4. Independent Sample t-test

Comparison	t-value	t-table ($\alpha = 0.05$)	Interpretation
Posttest Scores	3.52	2.04	Significant difference

The independent sample t-test demonstrates a statistically significant difference between the two groups. The t-value (**3.52**) is higher than the critical t-table value (**2.04**), meaning that PBL had a real, measurable impact on students' performance. This confirms that the difference in learning outcomes was not due to chance, but due to the instructional method applied.

Table 5. Effect Size (Cohen's d)

Comparison	Effect Size (d)	Interpretation
Experimental vs Control	0.86	High Effect

An effect size of **0.86** is considered **large**, indicating that the treatment produced a strong educational impact. This not only confirms statistical significance but also demonstrates practical significance, meaning that PBL has substantial real-world benefits for student learning. Such a large effect size is uncommon in instructional intervention studies and highlights the strength of combining PBL with digital flipbook creation.

The main scientific finding of this study is that Project-Based Learning (PBL) substantially improved students' ability to develop digital learning materials compared to conventional instruction. This directly answers the research objective, as the experimental group who created flipbooks showed much greater gains in content adaptation, visual design, and multimodal integration than the control group. These results support the premise that authentic, hands-on digital production tasks allow students to construct knowledge more deeply than text-based activities.

The significant improvement in the experimental group can be explained by constructivist and multimodal learning principles. PBL required students to analyze content, reorganize structure, integrate multimedia elements, and revise their work through feedback cycles. These cognitively demanding tasks foster higher-level thinking, creativity, and technological problem-solving, which explains the marked increase in both performance and digital literacy. In contrast, the control group's limited improvement reflects the constraints of passive learning with printed materials.

These findings are consistent with previous studies showing that PBL enhances digital competence and creative problem-solving (Carvalho et al., 2021; Prastyo et al., 2024) and align with research highlighting the pedagogical potential of flipbooks as multimodal learning tools (Sanchez et al., 2020; Abdullahi et al., 2022). However, this study differs from many earlier works by providing experimental, statistically validated evidence rather than descriptive or perception-based results. Additionally, the specific task of converting printed English textbooks into interactive flipbooks has rarely been examined, making this research a novel contribution to ELT material development.

Overall, the discussion confirms that PBL is a highly effective approach for enhancing digital learning material development, enabling students to master multimodal composition skills essential for contemporary English teaching.

D. CONCLUSION

This study concludes that Project-Based Learning (PBL) can significantly improve students' ability to develop digital learning materials, especially when converting printed English textbooks into interactive flipbooks. The experimental group showed a clear improvement, with a gain of 18.95 points in material development and a 20.7-point increase in digital literacy, both much higher than the control group. These results show that PBL, supported by multimedia creation tasks, helps students build stronger multimodal and digital skills compared to traditional printed-material instruction.

In addition, this study provides new empirical evidence by showing a statistically significant difference between the groups ($t = 3.52$, $p < 0.05$) and a large effect size ($d = 0.86$). This means that hands-on digital production through PBL is highly effective in strengthening students' instructional design abilities. The findings support the use of PBL-based digital projects in English education programs and suggest that this approach can better prepare students for technology-rich teaching environments. Future research may explore other digital platforms, examine long-term impacts on teaching practice, or use larger samples from different institutions to increase the general usefulness of the findings.

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