



Project-Based Learning and High-Quality Teaching: Student Challenges and Scaffolding

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Abstract: This case study delves into project-based learning (PBL) and high-quality teaching as conceptualised by OECD (2025), with the aim of identifying effective pedagogical strategies for PBL implementation. By examining the challenges faced by students and their responses to both teacher and peer scaffolding within a tertiary teaching context, the study unfolds a rich narrative. Data collection, spanning an entire semester, encompasses a range of sources, including student artefacts produced at various stages of the project, their data documentation files, and the teacher's reflective teaching journal. Data analysis was carried out using the thematic analysis approach. By exploring in depth the complex interplay between PBL and high-quality teaching, the research offers new perspectives for the pedagogical design, implementation, and evaluation of PBL. The key findings have been translated into a three-dimensional model of PBL scaffolding, that is, methodological, emotional, and informational scaffolding. An important finding of this study is that student support and collaboration is as essential as teacher scaffolding in the successful implementation of PBL. The implications also extend to strategies for enhancing data and digital literacy of tertiary learners.

Keywords: project-based learning (PBL), high-quality teaching, scaffolding, cognitive engagement, data literacy, digital literacy

1. Introduction

With the growing emphasis on developing students' 21st century skills, such as collaboration skills, critical thinking, and problem-solving (Kennedy & Sundberg, 2020), project-based learning (PBL) has emerged as a prominent global educational trend that is being widely implemented and promoted in schools of various levels. OECD (2025) recently dissected the intricacies of effective teaching and identified five central goals for high-quality teaching: ensuring cognitive engagement, developing high-quality subject content, providing social-emotional support, promoting classroom interaction, and using formative assessment and feedback. Interestingly, these benchmarks are closely aligned with the core tenets of PBL, which by its very nature demands students' intense cognitive engagement as they strive to solve authentic real-world problems (Morgan, 1983). In the process of knowledge construction within the PBL framework, students not only engage with the subject matter, but also refine and deepen their understanding of context-specific knowledge. Furthermore, the collaborative nature of PBL and its reliance on formative assessment (Thuan, 2018) directly aligns with the goals of promoting classroom interaction and utilising ongoing assessment and feedback. However, recent empirical research has highlighted several challenges

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associated with PBL implementation. For instance, students often struggle with issues such as negative emotionality towards working in teams (Huércano, 2021), psychological barriers related to academic inquiry (Mahmud & Islam, 2022), and teamwork conflicts (Mohamad & Tamer, 2021). These findings accentuate the critical importance of integrating social-emotional support, one of the key educational goals outlined by OECD (2025), into PBL practices to ensure students' holistic development and well-being.

Emotional scaffolding, inspired by Vygotsky's (1978) concept of scaffolding, weaves in the recognition of the crucial role of emotions in the learning process (Park, 2016). As defined by Rosiek and Beghetto (2009), it is specifically designed to shape students' responses to new ideas and learning experiences and emphasises the importance of teacher planning, monitoring and intervention in relation to students' emotional responses. Empirical research has demonstrated its effectiveness. For example, Alavi and Esmailifard's (2021) study shows that emotional scaffolding can significantly reduce elementary English as a foreign language (EFL) learners' anxiety and increase their engagement in learning. Park et al (2020) introduced a comprehensive three-part framework for implementing emotional scaffolding in early childhood education. This framework includes teachers' anticipation of students' emotional responses, the use of verbal and non-verbal cues to support emotional regulation, and the integration of emotional scaffolding into lesson planning. While this study has advanced our understanding of emotional support in early childhood settings, strategies specifically tailored to provide emotional scaffolding for tertiary students and how students themselves can provide social-emotional support to each other remain largely unexplored.

Improving the rigour of PBL is another key issue that educators need to address. To effectively increase the quality and depth of PBL, teachers can draw on the recommendations outlined by OECD (2025), particularly by focusing on increasing students' cognitive engagement. This approach is not only consistent with established pedagogical principles, but also serves as a practical way to ensure that PBL experiences are intellectually challenging and educationally rewarding for students. It is also important to note that the OECD (2025) framework is policy-oriented rather than pedagogical in nature and should therefore be applied with contextual sensitivity. In a Chinese EFL setting, for instance, where educational traditions prioritise teacher authority, examination performance, and collective harmony, the OECD's emphasis on student agency and cognitive engagement may conflict with local cultural norms and students' expectations of explicit guidance. Recent studies have unveiled some challenges and benefits of engaging students in higher order thinking (Chew & Cerbin, 2021; Sekwena, 2023) and determining appropriate levels of cognitive challenge in line with cognitive load theory (Martin et al., 2021; Skulmowski & Xu, 2022). To promote authentic and deep cognitive engagement, it is suggested that teachers provide meaningful contexts and make real-world connections, for example by involving students in work- or career-related projects (O'Neill & Short, 2025). Another effective approach to increasing the rigour of PBL is to cultivate students' data literacy. Data literacy, serving as a specialised subset within the broader framework of digital literacy, focusing specifically on data-related inquiry and analysis within this larger digital context (Wolff et al., 2016). Currently, much of the existing literature on data literacy focuses predominantly on its application in science, technology, engineering, and mathematics (STEM) education or the measurement and assessment of it. There is a notable lack of research exploring specific pedagogical methods or strategies for enhancing learners' data literacy, particularly in the context of humanities disciplines.

2. Literature Review

2.1. Project-Based Learning in Foreign/Second (L2) Language Education

PBL refers to an activity in which students take responsibility for designing learning activities to solve a real-world problem (Morgan, 1983). The initial stage of PBL is to identify a driving question, which is ‘a well-designed question that students and teachers will elaborate, explore, and answer throughout the project’ (Condliffe, 2017, p. 3). Learners then work collaboratively seeking answers to the driving question. As a result of the inquiry, students produce tangible artefacts or solutions to the driving questions (Guo et al., 2020). If the inquiry has an academic character, for example, a long-term activity that involves developing a research plan and questions, collecting and analysing data through empirical or documentary research, and reporting findings orally or in writing, the project is research-oriented (Beckett, 2002). When applied to L2 teaching, students often take responsibility for their learning by collecting, processing and reporting information from target language resources and constructing knowledge or real-world products as a result of PBL (Cahyono et al., 2024).

