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EXPLORING SCAFFOLDED ASSESSMENT IN RESEARCH-BASED PROJECT CLASSES: A QUALITATIVE PERSPECTIVE ON STUDENT AND LECTURER EXPERIENCES

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Abstract

This study investigates the benefits and challenges of implementing scaffolding strategies in research-based project classes at Esa Unggul University. The participants consisted of 37 undergraduate students enrolled in a research class focused on producing academic research articles. Using a qualitative case study approach, data were collected through semi-structured interviews and analyzed using thematic analysis to explore students' experiences with scaffolding throughout the research project process. The findings revealed that scaffolding enhanced students' critical thinking, time management, academic motivation, and ability to use feedback effectively. Structured support mechanisms—such as critical questioning, phased assignments, and staged feedback—enabled students to engage more deeply with complex research tasks and fostered the development of independent learning skills. However, several challenges emerged, including high cognitive load, unclear scaffolding instructions, difficulty applying feedback, and student overreliance on lecturer guidance. These results suggest that while scaffolding is a powerful instructional strategy, its effectiveness depends on intentional, flexible, and well-sequenced design that supports both structure and autonomy. This study contributes to instructional design by offering practical insights into how scaffolding can be optimized to meet the diverse needs of learners in higher education research setting.

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INTRODUCTION

Scaffolding, rooted in Vygotsky's Zone of Proximal Development (ZPD), is an instructional strategy that supports students as they progress through tasks beyond their independent capabilities. The ZPD refers to the distance between what learners can achieve on their own and what they can accomplish with guidance from a more knowledgeable individual, such as a teacher or peer. Scaffolding operates within this zone, providing structured support through techniques like modeling, feedback, and breaking tasks into manageable parts (Van de Pol et al., 2010) . As learners develop skills and understanding, the level of support is gradually reduced, promoting independence and deeper comprehension. Research shows that scaffolding enhances engagement, critical thinking, and problem-solving by encouraging active learning and collaboration(Belland, 2014). The method not only helps students grasp challenging concepts but also allows them to apply these skills in new contexts, ultimately fostering long-term retention and competence (Sawyer, 2005). Studies confirm that scaffolding within the ZPD is effective across various educational levels and

subjects, making it a versatile and impactful tool in teaching practice (Margolis, 2020; Shabani et al., 2010; Xue, 2023).

Scaffolding has proven effective in enhancing student engagement, motivation, and skill acquisition across a variety of educational settings, from language learning to STEM disciplines. For instance, scaffolding techniques have been shown to significantly improve student motivation and engagement in language acquisition, helping learners progressively develop language skills with structured support (Talitha et al., 2023). In STEM education, scaffolding fosters higher-order thinking and problem-solving skills, especially when integrated with collaborative learning and e-learning environments (Zheng et al., 2018). Additionally, computer-based scaffolding has been found to effectively enhance students' cognitive outcomes in problem-based learning scenarios across various STEM contexts (Belland et al., 2017). These findings highlight the versatility of scaffolding in improving both academic achievement and motivation in diverse learning environments.

Scaffolding, by breaking down complex tasks into smaller, manageable components, allows students to focus on mastering each part of the task sequentially, leading to independent problem-solving and task completion. Research shows that scaffolding strategies like task-supported and self-monitoring scaffolding enhance problem-solving skills by supporting learners' ability to represent problems, develop solutions, and monitor progress (Shin & Song, 2016). Additionally, using scaffolding in complex learning environments, such as mathematical modeling or distributed systems design, promotes student autonomy and helps them tackle intricate problems step-by-step (Feldgen & Clua, 2013; Stender & Kaiser, 2015) .

In Project-Based Learning (PBL), students engage in real-world, complex tasks that demand critical thinking, collaboration, and self-direction. Due to the open-ended nature of PBL, students often face challenges in navigating the tasks, which can lead to frustration or disengagement. Scaffolding within PBL offers structured guidance at critical points, enabling students to build confidence and develop skills incrementally. For instance, computer-based scaffolding in a project-based programming course significantly improved both high- and low-achieving students' performance by reducing frustration and enhancing motivation through structured support (Peng et al., 2022) . Additionally, scaffolding has been shown to help students manage complex problems in distributed systems design by integrating structured feedback, peer-review, and expert guidance to improve problem-solving skills and reduce cognitive overload (Feldgen & Clua, 2013).