From a pedagogical perspective, the successful implementation of PBL requires the fulfilment of several key requirements, with teachers playing multiple roles in planning, facilitating, scaffolding, and assessing learning activities. First, PBL inherently requires an extended time frame to achieve its central goal of solving real-world problems. As Ravitz (2010) highlighted, allowing sufficient time is crucial for students to engage deeply with complex tasks. Empirical evidence from Cahyono et al. (2024) suggests that a ten-week intervention period yields the most significant educational benefits compared to shorter durations of eight or four weeks. Second, instructional scaffolding serves as a cornerstone of effective PBL implementation. According to Roessingh and Chambers (2011), scaffolding involves creating opportunities for students to engage in critical self-reflection and providing constructive feedback. For instance, teachers can organise mid-project reflection sessions where students can share challenges they have encountered and receive support from peers and teachers. In this process, teachers act as dialogue facilitators, guiding students to consider different perspectives and fostering an environment for the exchange of ideas. Third, formative assessment and timely feedback are essential to maintaining students’ enthusiasm for PBL. This dynamic duo of educational tools provides students with a clear understanding of their progress and therefore empowers them to make informed adjustments to their learning strategies (Thuan, 2018). At the end of the project, teachers can help students identify authentic audiences for their work and enable them to disseminate their findings in real-world settings (Condliffe, 2017).

In recent years, PBL has emerged as a focal point in L2 teaching, with extensive empirical research on tertiary learners. Huércano (2021) found that PBL enhanced intermediate Spanish learners’ willingness to communicate, their sense of autonomy and confidence, while revealing barriers such as students’ negative responses to group work. Mahmud and Islam (2022) confirmed PBL’s benefits for learner autonomy and pragmatic language use among Bangladeshi EFL students, yet noted that even experienced teachers struggled with students’ psychological barriers. Research across educational levels has further enriched the understanding of this topic. Mouni (2022) found that Nepalese secondary EFL teachers identified learners’ personality traits as significant barriers. On a positive note, Londoño Llanos and Pedroza Parra (2024) demonstrated that PBL improved vocabulary acquisition, digital literacy, and intercultural skills among Colombian fifth graders, and continuous monitoring and contextual sensitivity were key to its successful implementation.

Taken together, these studies underscore a consistent theme: while PBL in L2 contexts offers significant pedagogical benefits, students' emotional and affective constraints remain a critical consideration. Teachers need to adopt proactive strategies, such as emotional scaffolding, to address these challenges and maximise the potential of PBL in L2 teaching.

2.2. Emotional Scaffolding in PBL

Emotional scaffolding has emerged as a critical component in the implementation of PBL to address the challenge of negative emotionality that students often experience for various reasons, as revealed in different studies. Historically, the role of emotions in education has been significantly overlooked or underestimated (Schutz & Lanehart, 2002). This oversight deserves serious attention, as Gardner (1987) warned that neglecting learners' emotional and affective factors can 'unnecessarily complicate the cognitive-scientific enterprise' (p. 6). From a pedagogical perspective, Rosiek and Beghetto (2009) argued that ignoring students' unexpected emotional responses can have detrimental consequences. Such dismissal not only deprives students of valuable learning opportunities, but also risks marginalising or alienating them within the educational environment. To avoid such consequences, scholars have introduced the concepts of affective scaffolding (Rosiek, 1995) and emotional scaffolding (Rosiek, 2003), emphasising the importance of teacher-supported interventions designed to shape students' affective and emotional responses to instructional designs and activities. As defined by Meyer and Turner (2007), emotional scaffolding involves teacher-initiated interactions aimed at fostering students' positive emotional experiences. In doing so, it facilitates students' understanding of complex concepts, increases their engagement, and enriches their overall learning experience.

In the past few years, the field of emotional scaffolding has experienced a surge of empirical research highlighting its diverse educational implications. Research has shown that emotional scaffolding offers significant benefits in a variety of educational contexts. For example, Alavi and Esmailifard (2021) found that it effectively reduced elementary EFL learners' language anxiety and increased their willingness to communicate and academic engagement. Park et al (2020) explored emotional scaffolding in early childhood education, underscoring its role in maintaining student interest. This study also revealed an ethical problem known as 'academic push down' - the practice of introducing advanced curriculum and teaching methods from upper elementary grades to early childhood classrooms. In a Chinese university setting, Zhang (2024) reported that teacher's emotional scaffolding, embodied in the emotional curves that students created to record their emotions, promoted a flexible translanguage space and a harmonious classroom climate among English majors.

Notably, although there is a growing body of research on emotional scaffolding, the existing literature is conspicuously limited in exploring strategies specifically designed for university students. This gap highlights the urgent need for more in-depth and targeted research to develop and validate effective emotional scaffolding approaches that meet the specific psychological and academic needs of tertiary learners.

2.3. Cognitive Engagement and Data Literacy

Promoting academic rigour is a key challenge for educators implementing PBL, requiring a strategic approach to facilitate student inquiry and effectively scaffold the learning process. To meet this challenge and ensure that PBL fulfils its educational potential, a clear understanding of what constitutes effective teaching is essential. OECD (2025) recently clarified the intricacies of

effective teaching by outlining five central goals for high-quality teaching. One of these is to ensure cognitive engagement. A plethora of studies have explored various dimensions of cognitive engagement. For example, based on pedagogical research, Chew and Cerbin (2021) developed a framework of nine cognitive challenges that educators need to address to ensure appropriate cognitive engagement, including mindset and emotional factors, metacognition and self-regulation, prior knowledge deficits, ineffective learning strategies, and attention and memory limitations. In order to foster learners' authentic and deep cognitive engagement, educators also need to provide meaningful contexts and make real-world connections. For example, The study by O'Neill and Short (2025) suggests that offering students work- or career-related projects is an effective approach to cognitive engagement for tertiary learners. In addition, Wang (2022) conducted a survey of 160 undergraduate English majors in China and found that research-oriented PBL can effectively stimulate students' research interest and awareness, which is crucial for tertiary learners.