Research classes, particularly in higher education, often present significant challenges for students as they are required to undertake complex, independent research projects. This process involves multiple steps, such as defining research problems, conducting literature reviews, designing methodologies, analyzing data, and presenting findings, which can be overwhelming for students, especially those new to research. Scaffolding can provide much-needed support by breaking down these tasks into manageable components and guiding students through each step. Research shows that using scaffolding, such as providing models, guiding feedback, and structured tasks, enhances student understanding and confidence in completing research projects. For example, implementing scaffolded assignments in research methods courses has been shown to improve students' ability to engage critically with research processes and overcome anxiety related to independent research (Fisher & Justwan, 2018; Manarin et al., 2016).

Scaffolding is essential in research classes as it provides structured support that guides students through each phase of the research process, from defining research problems to

analyzing data and presenting findings. This approach helps prevent students from becoming overwhelmed by complex tasks, fostering confidence and independence in conducting research over time. Research demonstrates that scaffolding in research classes, such as guided feedback, structured assignments, and clear frameworks, improves students' understanding of the research process and their ability to complete projects independently (Clear, 2014; Manarin et al., 2016).

Despite the acknowledged importance of scaffolding in facilitating learning, there is still a lack of clear understanding of how scaffolding assignments are structured within research classes that utilize project-based learning (PBL). In PBL, where students face complex, open-ended tasks, scaffolding becomes essential to guide students through phases such as research proposal writing. Studies suggest that scaffolding in these settings, when aligned with student needs, involves systematic frameworks, technology-friendly approaches, and incremental stages of support. For example, scaffolding used in PBL can enhance students' autonomy and research skills while addressing difficulties such as content or grammar in research writing tasks (Padmadewi et al., 2023). However, more nuanced research is necessary to explore the specific demands of independent research in such contexts.

Although scaffolding is widely recognized as an effective tool in research classes, there is limited research on how students experience and respond to scaffolded research tasks within project-based learning (PBL) environments. For instance, while many students prefer scaffolded projects due to the reduced stress and better time management it offers, others express concern that scaffolding can sometimes increase anxiety by creating more pressure or altering their perception of the project. Research indicates that breaking down projects into manageable parts can mitigate procrastination and enhance mental health, but challenges like maintaining motivation and navigating complex tasks still persist (Lopez et al., 2023). Additionally, some studies highlight that students often struggle with using scaffold prompts effectively, which can lead to incomplete responses and frustration during collaborative tasks (Belland et al., 2019). Hence, This study addresses these gaps by investigating both the **implementation of scaffolding assignments** and the **student experiences** within a research class that utilizes project-based learning.

The significance of this study lies in its contribution to instructional design, student learning outcomes, and the existing body of knowledge on scaffolding in education. By providing insights into the most effective ways to structure scaffolding assignments in research classes, the findings will inform instructional design practices in research-focused courses and enhance the integration of scaffolding in project-based learning environments. Additionally, by identifying the challenges and successes students experience with scaffolded research tasks, the study will offer practical recommendations for lecturer s to better support student learning. This understanding will help educators refine their teaching methods to ensure that students develop the necessary skills for conducting independent research. What distinguishes this investigation is its dual emphasis on the lived experiences of students and the pedagogical rationale behind scaffolding design, offering a more comprehensive perspective than studies that focus solely on learner outcomes. Finally, this study addresses a research gap by offering a deeper understanding of how scaffolding assignments can be effectively designed and implemented in research classes to support student learning in complex, research-oriented projects. To guide this investigation, the study addresses the following research questions:(1) What are the perceived benefits of scaffolding strategies in supporting student learning within a research-based project class? (2) What challenges do students encounter in engaging with scaffolded assignments during the research process?

Literature Review

Challanges Scafolding Assessment

Scaffolding in assessment presents several challenges that educators must navigate to ensure its effectiveness in supporting student learning. One of the primary difficulties lies in balancing the level of support provided with the need for student autonomy. Over-scaffolding can lead to excessive dependence on guidance, reducing students' ability to develop independent problem-solving skills and limiting their capacity for self-directed learning (Cheng et al., 2015). Conversely, under-scaffolding can leave students feeling lost and unable to progress through complex learning tasks without sufficient support (Rienties et al., 2012). Additionally, the fading process, which involves gradually removing scaffolds as students gain competency, must be timed correctly to avoid creating a learning gap between guided instruction and independent application (Schlagwein, 2015; Stanier, 2015).

Beyond balancing autonomy, scaffolding also presents practical implementation challenges, particularly in higher education settings. One major issue is the significant time and effort required from lecturer s to design, implement, and adjust scaffolding strategies to meet student needs (Kruiper et al., 2022). Individualized scaffolding, which is crucial for student success, is difficult to maintain in large classrooms, where teachers may struggle to provide personalized guidance and real-time feedback (Dewi et al., 2023). Moreover, many educators lack sufficient training or expertise in implementing scaffolding techniques effectively, leading to inconsistencies in how scaffolds are applied across different courses and disciplines (Evenddy et al., n.d.).

Another challenge with scaffolding in assessment is ensuring that it aligns with grading practices and provides fair evaluations of student learning. Scaffolding can complicate the grading process, as assessments may not accurately reflect a student's independent abilities if too much support is provided (Pero & Marcotte, 2019). Additionally, students often struggle to transfer scaffolded learning to unstructured or real-world problems when assessments do not effectively transition from guided to independent tasks (Renken et al., 2016). In formative assessments, there is also a risk of providing too much assistance, which may prevent lecturer s from accurately gauging students' actual levels of competence (Kruiper et al., 2021).

Student motivation and resistance to scaffolding also pose challenges in assessment. While scaffolding is designed to support learning, some students resist it, particularly when it requires more self-regulated learning and increased cognitive effort (Kim, 2020). Motivation varies among learners, and students with low intrinsic motivation may not engage with scaffolded tasks as intended (Nguyen, 2013). Additionally, peer scaffolding in group assessments can lead to disparities in feedback quality, as students at different levels of proficiency may provide inconsistent support (Lee, 2016) .

Lastly, technology and adaptive scaffolding present unique challenges in modern education. Technology-based scaffolding requires significant lecturer expertise and training to be effectively integrated into courses (Evenddy et al., n.d.). Adaptive scaffolding, which involves adjusting support based on student progress, remains difficult to implement due to the challenge of real-time assessment and instructional adjustments (Kim, 2020). Furthermore, some scaffolding models are too rigid, failing to accommodate the diverse learning needs of students, particularly those with different levels of prior knowledge (Dewi et al., 2023).

Benefits Scafolding Assessment

Scaffolding in assessment provides numerous benefits, enhancing students' learning experiences and academic performance by offering structured support that facilitates their transition from novice to independent learners. One of the primary advantages of scaffolding is its ability to help students manage complex, unstructured tasks, particularly in problem-based and inquiry-driven learning environments. By breaking down intricate assignments into

manageable steps, scaffolding allows learners to gradually develop competence and confidence in tackling academic challenges. Research has shown that scaffolding fosters the development of higher-order thinking skills, such as analysis, synthesis, and evaluation, enabling students to engage more deeply with the learning process and apply their knowledge to real-world contexts (Dewi et al., 2023; Stanier, 2015). Moreover, scaffolding is particularly beneficial in competency-based assessment, where students progress through different stages of skill acquisition with guided support, ultimately fostering greater autonomy(Krishnan, 2021; Pero & Marcotte, 2019).

In addition to cognitive benefits, scaffolding in assessment also promotes student engagement and motivation by providing structured learning experiences tailored to individual needs. The gradual release of responsibility encourages self-regulated learning, allowing students to take ownership of their educational progress while still receiving necessary support along the way (Krishnan, 2021; Saint et al., 2024). This approach is particularly effective in formative assessment contexts, where ongoing feedback and adaptive teaching strategies help sustain student interest and engagement (Diaferia et al., 2018; Kruiper et al., 2022). Additionally, scaffolding has been found to be particularly effective in language assessments, where students benefit from structured support in reading comprehension, storytelling, and complex linguistic tasks (Choi et al., 2019).