Just as cognitive engagement promotes deep thinking and active processing of information, data literacy equips individuals with the tools and skills necessary to effectively interpret, analyse, and use data, thereby enhancing the quality and depth of cognitive engagement in an increasingly data-driven world. According to Wolff et al. (2016), data literacy refers to 'the ability to ask and answer real-world questions from large and small data sets through an inquiry process' (p. 23). This process involves a comprehensive set of activities, including data selection, cleaning, analysis, visualisation, and interpretation - all integral parts of a well-structured research design. Sharing overlapping competencies with statistical literacy and information literacy, data literacy gives more emphasis on the data inquiry process aimed at solving real-world questions (Cui et al., 2023). Existing literature on students' data literacy mainly focuses on its assessment (e.g., Lusiya et al., 2020; Oguguo et al., 2020; Pratama et al., 2020), or approaches to increase data literacy in STEM education (e.g., Rahmawati et al., 2020). Based on a comprehensive review of the existing literature, data literacy in EFL contexts remains significantly under-researched. Compared to data literacy, digital literacy is much broader and more inclusive, referring to the competencies and skills needed to navigate a fragmented and highly complex information ecosystem (Tinmaz et al., 2022). From the content analysis of eight international frameworks from different institutions and initiatives, such as UNESCO and OECD, Martínez-Bravo et al. (2022) identified six dimensions of digital literacy, namely critical, cognitive, social, operative, emotional, and projective dimensions. From this perspective, digital literacy and PBL are inherently linked, with the six dimensions of digital literacy being supported and enhanced by PBL in complex ways.

The present study aims to contribute to the discussion of PBL and high-quality teaching by investigating the experiences of tertiary EFL learners engaged in a project-based listening course. Specifically, through a comprehensive analysis of students' responses, reflective writings, and project artefacts, this study seeks to address the following two research questions:

RQ1: What challenges do tertiary EFL learners experience in PBL in a listening course?

RQ2: What pedagogical strategies contribute to high-quality teaching in PBL?

3. Methodology

3.1. Research Context

This study was conducted at a public university in Beijing. As an integral part of an EFL listening course, the project under investigation spanned an entire semester (four months in total). Its

evaluation was included in the students' formative assessment, accounting for 10% of the total 40% formative assessment in this course. The teacher structured the project-based learning into three distinct stages, with each stage approximately four to five weeks apart, resulting in a ten-week project duration. The tasks for each stage were outlined in a presentation that the teacher introduced during the project launch stage (see Figure 1). This session provides detailed information on the teaching procedures, task instructions, and the underlying rationale for the teaching decisions made throughout the project activities.

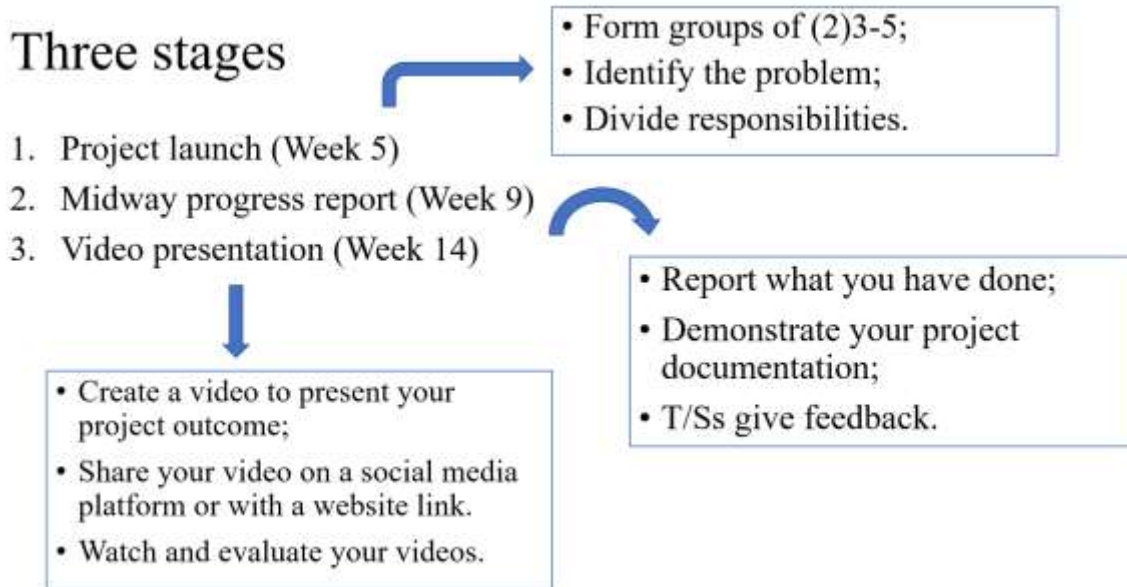


Figure 1. The three stages of the project

In the project launch session, the instructor explained the concept of PBL and guided students on how to formulate a 'driving question'. Based on the framework proposed by Krajcik and Shin (2014), the instructor systematically introduced five key criteria for developing high-quality driving questions: feasibility, value, contextuality, significance, and ethical considerations, and provided detailed explanations for each criterion. The instructor then illustrated the practical application of these principles through a real-world example, posing the question 'What can we do about packaging problems in China?'. To demonstrate the process of unpacking a driving question, the instructor outlined four critical dimensions for exploration: the root causes of the problem, relevant case studies, related regulations and policies, and potential solutions. As the project was embedded in an English listening course, its primary aim was to improve students' listening comprehension skills. Consequently, students were instructed to engage with audio or video materials relevant to their chosen driving questions and to record their reflections and insights in a shared digital document (see Figure 2). Each group was expected to add at least 10 entries to their documentation file by the end of the project.