Furthermore, scaffolding plays a crucial role in refining assessment and feedback strategies, ensuring that students receive timely, actionable insights to guide their learning. Effective scaffolding frameworks integrate structured assessment tools, such as rubrics and guided reflection activities, which enhance student comprehension and performance (Callison et al., 2019; Kruiper et al., 2022). By fostering a continuous cycle of feedback and improvement, scaffolding allows students to develop essential metacognitive skills that enhance both immediate learning outcomes and long-term knowledge retention. Research has shown that scaffolded learning strategies improve skill transfer, ensuring that students can apply their acquired knowledge beyond the classroom environment(Belland, 2017).

RESEARCH METHOD \

Research Design

This study adopts a qualitative case study design to explore how scaffolding assignments are implemented in a research class utilizing Project-Based Learning (PBL). A case study approach is particularly well-suited for gaining an in-depth understanding of a specific educational phenomenon within its real-life context, making it appropriate for examining the scaffolding process as it naturally unfolds in classroom practice (Creswell, 2018).The selected case focuses on a single undergraduate research methodology class in the English Language Education program at Esa Unggul University, in which students are required to produce academic research proposals and articles as their final projects. The study was conducted over the course of one academic semester (approximately 16 weeks), during which students completed a series of scaffolded research tasks, including topic formulation, literature review, methodology design, and data analysis planning. This time frame allowed for a full observation of how scaffolding evolved throughout the different stages of the research process and how students responded to the structured support mechanisms in place.

A purposeful sampling strategy was used to select participants who were actively enrolled in the course and engaged in scaffolded project work. This approach ensured that the sample was directly relevant to the phenomenon under investigation. The participants included 37 undergraduate students with varied levels of research experience, allowing for exploration of both common patterns and individual differences in how scaffolding was experienced. The lecturer of the course was also included to provide insights into the pedagogical intentions and challenges behind the scaffolding design. The exploratory nature of the study aims to uncover both the structure of scaffolding assignments and the challenges

and successes students encounter throughout the research process. Through this design, the study reveals how scaffolding supports students at different stages—from topic selection to data analysis—and identifies potential gaps in the scaffolding framework. These findings are intended to inform instructional practice, offering guidance on how scaffolding can be tailored to meet the needs of students in complex, research-oriented learning environments while promoting autonomy and competence.

Participants

The participants for this study consisted of students enrolled in a research methodology class within the English Language Education undergraduate program at Esa Unggul University. This class was purposefully selected due to its structured use of Project-Based Learning (PBL) and its deliberate implementation of scaffolded assignments throughout the research process—making it a highly relevant context for examining how scaffolding supports student learning in research-oriented environments. A total of 37 undergraduate students participated in the study. The students were in their sixth semester, a stage at which they are typically required to begin producing academic research proposals and preparing for thesis-level work. The demographic profile of the group included 23 female and 14 male students, providing a gender-balanced sample that allowed for observations on how scaffolding may be experienced across diverse learner profiles. Participants had varied levels of prior research experience: some had completed earlier coursework related to academic writing, while others were engaging in structured research tasks for the first time. This diversity enabled a more comprehensive analysis of how students with different research competencies engage with scaffolding.

To explore how scaffolding functions across a range of learner abilities, the study included both high-performing and low-performing students based on course progress and lecturer observations. This allowed for comparative insights into how structured support impacts learners with different levels of academic preparedness and motivation. In addition to the students, the lecturer of the course was also included as a participant. The lecturer's perspectives were critical in contextualizing the pedagogical rationale behind the scaffolding strategies, as well as the practical challenges involved in implementing them. Their insights helped triangulate student responses and added depth to the understanding of instructional design and delivery within the PBL framework. Together, the combination of student and lecturer perspectives offers a rich, multifaceted view of how scaffolding assignments operate in a real-world, project-based research class, contributing to a deeper understanding of effective instructional strategies in higher education.

Instrument of the Research

This study employed semi-structured interviews as the primary data collection instrument to explore the experiences of both students and lecturer s with scaffolded assignments in a project-based research class. Semi-structured interviews were chosen for their balance between flexibility and structure, allowing participants to elaborate on their experiences while ensuring that core themes related to scaffolding were consistently addressed across interviews. Separate but thematically aligned interview guides were developed for students and lecturer. For students, questions focused on their perceptions of the scaffolding process, the types of support they received, challenges encountered, and the extent to which scaffolding helped them gain independence in conducting research tasks. For lecturer, questions explored their rationale behind scaffolding strategies, challenges in implementation, and their evaluation of students' progress and research competence over time. To enhance methodological rigor, the interview protocols underwent a pilot phase. Draft questions were first tested with a small group of students and one lecturer not involved in the actual study but with similar backgrounds. Based on feedback from this pilot, several

questions were refined for clarity, relevance, and depth. Revisions included rewording ambiguous items, reordering questions to promote a more natural flow, and adding prompts to elicit richer responses.

Additionally, the interview protocols were reviewed by two expert colleagues in qualitative research and educational methodology to ensure content validity. Their feedback informed further adjustments, helping to align the questions more closely with the study's research objectives and theoretical framework. This process contributed to the credibility and trustworthiness of the instrument design. The interviews was conducted in either Indonesian or English, depending on the participants' preference, and will be audio-recorded with consent to support accurate transcription and analysis.

Data Collection and Analysis Procedure

The data collected from semi-structured interviews were analyzed using thematic analysis, based on the six-phase model proposed by Braun and Clarke (2006). This method was selected for its flexibility and suitability in exploring complex experiences such as scaffolding in a project-based learning (PBL) environment. The analysis began with a process of familiarization, during which all interview recordings were transcribed verbatim and read repeatedly to gain a deep understanding of the content. Initial impressions and potential patterns were noted to guide further analysis.

The coding process was facilitated using ATLAS.ti, a qualitative data analysis software that allowed efficient management, organization, and retrieval of data segments. Coding employed both inductive and deductive approaches. Inductive codes emerged naturally from the data, allowing unexpected insights to surface, while deductive codes were guided by prior research on scaffolding and PBL, particularly focusing on themes such as the balance between support and autonomy, types of scaffolding techniques, peer collaboration, and the evolution of student independence. These codes were then grouped into broader thematic categories reflecting key patterns relevant to the research questions. Themes were refined through a process of review and comparison, ensuring internal coherence and consistency with the data. When necessary, overlapping or ambiguous themes were redefined or merged. Each theme was given a clear definition and, where appropriate, divided into subthemes to reflect nuanced distinctions in participant experiences. Themes such as "scaffolding as structured guidance," "evolving student independence," and "peer-based scaffolding dynamics" were particularly salient. The analysis also paid close attention to differences between high-performing and low-performing students, enabling the study to examine how scaffolding strategies impacted learners with varying levels of research proficiency.

To ensure the trustworthiness of the analysis, several strategies were employed. Peer debriefing was used to challenge the researcher's interpretations and reduce potential bias. An audit trail was maintained to document analytic decisions throughout the process, ensuring transparency and replicability. Member checking was also conducted with selected participants to confirm the accuracy of interpretations and ensure that the themes resonated with their actual experiences. Furthermore, the study triangulated data from both student and lecturer interviews to provide a more comprehensive understanding of how scaffolding was experienced and implemented in the research class.

RESEARCH FINDINGS AND DISCUSSION

Research Findings

Benefits of Scaffolding Assignment in Research Class

The interview results confirmed that scaffolding contributed significantly to improving students' critical thinking skills. Students who were provided with critical questions in literature analysis tasks reported that they not only read and understood the content of the articles but also began to question the methodology and the validity of the research findings.

One respondent stated, *"In the task of critiquing research articles, the scaffolding from the lecturer , in the form of critical questions, helped me not only read but also question the methodology and the arguments used by the article's author. This really enhanced my critical thinking skills."* Additionally, the checklists and evaluation rubrics provided in scaffolding encouraged students to assess studies more systematically, helping them identify aspects that needed questioning or strengthening. Another respondent emphasized that without scaffolding, they tended to read descriptively without conducting further analysis. *"I found it hard to think critically when I first read articles, but with the guiding questions from the lecturer , I started to see what I could critique,"* said one respondent. Therefore, it can be concluded that scaffolding provided the structure that enabled students to develop critical thinking skills in evaluating research.