Topic/Title	Resource/Link	Language	Thoughts/reflections
Packaging cuts food waste – but how do we solve the plastic problem?	https://www.youtube.com/watch?v=BcqYUFZOmZ4	circularity; recycling facilities; local circular economy; leverage off global network; interdependency	This is a case study about Circular Plastics Australia - what Australia is doing to deal with problems caused by plastic. Three years ago, Australia banned plastic exports (e.g., to China) and began plastic process locally. They value consulting, listening, and structuring in the process. They think finance plays a very powerful role; collaboration is a necessity; no singer player can do it on its own. The experience we can take from them: to produce recyclable products, and to create circularity.

Figure 2. The instructor's example of an entry in the project documentation

In order to ensure that students had a full understanding of the assessment parameters, the instructor explicitly outlined the assessment criteria for the final project: a three to five minute video (see Figure 3). This clarity aimed to provide students with explicit guidance on the expectations of their work, facilitating more focused project execution, and enabling them to align their efforts with the desired learning outcomes.

Content	informative	2
	inspirational	2
	engaging	2
Language	appropriate	2
	accurate	2
	fluent	2
Length	3-5 m	2
Quality	viewer-friendly (subtitle or not)	2
Collaboration	fair share of work	2
	integration of efforts	2

Figure 3. Evaluation criteria for the final project product

Following the teacher's instructions, the students proceeded to form their groups. At the end of this initial stage, each group documented key project details on a shared Word document, including the names of group members (from pairs to groups of three to five), their chosen driving question and a breakdown of individual responsibilities derived from the question unpacking process.

In the second stage, the groups presented their midway reports. This process began with students reflecting on their collaborative work through a written handout. Presenters from each group were instructed to address several critical issues in their reports: the current status of the project documentation, challenges encountered, and questions they wished to explore with their peers and the teacher. As each group presented, other students took notes on the handouts, documenting

elements they found interesting or problematic (see Appendix). After the presentation, the audience offered constructive comments and suggestions for improving the project. Group members then met to strategise next steps and recorded detailed action plans in the handout.

In the final stage, the groups presented their project videos. Peer evaluation was conducted using the criteria outlined in Figure 3. At the end of the project, students disseminated their videos in a real-world setting, for example, a social media platform.

3.2. Participants

The student participants were recruited from two first-year English listening courses: one class specialising in International Communication (coded as Class A) and another specialising in International Relations (coded as Class B), comprising 20 and 22 students respectively. The learners represented a wide range of English proficiency levels, from B1 (lower intermediate) to B2 (upper intermediate) and C1 (advanced), as defined by the Common European Framework of Reference for Languages (CEFR). These levels were determined according to the institution's internal placement test administered at the start of the academic year.

This project-based learning initiative was a fresh experience for some students, while those from educationally advanced urban centres such as Beijing and Shanghai were already familiar with the approach through their secondary education. This difference in prior exposure added an interesting dimension to the study, as it allowed for an exploration of how different levels of familiarity with PBL might influence students' engagement, performance, and overall experience. At the same time, the difference in students' learning experiences required an increased need for the teacher to provide tailored emotional scaffolding, which was essential to prevent students who were unfamiliar with PBL from feeling marginalised or left behind.

The instructor, who also acted as the researcher, had more than 20 years of teaching EFL among different levels of students. This was her first attempt to implement PBL in a tertiary level EFL course. In her previous efforts to implement PBL in secondary education, the initiatives lacked a strong research-oriented component. However, these experiences reinforced her belief in the profound impact of PBL on the holistic development of EFL learners.

3.3. Data Collection and Analysis

Triangulation as an approach to increase the credibility of research could be achieved by using multiple methods (Flick, 2017). In this study, data were gleaned from three main sources: student artifacts, student documentation files, and a reflective teaching journal. This multi-source data collection strategy provided a comprehensive view of the PBL experience from both student and teacher perspectives. Student artifacts included a range of materials, including midway report slides, initial and mid-project reflection handouts, and the final products. Documentation served as a crucial component of PBL in this study, which not only captured learners' evolving understanding of the listening materials and the driving question, but also provided a rich and introspective account of their reflections.

On the teacher's part, in the reflective teaching journal, the teacher recorded critical incidents along with her thoughts and reflections. As defined by Tripp (1994) and further elaborated by Richards and Farrell (2005), critical incidents refer to unexpected events that occur during a lesson and stimulate a deeper understanding of teaching and learning processes. These events, being unplanned and unanticipated, trigger insights into different aspects of educational practice.

Documenting and analysing such critical incidents can help teachers to engage in reflective inquiry, identify and resolve problems, and cultivate a higher level of self-awareness in their teaching. The teacher in the current study documented all the instances where students encountered problems, their expressions of confusion and the strategies she used to identify these problems or to respond to student queries.

Due to its remarkable flexibility, thematic analysis was chosen as the approach to analyse the qualitative data in this study. Nowell et al. (2017) highlighted that thematic analysis is particularly well suited to uncovering rich and nuanced insights within complex data sets. Guided by the established six-step analysis framework developed by Braun and Clarke (2006), the data analysis process unfolded in a systematic manner. This framework, consisting of data familiarisation, initial coding, identification of emergent themes, theme review and refinement, theme definition and thematic presentation, provided a structured yet adaptable roadmap for distilling meaningful patterns and interpretations from the collected data (see Table 1). Throughout the data analysis process, the researcher closely followed these steps.