Moreover, scaffolding also played a role in enhancing students' planning and learning management skills. Respondents reported that with clear stages in their research tasks, they were able to manage their time better and avoid feeling overwhelmed by large assignments. One student mentioned, *"With clear milestones in the project, I could plan my study around those deadlines and allocate time for revisions based on the feedback I received."* Several other students emphasized that the breakdown of tasks into several stages with deadlines set by the lecturer helped them complete their work more efficiently. *"I usually procrastinate until the deadline approaches, but with scaffolding, I could complete the tasks more systematically and didn't feel rushed at the end,"* said one respondent. Scaffolding also proved helpful in group work contexts, where the division of responsibilities became clearer, and students found it easier to understand their contributions to the research project. One student shared, *"Without scaffolding, we often struggled to divide tasks, but with the stages set by the lecturer , it became easier for us to complete the project together."*

The interview results also revealed that scaffolding contributed to increasing students' motivation in completing academic tasks. Some respondents shared that tasks without scaffolding often felt too large and difficult to manage, which led to a lack of motivation. *"I often felt that the tasks were too big and didn't know where to start. But when the tasks were provided step by step, I felt more confident in completing them,"* said one respondent. Another respondent stated that they were more engaged in scaffolded tasks compared to those without structure. *"With clear steps, I felt more motivated because I knew what I had to do next,"* said one student. Furthermore, the feedback provided at each stage of scaffolding made students feel valued and supported in the learning process, motivating them to complete tasks more effectively. *"I'm more enthusiastic about completing tasks because I know I will get feedback before the final submission. This gives me more confidence in improving my work,"* said one respondent.

The interview results also showed that scaffolding helped students receive and utilize feedback more effectively. Students reported that with feedback provided gradually, they better understood the aspects that needed improvement and how to apply it to their tasks. *"I am more open to feedback because I know it is part of the learning process. Feedback has become something I look forward to in improving my work, not something I fear,"* said one student. Additionally, another respondent highlighted that they found it easier to understand revisions because feedback was given specifically. *"When I received feedback, the lecturer didn't just point out my mistakes but also gave examples of how to fix them. This really helped me understand how to improve the quality of my tasks,"* shared one respondent. Scaffolding also allowed students to revise their work more systematically as they could apply the feedback directly at each task stage. One student mentioned, *"In the research proposal task, I received structured feedback showing where I needed to clarify the hypothesis and add more supporting evidence. By following that feedback, I was able to strengthen my proposal and make it more convincing."*

Overall, the interview results confirmed that scaffolding had a significant impact on students' learning processes, improving their critical thinking skills, time management, academic motivation, and the effective use of feedback.

Challenge of Scaffolding Assessment in Research Class

Based on , several key challenges emerged in the implementation of scaffolding within research-based project classes. The most frequently reported issue was high cognitive load (26 respondents), indicating that students often felt overwhelmed by the complexity of tasks, especially during data analysis and methodology development. Difficulty understanding instructions was noted by 21 respondents, with students expressing confusion over vague or overly general guidance despite structured support. Additionally, limited ability to apply feedback was identified by 17 respondents, as some students struggled to interpret or revise their work effectively based on the feedback provided. Lastly, overdependence on lecturers was reported by 15 participants, revealing a reliance on constant lecturer support that hindered the growth of independent research skills. These findings emphasize the need for more targeted and phased scaffolding strategies that balance guidance with autonomy-building, particularly in higher education research settings.

Although scaffolding provides many benefits in supporting students' learning processes, interview results indicated that students still face various challenges in completing their research tasks under guidance. These challenges include difficulties in understanding scaffolding instructions, limitations in applying feedback, excessive dependence on lecturer support, and high cognitive load in completing complex research tasks.

One of the main challenges students faced was difficulty in understanding the scaffolding instructions given by the lecturer . Some students stated that although scaffolding was designed to provide gradual guidance, the instructions were sometimes still too general or not specific enough in explaining what they were supposed to do. *"Sometimes, I feel like the instructions given in scaffolding are still too broad. I'm still confused about how to apply the steps to my own research,"* said one respondent. Another student shared that they often felt the need to ask for additional clarification from the lecturer or peers to ensure they understood each step correctly. *"I often reread the guidelines, but I'm still not sure if I've done it correctly,"* said another student.

Moreover, students also faced difficulties in applying the feedback given during the scaffolding process. Although feedback from the lecturer helped them improve their assignments, some students felt that the feedback they received was sometimes too abstract or not specific enough in explaining how they should make the improvements. *"I got feedback saying I should clarify my argument in the essay, but I still don't know how to do it properly,"* one respondent said. Another student added that they often struggled to connect feedback from earlier stages with their ongoing work. *"After receiving feedback, I try to improve my task, but I'm still not sure if the improvements align with the lecturer 's expectations,"* said one student.

Excessive reliance on lecturer support was also a challenge in the scaffolding learning process. Some students felt that because they were used to receiving guidance at every stage of the task, they became less confident in making decisions independently. *"I feel that scaffolding is very helpful, but I also feel more dependent on the lecturer . I often wonder if I can complete the task without the same level of guidance,"* said one student. Additionally, another student mentioned that they often waited for feedback from the lecturer before continuing their work, which could slow down their research process. *"I'm more comfortable when the lecturer gives direct guidance, but when I have to continue on my own, I feel hesitant and tend to procrastinate,"* said one respondent.

Another challenge students faced was the high cognitive load in completing complex research tasks. Although scaffolding was designed to help break tasks down into smaller

steps, some students still felt overwhelmed by the amount of information they had to manage in their research. *"The research task has so many aspects to think about—from literature to data analysis. Even though there's scaffolding, I still feel that the task is very large and hard to manage,"* said one student. Another student added that although scaffolding helped them understand the steps of the research, they still struggled to integrate all the stages into one cohesive project. *"I can do each stage well, but when it comes to putting everything together into one research report, I still feel confused,"* said one respondent.

Overall, although scaffolding provides many benefits in supporting students with their research tasks, there are still challenges that need to be addressed. Difficulties in understanding instructions, limitations in applying feedback, dependence on the lecturer , and high cognitive load are the main obstacles students face. Therefore, the development of more flexible and adaptive scaffolding strategies can help students overcome these challenges and improve the effectiveness of project-based learning.

Discussion

The interview results confirmed that scaffolding plays a vital role in enhancing students' learning processes, a conclusion that is strongly supported by existing research. First, scaffolding was found to significantly improve students' critical thinking skills. Structured guidance through critical questions helped students move beyond mere comprehension to deeper analysis and evaluation of research articles, a finding consistent with previous studies that demonstrated how scaffolding prompts and modeling foster higher-order thinking skills (Browne et al., 2009) and promote critical engagement through peer assessment structures (Barahona et al., 2023). Additionally, scaffolding contributed to students' time management and task organization skills.

Respondents noted that breaking down complex assignments into smaller, manageable stages allowed them to plan their work systematically and reduce feelings of being overwhelmed, aligning with research findings that effective scaffolding structures significantly enhance students' ability to manage workload and deadlines (Erdil, 2017). Scaffolding was also shown to increase students' academic motivation, with respondents emphasizing that step-by-step guidance made tasks feel more achievable and encouraged greater engagement, a result mirrored in studies linking scaffolded learning to higher motivation and commitment to academic tasks (Hotea & Turda, 2024). Furthermore, scaffolding improved students' ability to receive and utilize feedback effectively. Students reported that staged feedback allowed them to understand and apply revisions more confidently and systematically, consistent with research emphasizing that scaffolded feedback enhances students' feedback literacy and promotes continuous improvement (Rad & Mirzaei, 2024; Rodgers, 2019). In conclusion, both the interview findings and the broader research literature demonstrate that scaffolding is a highly effective instructional strategy for enhancing critical thinking, time management, motivation, and feedback utilization among students.