Table 1. Codes, emergent themes, and final themes derived from multi-source data

Codes	Emergent themes	Final themes
Search for information, collect first-hand data, find interview participants & survey respondents, data analysis, relationships between themes, desk research, case study, official documents, integrate others' thoughts	Data literacy	Informational scaffolding
Identify the best platforms, search for relevant video resources, evaluate & synthesise audio & video materials	Digital literacy	
Find group members, communicate with group members, allocate work within groups	Collaborative skills	Emotional scaffolding
Peer feedback, exchange ideas & approaches, new perspectives, whole-class sharing, group discussion, peer evaluation	Peer support	
Self-reflection, collective reflection, cognitive interaction, metacognition development	Cognitive engagement	Methodological scaffolding
Transparency of assessment, timely feedback, ongoing guidance, methodological guidance, detailed instruction & demonstration	Teacher instruction	

4. Findings

4.1. Challenges that Students Encountered in PBL

The challenges reported by students in their midway reports were summarised and presented in Table 2. These challenges fell into two main areas: data collection methods and collaborative skills. Firstly, identifying the most effective methods of searching for information was a major challenge for almost half of the groups. Specifically, they struggled to identify the best platforms and methods for searching for relevant video resources. This could include knowing where to look (e.g., audio platforms) and how to filter the available options to get the most useful content. This problem indicated a lack of digital literacy among the students. In terms of collecting first-hand data through interviews or surveys, students encountered difficulties in finding participants, such as finding foreigners to interview to get a different perspective and widening their survey sample to get a broader understanding of the research topic. Students also faced challenges in data analysis. For example, one group found it difficult to establish relationships between themes, indicating a lack of analytical skills. Secondly, collaborative skills were another common challenge that students encountered. To be detailed, some had difficulty in finding group members; others found it difficult to communicate with group members about combining ideas and assigning tasks.

Table 2. Research topics and difficulties reported by students in the midway report

Research topics	Difficulties
Attitudes towards group collaboration	Finding group members
How to identify fake news?	Data search
How can we break the limitation brought by MBTI?	/
Why do people so easily get addicted to short videos?	Finding foreigners to interview
How can we improve food safety?	How to search video resources?
High return rate for women's clothing, but why?	/
Garbage sorting in university	/
The scientific link between sleep and learning efficiency	/
Problems of online shopping	Methods to search for information; relations between topics; a small survey sample
The process of environmental governance and management in Beijing	/

An investigation into the work situation of grassroots staff at our university	Allocation of work between group members
Traffic problems and solutions	Listening resources

The difficulties students shared in the midway report regarding social and emotional challenges were aligned with some of the critical incidents that the teacher documented in the reflective teaching journal.

In today's lesson, I noticed that Amy (a pseudonym) did not join any groups. After reminding her of the possible impact on her marks, I communicated with her as a group member. I then learnt that Amy didn't want to bend her thoughts to agree with others, so she preferred to be alone. (Reflective teaching journal, the entry about the first session in Class A)

The next day, the subject monitor informed the teacher that Amy and Betty (a pseudonym), had decided to form a group, as neither of them had yet joined a group. Interestingly, they chose 'attitudes towards group work' as the focus of their research project. In order to collect data, the pair conducted a survey of 50 university students.

In Class B, the teacher documented another critical incident related to group collaboration, which revealed the dynamics and challenges students faced when working together in PBL.

After class, Mike (a pseudonym) told me he and Jack (a pseudonym) had very different ideas about the driving question they wanted to explore: one wanted to do something about the fallen leaves on campus; the other wanted to do something bigger. After listening to their problems, I advised them to find a convergent idea, for example, something about the university's temporary workers. (Reflective teaching journal, the entry about the first session in Class B)

It turned out that they took the teacher's suggestion and found a way to work together. At the end of the project, Mike's group produced a video entitled 'An investigation into the work situation of grassroots staff at our university'. In the video, Mike did all the interviews. After playing the video, Mike explained that Jack did a lot of work 'behind the scenes'.

Interestingly, one group's project focused on 'students' attitudes toward group collaboration'. In the midway report, they presented preliminary findings based on a survey of 50 students. In response to the question 'Have you ever experienced conflict among team members during group work?', the results were: Regularly (29.52%), Occasionally (42.86%), Rarely (28.57%), and Never (19.05%). To the question 'What is the most common conflict you encounter in group work?', the top three issues they identified were poor communication (57.14%), time management challenges (28.57%), and misaligned goals (14.29%).

In the midway report session, after each group's presentation, there was time for the audience to ask questions or give suggestions. Taking this chance, some students shared strategies for searching information, such as keyword searching, content browsing, and extracting key information. Some students gave constructive feedback that prompted peers' critical reflections on their designs. For example, after presenting their plan on 'Transport problems and solutions', one group was challenged by their peers on the broad scope of the topic. Recognising the validity of this concern, the group reflected further and subsequently refined their research focus to 'traffic problems in Beijing and possible solutions', demonstrating their ability to adapt and improve their project based on peer feedback. By identifying problems in other groups' research/project design,

students engaged in self-reflection that enabled them to make necessary adjustments to their own projects.

During the final product presentation, one group presented a video on ‘misinformation’. They revealed that they had watched ‘a variety of social media videos to understand related phenomena’. Upon analysing these data, they concluded that ‘insufficient media literacy’ was a key factor in the spread of misinformation. Ultimately, the group developed a set of 5C strategies to address misinformation (see Figure 4).

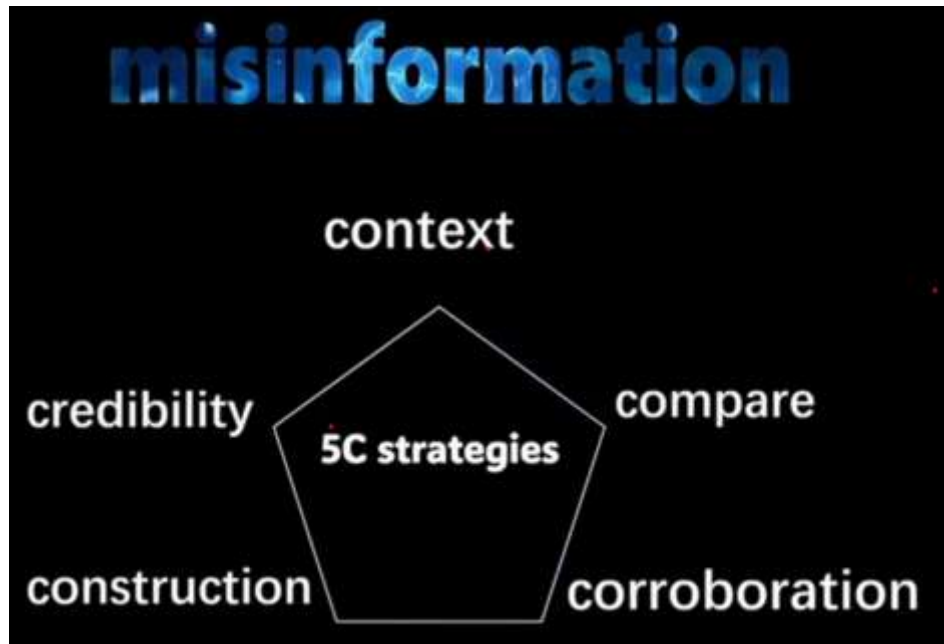


Figure 4. 5C strategies for tackling misinformation (a screenshot of one group’s final product)

4.2. Student Responses to Teacher and Peer Scaffolding

Inspired by the instructor’s guidance (see the demonstration example in Figure 2), several groups showed a remarkable ability to unpack their ‘driving questions’. In addition, these groups effectively distributed tasks among members, drawing on each individual’s strengths to ensure a well-coordinated approach to the project. This facilitated a more efficient workflow and promoted collaborative learning within the groups.

Regarding data collection, several students shared that they were inspired by their peers’ presentations during the midway reports. This exchange of ideas and approaches proved to be valuable, providing new perspectives and strategies for collecting relevant data. In the end, all groups successfully submitted their documentation files on time. Following the format recommended by the teacher, their submissions were well organised and consistent.

In the project launch session, the teacher did not give explicit instructions about collecting first-hand data through surveys and interviews. In Class A, the subject monitor made an enquiry about this the following day. In response, the teacher informed Class A and Class B that collecting first-hand data was preferable but not mandatory. In the midway report session, several groups in the two classes expressed an interest in collecting first-hand data. To help them carry out their research, the teacher provided more detailed guidance, covering issues such as determining an appropriate sample size for surveys and interviews and ethical considerations (e.g., choosing appropriate times for interviews and the duration of interviews and completion of surveys). This

guidance had a notable impact, as all Class A groups ended up collecting first-hand data. Three out of six groups used mixed methods, combining surveys and interviews to gather comprehensive information from participants. In Class B, four out of six groups chose to collect first-hand data. Mike's group was a compelling example. They conducted in-depth interviews with three temporary workers of the university, including cafeteria cooks and cleaners. In their video, they powerfully asked the question: 'You know the place well, but how much do you know about them? Those who maintain this place for us, who live in this place with us, who clean the leaves you leave behind.' Through this work they amplified the voices of often marginalised people.

For those who did desk research, students gathered information from multiple sources, including related case studies and official documents. This might have been influenced by the teacher's example and instructions (see Figure 2). Students also demonstrated a variety of skills in gaining relevant information. In a group's documentation, they noted the use of multiple methods to glean information, including the use of AI, the Bing search engine, and academic papers.

In addition to gathering information from a range of sources, some groups collected data and analysed it with theoretical tools.

In our project, we interviewed five people to ask their opinions about the addiction to short video. Our content included the phenomenon we found nowadays, our own views and our solutions. What we will do next is to find deeper theories under the problems. To have a creative view on this topic, there is still something difficult for us to address. (an excerpt from a group's midway report slides)

This midway report revealed their major methods of data collection, how they integrated others' thoughts with their own, and expressed their plan to find theoretical underpinnings. Interestingly, they also conveyed a desire to be creative - an expression that revealed their intention to achieve originality in their project.

5. Discussion

5.1. Project-Based Learning and High-Quality Teaching

This section draws on the findings of the current study and the five criteria outlined in the OECD's (2025) framework for high-quality teaching to examine the pedagogical strategies and effects of PBL. To be specific, the five criteria are: ensuring cognitive engagement, crafting quality subject content, providing social-emotional support, fostering classroom interaction, and using formative assessment and feedback.

First, PBL makes use of diverse knowledge bases and skills, effectively promoting students' cognitive engagement and improvement. The multifaceted processes inherent in PBL — such as problem identification, material collection and synthesis, and output production — involve different types and levels of cognitive engagement (Cahyono et al., 2024). In this study, students began their projects by identifying a driving question and breaking it down into sub-questions, followed by collecting data from video and audio resources, maintaining a documentation file, and synthesising the data into a final product — a video to disseminate ideas. In these processes, students experienced some common cognitive challenges, such as insufficient prior knowledge and ineffective learning strategies (Chew & Cerbin, 2021). However, in the meaningful contexts of PBL, students were able to build real-world connections, which helped them cope with the cognitive challenges. Corroborating the findings of another case study conducted among tertiary

EFL learners (Mahmud & Islam, 2022), some students in the current study expressed a lack of confidence in their research skills, which again underscored the importance of teachers' methodological guidance.

Secondly, with specific instructions, PBL offers students a meaningful opportunity to curate rich and meaningful subject content. In the present study, the practice of documenting listening activities emerged as a key component that enabled learners to systematically and consistently access linguistic input in authentic and meaningful contexts. Through reflective practice, students generated linguistic output that helped them internalise the input they had received. This practice incrementally refined the clarity, accuracy, and coherence of their expressions in the target language. As proved by previous studies (e.g., Londoño Llanos & Pedroza Parra, 2024; Mahmud & Islam, 2022), this study gathered evidence that PBL contributes to EFL learners' language acquisition in authentic and contextualised input and output. The 'Language' section in the documentation file was specifically designed to encourage students to select useful language items that could linguistically facilitate their reflective output and improve their language acquisition in the long term.