Furthermore, The interview results highlight several significant challenges in implementing scaffolding strategies in higher education project-based learning environments, and these findings are strongly reflected in existing research. One major issue identified was students' experience of high cognitive load, where the complexity of research tasks overwhelmed learners despite the intended benefits of scaffolding. This aligns with findings by Appiah-Twumasi (2024), who demonstrated that scaffolding can reduce cognitive load if appropriately phased but also noted that when tasks remain complex, students can still experience significant mental strain. Another frequent challenge was the difficulty students faced in understanding scaffolding instructions. Even when support was available, vague or overly general guidance led to confusion, a challenge echoed by Stanier (2015), who emphasized that in higher education, scaffolding must be carefully designed to promote

metacognitive and strategic skills, not just procedural tasks. Additionally, many students struggled with applying feedback effectively during the scaffolded process. Cook et al. (2020) found that without specific structures to encourage reflection on feedback, students often failed to meaningfully engage with or act on it, suggesting the need for explicit scaffolds for feedback reflection.

Finally, overdependence on lecturer s emerged as a concern. Students' reliance on frequent guidance hindered the development of independent learning skills. Stanier (2015) also noted that the fading of scaffolds—the gradual removal of support—is particularly difficult to implement in higher education and, if not carefully managed, can leave students dependent rather than autonomous. Overall, these findings emphasize that although scaffolding is a valuable educational strategy, its design and application must be highly adaptive, moving students progressively toward independence while minimizing cognitive overload, clarifying instructions, supporting reflective feedback practices, and carefully planning the fading of support structures.

Beyond reaffirming existing literature, the findings of this study offer novel insights into the nuanced implementation of scaffolding within project-based learning (PBL) contexts, particularly in higher education research classes. While prior studies have largely focused on the cognitive and motivational benefits of scaffolding, this study highlights the importance of sequencing and contextualization in scaffold design—specifically, how aligning scaffolds with the evolving research competencies of learners can significantly enhance engagement and autonomy. Furthermore, the dual perspective of students and lecturer s provides a more holistic understanding of scaffolding as a dynamic, relational process, rather than a static instructional tool. This research emphasizes the need for adaptive scaffolding models that respond not only to task complexity but also to learners' fluctuating confidence, self-regulation, and capacity to act on feedback.

By foregrounding the challenges of fading support, miscommunication, and feedback uptake, the study also contributes to the emerging discourse on scaffolded metacognitive training, suggesting that PBL lecturer s should integrate explicit strategies for feedback reflection, instruction clarity, and gradual release of responsibility. These contributions underscore the potential of scaffolding not merely as a support mechanism, but as an intentional pedagogical architecture that fosters sustained learner growth in complex, inquiry-driven environments.

CONCLUSION

The findings of this study affirm that scaffolding is a highly effective instructional strategy in research-based classes, significantly enhancing students' critical thinking, time management, academic motivation, and capacity to utilize feedback. Structured guidance, critical questioning, phased assignments, and formative feedback were found to promote deeper engagement with research processes, foster systematic work habits, and build greater student confidence in academic tasks. However, alongside these benefits, the study also uncovered key challenges that complicate the implementation of scaffolding. Students frequently experienced high cognitive load, difficulty in understanding instructions, limited ability to apply feedback effectively, and overdependence on lecturer support. These obstacles highlight that while scaffolding can support student learning, it must be carefully and adaptively designed. Effective scaffolding strategies should provide clear, specific guidance, promote reflective feedback practices, and gradually develop student autonomy by systematically reducing support over time.

Future instructional designs must focus on balancing structured support with opportunities for independent learning, ensuring that scaffolding not only aids task completion but also builds the critical, self-regulatory skills necessary for success in complex research projects. To extend the contribution of this study, future research could explore how

scaffolding impacts different student profiles—such as novice vs. advanced researchers or students with varying levels of academic self-efficacy. Longitudinal studies are also needed to examine how scaffolded research instruction affects students' independent research performance over time. Additionally, pedagogical innovations such as technology-enhanced scaffolding (e.g., adaptive digital feedback systems, self-paced learning modules, or AI-supported writing assistants) may offer new avenues for improving both scalability and personalization in PBL environments. Integrating these approaches could further optimize scaffolding strategies to meet diverse learner needs in higher education contexts.

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