Thirdly, the provision of social-emotional support is a linchpin for the successful implementation of PBL. A defining characteristic of PBL is its emphasis on collaborative engagement (Guo et al., 2020; Thuan, 2018). However, as recent empirical studies (e.g., Huércano, 2021; Mahmud & Islam, 2022; Mohamad & Tamer, 2021) have shown, students often struggle with negative emotions, psychological barriers, and intra-group conflicts during collaborative projects. The current study echoed these findings, with several students experiencing challenges in forming groups and working effectively with their peers. Sensitive to these potential pitfalls, the teacher closely monitored students' responses at different stages of the project, paying particular attention to the group formation process. When students encountered difficulties, the teacher intervened promptly to provide guidance and support, which empowered the students to overcome their obstacles and enabled them to successfully complete their research and project tasks.

Fourthly, encouraging classroom interaction helps to improve the effectiveness of PBL. The midway report session in the current study is a good example. In the whole-class sharing activity, students were able to ask their questions, express their confusion or concerns, and their peers had the opportunity to respond to such questions and provide peer-to-peer support accordingly. Several students explicitly expressed their gains and their decision to improve their research design based on the feedback they had received from peers and the teacher. Student interaction was also embodied in the group discussion following the peer and teacher intervention. In the handout, students expressed their thoughts on the design and research activities of other groups. Based on their handout notes, students in their groups made plans on how to improve their own design. Adding to previous literature highlighting the importance of self-reflection (Roessingh & Chambers, 2011), this study shows that collective reflection, which involves cognitive interaction between peers in collective activities, is also essential for PBL implementation.

Finally, the use of formative assessment and feedback is crucial to the continuous improvement of PBL. In this study, the teacher clearly communicated the assessment criteria for the final products to the students at the outset. This transparency enabled students to make iterative adjustments to their project designs throughout the learning process, ensuring that their work met the established standards. After the final presentations, students evaluated each other's work on the basis of pre-defined criteria. The subject monitor promptly tabulated the scores and shared the results with the whole class, thus maintaining the transparency of the assessment process. Moreover, echoing the

findings of another case study (Mouni, 2022), this study gathered evidence that peer evaluation in PBL contributes to its effective implementation. This approach facilitated students' self-improvement by fostering a culture of peer learning and accountability in the classroom. On the teacher's part, it is important to provide timely feedback and ongoing guidance. For example, when the students demonstrated their passion for collecting first-hand data, mirroring the finding of a study conducted in a similar context (Wang, 2022), the teacher provided immediate methodological guidance, which proved to be conducive to fostering students' research-oriented interest and skills.

5.2. Three-Dimensional Scaffolding for PBL Implementation

This section focuses on strategies to support teachers in implementing project-based inquiry learning. Based on the findings of this study, a three-dimensional scaffolding model (see Figure 5) for PBL has been developed, including methodological, emotional, and informational scaffolding, with indications of the roles played by the teacher and students in each aspect.

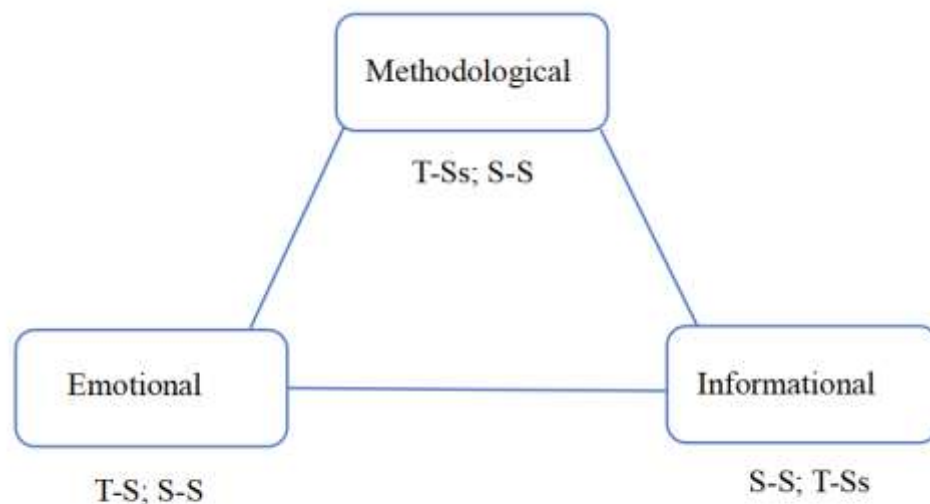


Figure 5. Three-dimensional scaffolding for project-based inquiry learning (Note: T-Ss refers to teacher to students; T-S refers to teacher to student; S-S refers to student to student.)

Methodological scaffolding, the foundation of inquiry learning, refers to the guidance that teachers provide to enable students' cognitive engagement in finding answers to a real-world inquiry. Such guidance includes crucial aspects such as topic selection, appropriate data collection techniques, and ethical considerations for fieldwork. This is essential to mitigate the cognitive challenges that students commonly encounter, such as students' fear of content-related investigations and inadequate learning strategies for inquiry-based learning (Chew & Cerbin, 2021). In the project launch session of this study, the teacher provided methodological scaffolding by demonstrating how to identify a 'driving question' as a research question, how to unpack it into sub-questions, how to collect data from multiple sources, and how to analyse and self-reflect on the data. This type of instruction is most effective in a whole-class setting, where the teacher can address common concerns and provide consistent guidance to all students. In the midway report session, students shared difficulties in collecting first-hand data (e.g., finding interviewees and achieving an appropriate sample size) and data analysis (e.g., integrating thoughts from different listening

resources). In this case, peer scaffolding plays a crucial role, achieved through listening to, commenting on, and borrowing ideas from others' methodological designs and approaches. Importantly, methodological scaffolding should be continuous and responsive to meet students' ever-changing needs in the implementation of PBL.

In conjunction with methodological scaffolding, emotional scaffolding, the psychological and affective support provided by interpersonal communication and feedback plays an important role in PBL (Rosiek, 1995, 2003). Teachers need to remain sensitive to students' unexpected emotional responses and provide timely and targeted support (Rosiek & Beghetto, 2009). These teacher-student interactions serve as invaluable opportunities to uncover the challenges that learners may face, enabling teachers to provide more comprehensive scaffolding tailored to the broader classroom context. Of the limited number of studies that have looked at the effectiveness of emotional scaffolding, most have focused on how teachers can design and deliver emotional scaffolding (Alavi & Esmailifard, 2021; Park et al, 2020; Shahidzade et al., 2022; Zhang, 2024). The current study extends the existing literature by adding the students' contribution to emotional scaffolding. As the results of this study show, students have the ability to provide emotional support to their peers, for example, by forming groups of like-minded individuals. In such groups, students can share common perspectives, which not only facilitates smoother collaboration, but also creates a supportive environment where they can provide the necessary emotional scaffolding to navigate the collaborative learning process together.

Information scaffolding in PBL is primarily aimed at improving students' data and digital literacy so that they are able to acquire, synthesise, and analyse data to solve real-world problems (Cui et al., 2023; Wolff et al. 2016). In this study, students demonstrated a lack of ability to integrate and interpret data, which are key features of data literacy in the inquiry learning process. Similarly, some students struggled to find relevant information and learning materials in digital platforms, indicating a lack of digital literacy. This deficit was evident in their inability to navigate complex sources of information and to critically assess the credibility of the sources they encountered, a key aspect of the critical dimension of digital literacy (Martínez-Bravo et al., 2022; Tinmaz, 2022). In this study, teacher informational scaffolding was embodied in the pedagogical design, that is, instructing students to share documentation files with links to useful materials, thus facilitating peer discovery of relevant content. Notably, informational scaffolding emerged mostly from collaborative peer exchange, which was best demonstrated in the midway report session. By sharing the techniques they used to collect relevant information, students enabled their peers to observe, imitate, and learn from each other. This peer-to-peer knowledge transfer improved learners' skills in collecting and analysing data, helping to improve their data literacy in a subtle and almost imperceptible manner.

It is apparent that students are actively engaged in all three forms of scaffolding. This significant aspect of student-led scaffolding has received limited attention in previous literature, highlighting a crucial gap that this study seeks to address. By demonstrating the integral role of students in providing cognitive, metacognitive, and emotional scaffolding, this study brings to light an under-explored dimension of the learning process and challenges conventional understandings of scaffolding as a predominantly teacher-centred practice.

6. Conclusion

This qualitative case study took an in-depth look at PBL through the lens of students' challenges and responses to teacher and peer scaffolding, with the overall aim of uncovering pedagogical scaffolding strategies to facilitate its successful implementation.

Against the backdrop of OECD (2025)'s five key goals for high-quality teaching, this study has gathered compelling evidence that PBL offers educators ample opportunities to achieve these key goals. To promote cognitive engagement, teachers can actively engage students in a series of critical tasks: from identifying a driving question and unpacking it into manageable sub-questions, to collecting and analysing data, to reporting and presenting their findings to a wider audience. The process of exposing students to relevant learning materials — such as listening to course-related content — and encouraging them to engage in continuous reflection not only deepens their understanding, but also contributes to the development of high-quality subject knowledge. In addition, organising collaborative activities, such as midway reports and sharing sessions, is an effective way of stimulating lively and constructive classroom interaction. In order to provide adequate social-emotional support, teachers need to remain vigilant and attuned to students' unexpected reactions and emotions throughout the PBL process. This sensitivity enables teachers to provide timely assistance and reduce learners' psychological barriers. Regarding the assessment of PBL, the current study supports the idea that the implementation of formative and peer assessment, along with the provision of immediate feedback, can significantly increase students' enthusiasm and maintain their interest in the learning process, thereby enhancing the overall effectiveness of PBL.

Based on the results of this study, a three-dimensional model for scaffolding project-based inquiry learning is created. First and foremost, providing students with methodological scaffolding is essential for PBL to move in the right direction and to enhance students' skills in inquiry learning. Emotional scaffolding, on the other hand, helps students to have a positive attitude and sustained momentum towards collaboration and challenging tasks. Informational scaffolding is most effectively achieved between peers, allowing them to share methods and skills in data collection and analysis, although teachers' pedagogical design and guidance is required. It is important to emphasise that three-dimensional scaffolding is not the responsibility of teachers alone. Instead, students actively contribute to and are integral to every facet of this scaffolding process.

Implications of the study include detailed strategies for PBL implementation based on the difficulties encountered by students, which proved effective in this study and therefore can be applied to similar teaching contexts. In addition, the benefits demonstrated by students' artefacts confirm that despite the challenges, PBL is worth trying, especially in tertiary teaching contexts where students need to be equipped with research-oriented skills. The limitations of the study should also be noted. Conducted within a single institution and involving only one teacher, the findings may not be readily generalisable to other educational contexts. Although the researcher kept a reflective teaching journal, the single perspective of data analysis should be taken with caution. Moreover, due to the limited scope of this study, some of the problems encountered by students (e.g., difficulty in analysing data) were not fully addressed. It is hoped that further research could be conducted to provide more insights and effective strategies for PBL implementation in various teaching environments.

7. References

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8. Appendix

8.1. Project Midway Report Handout

1. Reflection on what you have done
2. Take down something you find interesting/problematic about other groups' projects
3. What you need to do in the next stage

Author bio

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